United States Department of Agriculture

Natural Resources Conservation Service

In cooperation with West Virginia Agricultural and Forestry Experiment Station

Soil Survey of Calhoun and Roane Counties, 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.

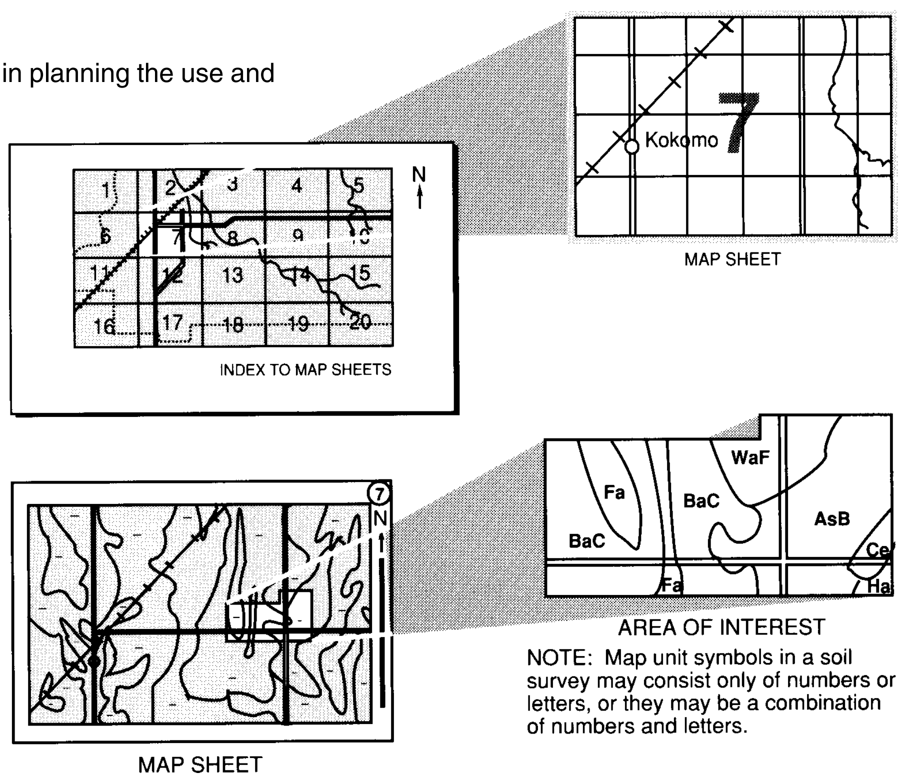
Detailed Soil Maps

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.



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

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.

This survey updates the “Soil Survey of the Spencer Area, West Virginia,” printed in 1910 (Latimer and Meeker, 1910). It provides additional information and has larger maps, which show the soils in greater detail.

Major fieldwork for this soil survey was completed in the period 1989 to 1993. Soil names and descriptions were approved in 1992. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1992. This survey was made cooperatively by the Natural Resources Conservation Service and the West Virginia Agricultural and Forestry Experiment Station. The survey is part of the technical assistance furnished to the Little Kanawha Soil Conservation District.

Cover: A typical area of the Gilpin-Peabody complex, 35 to 70 percent slopes, severely eroded.

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 1999

Foreword

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

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

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

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

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

William J. Hartman
State Conservationist
Natural Resources Conservation Service

Soil Survey of Calhoun and Roane Counties, West Virginia

By Robert N. Pate, Natural Resources Conservation Service

Soils surveyed by Robert N. Pate, Claude L. Marra, and Carlos Cole, Natural Resources Conservation Service

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

CALHOUN AND ROANE COUNTIES are in the west-central part of West Virginia (fig. 1). Calhoun County is 179,500 acres, or about 280 square miles, in size, and Roane County is 309,700 acres, or about 484 square miles, in size. In the two counties, land makes up about 487,500 acres and water about 1,700 acres.

The major enterprises throughout the survey area are oil and gas production, timber and related wood production, and a small amount of manufacturing in incorporated areas.

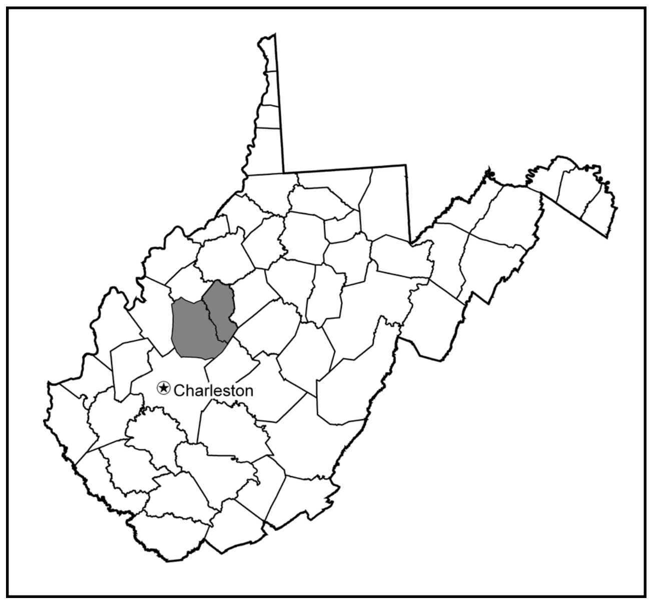


Figure 1.—Location of Calhoun and Roane Counties in West Virginia.

General Nature of the Survey Area

This section provides information about some of the natural and cultural factors that affect land use in the survey area.

Settlement

The first settler in Calhoun County was Abraham Thomas, who settled along the banks of the Little Kanawha River in 1774 (Mills and the Calhoun County Historical and Genealogical Society, 1900). Calhoun County was formed from Gilmer County, Virginia, in 1856 and was named in honor of John C. Calhoun. Grantsville, the county seat, was named for General Ulysses S. Grant.

The first settlers in Roane County were the Samuel Tanner family, who settled near Spencer in 1812 (Mylott, 1984). Roane County was formed from Gilmer, Jackson, and Kanawha Counties, Virginia, in 1856 and was named in honor of Judge Spencer Roane of the Court of Appeals of Virginia. Spencer, the county seat, also was named for Judge Spencer Roane.

The early settlers in the survey area were hunters, trappers, and woodsmen. Cattle grazing and timber production were the chief sources of income. Corn, wheat, and oats were the first crops. Later, tobacco also was grown. There were extensive areas of bluegrass pasture. The first pure breed of cattle was the Shorthorn in 1880.

Population

In 1990, the population of Calhoun County was 7,885 (U.S. Department of Commerce, 1991). In that year, Grantsville had a population of 671, making it the largest city in Calhoun County. The population of Roane County was 15,095 in 1990. There are two incorporated cities in Roane County—Spencer and Reedy. In 1990, Spencer had a population of 2,203 and Reedy had a population of 229. Many scattered small communities that are unincorporated are throughout the survey area.

Transportation Facilities

The transportation needs of the survey area are met by Interstate 79; U.S. Routes 33 and 119; State Routes 5, 14, 16, and 36; and numerous county routes. At present, there are no railroads operating in the survey area.

Farming

In 1992, Calhoun County had 162 farms and a total farm acreage of 34,919 acres. The average farm size was 216 acres. In 1982, the total number of farms was 191 and the average farm size was 198 acres (U.S. Department of Commerce, 1992).

In 1992, Roane County had 437 farms and a total farm acreage of 82,154 acres. The average farm size was 188 acres. In 1982, the total number of farms was 522 and the average farm size was 193 acres (U.S. Department of Commerce, 1992).

Most of the farms are used for raising sheep and beef cattle in conjunction with the production of hay and pasture species. The beef cattle are raised mostly in cow-calf operations. Small acreages are used for tobacco or corn. The production of specialty crops, such as summer vegetables, is proving profitable, and markets for these crops are growing. Most of the farms are operated on a part-time basis.

Relief and Drainage

Calhoun and Roane Counties are in the highly dissected Central Allegheny Plateau land resource area. They are characterized by moderately steep ridgetops and very steep side slopes that are broken by narrow bench areas. This type of landscape is called “bench-break topography.” The flood plains generally are narrow but widen out along the major streams. Stream terraces are along the larger streams. They remain as evidence of the various stream levels through the ages.

Elevations in Calhoun County range from 1,584 feet on Mule Knob, at the head of Owl Run north-northeast of Chloe, to 635 feet in an area where the Little Kanawha River runs into Wirt County and in an area on the Calhoun-Roane County line where the West Fork of the Little Kanawha River runs into Wirt County.

Elevations in Roane County range from 1,470 feet on Weedy Knob, at the head of Blowntimber Run east of Newton, to 635 feet in an area where Big Sandy Creek runs into Kanawha County and in an area where the West Fork of the Little Kanawha River enters Wirt County.

The Little Kanawha River is the largest waterway in the survey area. It flows from east to west across the northern part of Calhoun County. Calhoun County is drained by the West Fork of the Little Kanawha River and by Henry Fork. These streams form the boundary between Calhoun and Roane Counties. Roane County is dissected by many small streams, such as Reedy Creek, Spring Creek, Big Sandy Creek, and the headwaters of the Pocatalico River.

Geology

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

Most of the soils in Calhoun and Roane Counties are weathered from bedrock that generally is part of the Dunkard, Monongahela, and Conemaugh Groups (Hennen, 1911). A small part of the Allegheny Formation is in the southeast corner of Roane County. These groups are considered to be approximately 280 to 320 million years old. The bedrock consists of red and olive yellow shale interbedded with acid, gray and brown siltstone and sandstone. Limestone and coal seams occur, but they are thin and of no commercial value.

The dominant rock types of the Dunkard and Monongahela Groups are red and olive yellow shale and siltstone interbedded with sandstone. These groups are in the northwestern part of Calhoun and Roane Counties and cover approximately 80 percent of the survey area. Gilpin, Peabody, and Upshur soils are in this part of the survey area. They formed in material weathered from these red and yellow shales and siltstones. The more resistant sandstone layers crop out in many areas along the spines of ridges and in areas where the ridgetops break to steeper slopes (fig. 2).

The dominant rock types of the Conemaugh Group

Figure 2.—A natural bridge formed from resistant sandstone of the Monongahela Group.

and the Allegheny Formation are olive yellow siltstone and sandstone about equally mixed with areas of red and olive yellow shale and siltstone. These groups are in the southeast part of Calhoun and Roane Counties and cover approximately 20 percent of the survey area. These rock types weather into two distinct bands of soils. The red and yellow shales and siltstones form the Gilpin, Peabody, and Upshur soils, and the sandier olive yellow siltstone and sandstone form the Gilpin and Pineville soils.

The rock types in the survey area are typical of the Appalachian Plateau province, which consists mostly of horizontally bedded sedimentary rocks. There are some areas with subtle synclines and anticlines, which form the major oil and gas fields in Calhoun and Roane Counties.

The soils along the Little Kanawha River, the West Fork of the Little Kanawha River, Spring Creek, Reedy Creek, the Pocatalico River, and Big Sandy Creek formed in Quaternary alluvial material of recent deposition.

Climate

Winters are cold and snowy in the survey area, but intermittent thaws preclude a long-lasting snow cover. Summers are very warm and occasionally include very hot days when the humidity is very high. The normal annual precipitation is adequate for all of the crops commonly grown in the survey area.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Spencer, 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 at Spencer on January 22, 1984, is -20 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 August 14, 1954, 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 annual precipitation is nearly 42 inches. Of this, nearly 23 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 20 inches. The heaviest 1-day rainfall during the period of record was 3.50 inches at Spencer on August 10, 1969. Thunderstorms occur on about 44 days each year. Heavy rains, which occur at any time of the year, and severe thunderstorms in summer sometimes cause flash flooding, particularly in narrow valleys.

The average seasonal snowfall is about 28 inches. The greatest snow depth at any one time during the period of record was 24 inches. On the average, 11 days of the year have at least 1 inch of snow on the ground, but the number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 55 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. The average windspeed is highest, 8 miles per hour, in spring.

How This Survey Was Made

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

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

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

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

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

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

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

General Soil Map Units

The general soil map in this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. These areas are called soil associations. Each association 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 association can occur in another but in a different pattern.

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

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

In some areas where the general soil map of Calhoun and Roane Counties joins the general soil map of Kanawha, Jackson, Wirt, Ritchie, or Braxton County, West Virginia, there are differences in the map unit names or in the proportion of component soils. These differences are the result of variations in the map scale and advancements in soil science.

Soil Descriptions

1. Gilpin-Peabody-Upshur Association

Moderately deep and deep, well drained, strongly sloping to very steep soils on uplands

This association consists of soils on ridgetops, benches, and very steep side slopes on uplands in the northern and central parts of the survey area. The very steep side slopes generally are broken by a series of moderately steep bench areas. This type of landscape is commonly referred to as “bench-break topography.” This association is dissected by many small intermittent streams, which form narrow, nearly level flood plains and alluvial fans. The association also includes soils on colluvial footslopes. Slopes range from 15 to 70 percent.

This association makes up 86 percent of the survey area. It is 43 percent Gilpin soils, 20 percent Peabody soils, 10 percent Upshur soils, and 27 percent soils of minor extent (fig. 3).

Gilpin soils are moderately deep, well drained, and strongly sloping to very steep. They are on ridgetops, backslopes, and benches. They have a dark brown, medium textured surface layer; a yellowish brown and brown, medium textured subsoil; and a yellowish brown, medium textured substratum. These soils formed in acid material weathered from interbedded siltstone, shale, and sandstone.

Peabody soils are moderately deep, well drained, and very steep. They are on shoulders and backslopes. They have a reddish brown, medium textured surface layer and a reddish brown, fine textured subsoil. These soils formed in material weathered from clayey shale and siltstone.

Upshur soils are deep, well drained, and strongly sloping to steep. They on ridgetops and benches. They have a brown, medium textured surface layer; a yellowish red, dark red, and dusky red, fine textured subsoil; and a dusky red, fine textured substratum. These soils formed in material weathered from clayey shale and siltstone.

The Gilpin-Peabody soils and the Upshur-Gilpin soils occur as areas so intermingled that it was not practical to separate them in mapping.

The minor soils are the well drained Vandalia soils on colluvial footslopes, the well drained Sensabaugh soils on flood plains, and the moderately well drained Tilsit soils on flat, broad ridgetops.

Most of this association consists of very steep areas that were once cleared but are now wooded. Erosion in these areas is severe. About 30 percent of the association is used for farming. Most cleared areas are used for hay and pasture. Some small areas are used for tobacco, specialty crops, or home gardens.

Most farms in areas of this association are managed for the production of beef cattle (cow-calf operations) and sheep. Timber and woodland products also are important. Generally, the soils on ridgetops, benches, and bottom land are suitable for hay and

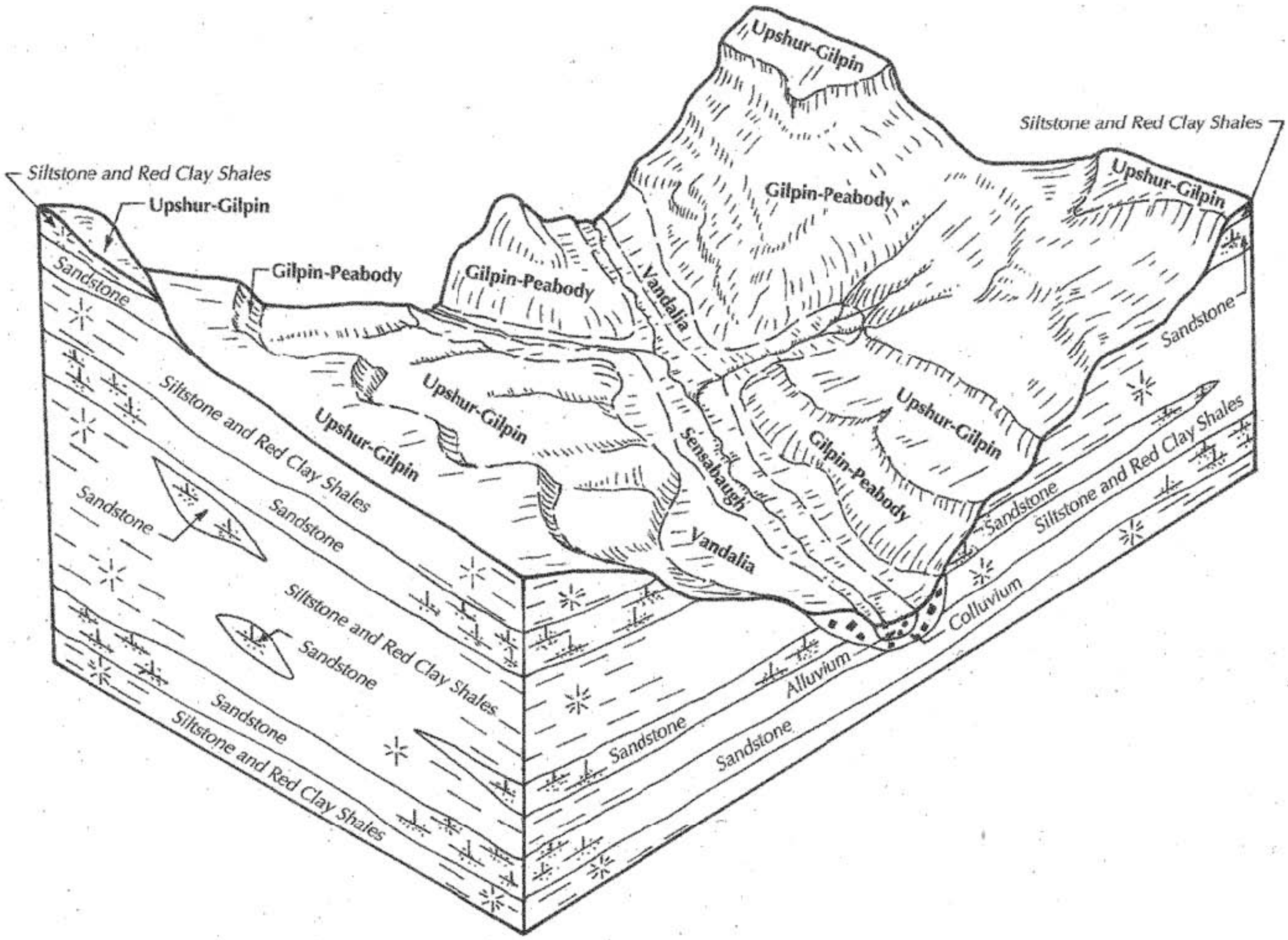


Figure 3.—Pattern of soils and parent material in the Gilpin-Peabody-Upshur association.

pasture. The soils on very steep side slopes are suitable for woodland. The hazards of slippage and erosion, slope, and the depth to bedrock are the main limitations.

About 70 percent of this association is used as woodland. The association is suitable for trees. Woodland productivity is moderate or moderately high. Proper woodland management techniques can increase yields and production. The hazard of erosion and equipment limitations are the main management concerns.

Some of the more nearly level areas on ridgetops and benches are used for housing. These areas have limited suitability for housing and septic tank absorption fields because of slope, slow permeability, the depth to bedrock, a high shrink-swell potential, and slippage. Sites for houses are available in many areas of the minor Sensabaugh soils on rarely flooded alluvial fans. These areas have limited suitability for housing because of flooding and underground piping of water.

2. Gilpin-Pineville-Peabody Association

Moderately deep and very deep, well drained, strongly sloping to very steep soils on rugged uplands

This association consists of soils on very steep shoulders, backslopes, and sharp, peaked ridgetops in the uplands on the eastern edge of Calhoun County and in the southern, most rugged part of Roane County. In the southern part of Roane County, the association generally corresponds to the sandier geology of the Conemaugh Group. This is a transitional area where distinct units of Gilpin-Pineville soils are directly adjacent to distinct units of Gilpin-Peabody soils. This association is dissected by small intermittent streams, which form narrow, nearly level flood plains and alluvial fans. Slopes range from 35 to 70 percent.

This association makes up 10 percent of the survey area. It is 43 percent Gilpin soils, 19 percent Pineville soils, 10 percent Peabody soils, and 28 percent soils of minor extent.

Gilpin soils are moderately deep, well drained, and strongly sloping to very steep. They are on ridgetops, shoulders, backslopes, and benches. They have a dark brown, medium textured surface layer; a yellowish brown and brown, medium textured subsoil; and a yellowish brown, medium textured substratum. These soils formed in acid material weathered from interbedded sandstone, siltstone, and shale.

Pineville soils are very deep, well drained, and steep and very steep. They are on the lower backslopes and on colluvial footslopes. They have a dark brown, coarse textured surface layer; a yellowish brown and strong brown, medium textured subsoil; and a yellowish brown, coarse textured substratum. These soils formed in colluvium derived from sandstone, siltstone, and shale.

Peabody soils are moderately deep, well drained, and very steep. They on shoulders and backslopes. They have a reddish brown, medium textured surface layer and a reddish brown, fine textured subsoil. These soils formed in material weathered from clayey shale and siltstone.

The Gilpin-Pineville soils and the Gilpin-Peabody soils occur as areas so intermingled that it was not practical to separate them in mapping.

The minor soils are the well drained Upshur soils on uplands, the well drained Vandalia soils on colluvial footslopes, the well drained Sensabaugh soils on flood plains, and Udorthents in the area disturbed by the construction of Interstate 79.

About 5 percent of this association has been cleared and is used for hay or pasture. Most of this association consists of rugged, generally inaccessible, very steep areas that are used as woodland.

This association is used for the production of timber and woodland products and for outdoor recreation. Generally, the soils on narrow bottom land are used for permanent housing or hunting camps. The ridgetops generally are inaccessible. Oil and gas production is a growing industry in areas of this association and may lead to better access because of the roads built to the well sites. The hazard of erosion, slope, and the depth to bedrock are the main limitations.

About 95 percent of this association is wooded. The association is suitable for trees. Woodland productivity is moderately high. Proper woodland management techniques can increase yields and production. The hazard of erosion and equipment limitations are the main management concerns.

Some of the more nearly level areas on ridgetops and benches are used for housing. These areas have limited suitability for housing and septic tank absorption fields because of slope, slow permeability, the depth to bedrock, a high shrink-swell potential, and slippage. Sites for houses are available in many areas of the minor Sensabaugh soils on rarely flooded alluvial fans. These areas have limited suitability for housing because of flooding and underground piping of water.

3. Moshannon-Vandalia-Hackers Association

Very deep, well drained, nearly level or moderately steep soils on flood plains and footslopes

This association consists of occasionally flooded or rarely flooded alluvial soils and soils on colluvial footslopes that are not subject to flooding. The association is along the major streams in the survey area. Slopes range from 0 to 3 percent on the flood plains and from 15 to 25 percent on the footslopes.

This association makes up 4 percent of the survey area. It is 39 percent Moshannon soils, 21 percent Vandalia soils, 11 percent Hackers soils, and 29 percent soils of minor extent.

Moshannon soils are very deep, well drained, and nearly level. They are on low flood plains. They are reddish brown and medium textured in the surface layer, subsoil, and substratum. These soils formed in alluvial material that washed from reddish soils on uplands.

Vandalia soils are very deep, well drained, and moderately steep. They are on colluvial footslopes. They have a reddish brown, medium textured surface layer; a yellowish red and reddish brown, fine textured subsoil; and a dark reddish brown, medium textured substratum. These soils formed in colluvial material that collected from reddish soils on uplands.

Hackers soils are very deep, well drained, and nearly level. They are on high flood plains. They have a brown, medium textured surface layer and a reddish brown, medium textured subsoil and substratum. These soils formed in alluvial material that washed from reddish soils on uplands.

The minor soils are the well drained Sensabaugh, moderately well drained Senecaville, and poorly drained Melvin soils on flood plains; the moderately well drained Monongahela soils on stream terraces; and the well drained Gilpin, Peabody, and Upshur soils on uplands.

About 80 percent of this association has been cleared and is used for hay, pasture, cultivated crops, or housing. The cultivated areas are used for tobacco, specialty crops, or home gardens. Most of the cleared areas are used for hay. Only a small percentage of the association is used as woodland.

Most farms in areas of this association are intensively managed for the production of beef cattle (cow-calf operations) and hay. Usually, the meadows are cut for hay only twice during the year. They are then grazed later in the fall or left idle until the next year's growing season. On many farms the bottom land is used to feed livestock in winter because of the close proximity to the barns where the hay is stored.

About 20 percent of this association is wooded. The association is suitable for trees. Woodland productivity is moderately high. Proper woodland management techniques can increase yields and production. Equipment limitations caused by flooding, slope, slippage, and low soil strength during wet seasons are the main management concerns.

Many areas are used for housing. These areas have limited suitability for housing and septic tank absorption fields because of the hazard of flooding, slope, slippage, and slow 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 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. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils 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. If intensive use of small areas is planned, however, 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, Vandalia silt loam, 15 to 25 percent slopes, extremely bouldery, is a phase of the Vandalia series.

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

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Gilpin-Peabody complex, 35 to 70 percent slopes, severely eroded, 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. Senecaville and Melvin silt loams, occasionally flooded, is an undifferentiated group in this survey area.

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

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

GpF3—Gilpin-Peabody complex, 35 to 70 percent slopes, severely eroded

This complex consists of very steep, well drained soils on hillsides, shoulders, backslopes, and benches throughout most of the survey area. The very steep hillsides generally are broken by a series of less steep bench areas. This type of landform is commonly referred to as “bench-break topography” (fig. 4). The hillsides are dissected by drainageways, and land slips are common in some areas. Erosion has removed most of the original surface layer of these soils, and in places the subsoil is exposed. The two soils occur as long, narrow areas in a repeating, alternating pattern, and it was not practical to separate them in mapping. This complex is about 50 percent Gilpin soil, 30 percent Peabody soil, and 20 percent other soils.

Typically, the surface layer of the Gilpin soil is dark brown silt loam about 3 inches thick. The subsoil is 22 inches thick. The upper 5 inches is yellowish brown silt loam, the next 10 inches is yellowish brown channery silty clay loam, and the lower 7 inches is brown very channery silty clay loam. The substratum is yellowish

Figure 4.—Typical bench-break topography in an area of Gilpin-Peabody complex, 35 to 70 percent slopes, severely eroded.

brown very channery silty clay loam. Rippable bedrock is at a depth of 32 inches.

Typically, the surface layer of the Peabody soil is reddish brown silt loam about 3 inches thick. The subsoil is 21 inches thick. It is reddish brown. The upper 6 inches is channery silty clay loam, and the lower 15 inches is channery silty clay. Bedrock is at a depth of 24 inches.

Included with these soils in mapping are a few small areas of the moderately well drained Tilsit and well drained Vandalia soils. Also included are areas of Upshur soils, which have bedrock at a depth of more than 40 inches; Udorthents, which have more than 35 percent rock fragments in the control section; a few areas where 1 to 3 percent of the surface is covered with stones; some areas where rock ledges crop out along the spines of ridges or directly below the crest of hills; and less eroded areas.

The available water capacity of the Gilpin soil is moderate. Permeability is moderate in the subsoil. Runoff is very rapid. Natural fertility is low or moderate. In unlimed areas the soil ranges from extremely acid to strongly acid. The root zone of some plants is restricted by bedrock at a depth of 20 to 40 inches.

The available water capacity of the Peabody soil is low or moderate. Permeability is slow or moderately slow in the subsoil. Runoff is very rapid. Natural fertility is moderate or high. In unlimed areas the soil ranges from very strongly acid to slightly acid in the solum. The root zone of some plants is restricted by bedrock at a depth of 20 to 40 inches. The subsoil has a high shrink-swell potential. The hazard of slippage is severe.

Most areas of these soils are used as woodland. A small percentage of this unit is used as pasture.

These soils are not suited to cultivated crops or hay and are difficult to manage as pasture. The hazard of erosion is very severe in unvegetated areas and is a major management concern.

These soils have moderately high potential productivity for trees. The tree species on these soils include northern red oak, white oak, chestnut oak, hickory, beech, sugar maple, yellow-poplar, and Virginia pine. Proper woodland management techniques, such as timber stand improvement, can increase yields in wooded areas.

The use of equipment is restricted on these soils because of the slope. Erosion on logging roads and skid trails is a major management concern. It can be controlled by establishing roads and skid trails on a gentle side slope. The hazard of slippage is severe on the Peabody soil. Many of the logging roads and skid trails can be constructed so that they follow the small benches in areas of this unit. Minimizing road cuts can help to prevent slippage on the Peabody soil. Diverting surface water from the logging road, establishing and maintaining a crown on the road, and establishing and maintaining sod on bare roadbanks help to control erosion. Plant competition is a management concern.

The very steep slope and the depth to bedrock are the main limitations if the Gilpin and Peabody soils are used as sites for dwellings or septic tank absorption fields. Slow or moderately slow permeability, a high shrink-swell potential in the subsoil, and the hazard of slippage are additional limitations in areas of the Peabody soil. Alternative sites with fewer limitations should be selected for dwellings and septic tank absorption fields.

The very steep slope and other soil-related management concerns severely limit the use of this unit as a site for local roads and streets.

The capability subclass is VIIe.

GvF—Gilpin-Pineville complex, 35 to 70 percent slopes, very stony

This complex consists of very steep, well drained soils on narrow ridgetops and side slopes in southern Roane County and in a small area on the eastern edge of Calhoun County. In some areas the very steep side slopes are broken by a series of less steep bench areas. Stones 10 to 24 inches in diameter cover 1 to 3 percent of the surface. The Gilpin and Pineville soils are closely intermingled on the landscape. Thus, it was not practical to separate them in mapping. This complex is about 55 percent Gilpin soil, 35 percent Pineville soil, and 10 percent other soils.

Typically, the surface layer of the Gilpin soil is dark brown silt loam about 3 inches thick. The subsoil is 22 inches thick. The upper 5 inches is yellowish brown silt loam, the next 10 inches is yellowish brown channery silty clay loam, and the lower 7 inches is brown very channery silty clay loam. The substratum is yellowish brown very channery silty clay loam. Rippable bedrock is at a depth of 32 inches.

Typically, the surface layer of the Pineville soil is dark brown loam about 3 inches thick. The subsoil is 53 inches thick. The upper 7 inches is yellowish brown channery loam, the next 12 inches is strong brown channery loam, the next 13 inches is strong brown channery clay loam, and the lower 21 inches is strong brown very channery clay loam. The substratum is yellowish brown very channery sandy loam. It extends to a depth of 65 inches.

Included with these soils in mapping are a few small areas of the well drained Peabody soils, soils that have bedrock within a depth of 20 inches, and some areas of rock outcrop 5 to 15 feet high. Also included some areas of soils that are similar to the Pineville soil but have a weak fragipan below a depth of 40 inches, soils that are similar to the Gilpin soil but are sandier throughout, and soils that have more than 35 percent rock fragments throughout.

The available water capacity of the Gilpin soil is moderate. Permeability is moderate in the subsoil. Runoff is very rapid. Natural fertility is low or moderate. In unlimed areas the soil ranges from extremely acid to strongly acid. The root zone of some plants is restricted by bedrock at a depth of 20 to 40 inches.

The available water capacity of the Pineville soil is moderate or high. Permeability is moderate in the subsoil and moderately rapid in the substratum. Runoff is very rapid. Natural fertility is low or moderate. In unlimed areas the soil ranges from extremely acid to neutral in the surface layer and from extremely acid to strongly acid in the subsoil and substratum. The depth to bedrock is more than 60 inches.

Most areas of these soils are used as woodland.

These soils are not suited to cultivated crops or hay and are difficult to manage as pasture. The hazard of erosion is very severe in unvegetated areas and is a major management concern.

These soils have moderately high potential productivity for trees. The tree species on these soils include northern red oak, white oak, chestnut oak, hickory, beech, sugar maple, yellow-poplar, and Virginia pine. Proper woodland management techniques, such as timber stand improvement, can increase yields in wooded areas.

The use of equipment is severely restricted on these soils because of the slope. Erosion on logging roads and skid trails is a major management concern. It can be controlled by establishing roads and skid trails on a gentle grade across the slope. Many of the logging roads and skid trails can be constructed so that they follow the small benches in areas of this unit. Diverting surface water from the logging road, establishing and maintaining a crown on the road, and establishing and maintaining sod on bare roadbanks help to control erosion. Plant competition is a management concern.

The very steep slope is the main limitation if these soils are used as sites for dwellings or septic tank absorption fields. The depth to bedrock is an additional limitation in areas of the Gilpin soil. Alternative sites with fewer limitations should be selected for dwellings and septic tank absorption fields.

The very steep slope and other soil-related management concerns severely limit the use of these soils as sites for local roads and streets.

The capability subclass is VIIs.

Ha—Hackers silt loam

This soil is nearly level, very deep, and well drained. It is on high flood plains and low stream terraces along the Little Kanawha River and the West Fork of the Little Kanawha River and is in small areas along other major streams in the survey area. The soil is subject to rare flooding. Slopes range from 0 to 3 percent.

Typically, the surface layer is brown silt loam about 8 inches thick. The subsoil is 42 inches thick. It is reddish brown. The upper 4 inches is silt loam, and the lower 38 inches is silty clay loam. The substratum is reddish brown silty clay loam. It extends to a depth of 65 inches.

Included with this soil in mapping are a few small areas of the well drained Moshannon and Vandalia soils, the moderately well drained Senecaville soils, and the poorly drained Melvin soils. Also included are small areas of soils that have more sand in the subsoil than the Hackers soil and some areas of soils with slopes of more than 3 percent. Included soils make up about 10 percent of this map unit.

The available water capacity of the Hackers soil is high. Permeability is moderate in the subsoil. Runoff is slow. Natural fertility is high. In unlimed areas the soil ranges from strongly acid to slightly acid. The depth to bedrock is more than 60 inches.

Most areas of this soil are used for hay. A small acreage is wooded.

This soil is well suited to cultivated crops, hay, and pasture. Crops can be grown year after year, but the protection of a cover crop is needed. Applying a system of conservation tillage and returning crop residue and cover crops to the soil help to control erosion and maintain fertility and tilth. Proper stocking rates, which help to maintain desirable grasses and legumes, and rotational grazing are the major pasture management needs.

This soil has moderately high potential productivity for trees. The tree species on this soil include boxelder, yellow-poplar, sycamore, and ash. Proper woodland management techniques, such as timber stand improvement, can increase yields in wooded areas. Plant competition is a management concern.

The flooding is the main limitation if this soil is used as a site for dwellings or septic tank absorption fields. Soils that are not subject to flooding should be selected for these uses.

The flooding, the potential for frost action, and low soil strength limit the use this soil as a site for local roads and streets. Constructing the roads and streets on raised fill and properly installing culverts can minimize these limitations.

The capability class is I.

MoB—Monongahela silt loam, 3 to 8 percent slopes

This soil is gently sloping, very deep, and moderately well drained. It is on stream terraces along the Little Kanawha River, the West Fork of the Little Kanawha River, Reedy and Spring Creeks, and other major streams in the survey area.

Typically, the surface layer is brown silt loam about 8 inches thick. The subsoil is 57 inches thick. The upper 15 inches is yellowish brown silt loam, the next 11 inches is a fragipan of yellowish brown silt loam that has common light brownish gray mottles and black manganese concretions, and the lower 31 inches is a fragipan of strong brown silt loam that has many brown mottles and black manganese concretions.

Included with this soil in mapping are small areas of the well drained Gilpin, Upshur, Vandalia, and Hackers soils. Also included are small areas of well drained soils that do not have a fragipan, small areas of soils with slopes of less than 3 percent, small areas of soils with slopes of more than 8 percent, and areas on short, steep slopes that generally are a mixture of residual and alluvial soils. Included soils make up about 15 percent of this map unit.

The available water capacity of the Monongahela soil is moderate. Permeability is moderate above the fragipan and moderately slow or slow in the fragipan. Runoff is medium. Natural fertility is moderate. In unlimed areas the soil is very strongly acid or strongly acid in the surface layer, very strongly acid to neutral in the upper part of the subsoil, and very strongly acid or strongly acid in the fragipan and in the substratum. A seasonal high water table at a depth of 1.5 to 3.0 feet and the fragipan restrict the root zone of deep-rooted plants. The depth to bedrock is more than 60 inches.

Most areas of this soil are used for hay. A small acreage is wooded.

This soil is suited to cultivated crops, hay, and pasture (fig. 5). The hazard of erosion is moderate in unvegetated areas, and the protection of a cover crop is needed. Applying a system of conservation tillage, including hay in the crop rotation, maintaining sod in shallow drainageways, and returning crop residue and cover crops to the soil help to control erosion and maintain fertility and tilth. The seasonal high water table may become an important factor during the growing season. In dry years row crops and hay grow well because of the available moisture. In wet years, however, growth can be inhibited by excess soil moisture. Proper stocking rates, which help to maintain desirable grasses and legumes, rotational grazing, and deferment of grazing until the soil is reasonably firm in the spring are the major pasture management needs.

This soil has moderately high potential productivity for trees. The tree species on this soil include northern red oak, white oak, scarlet oak, hickory, yellow-poplar, sycamore, and ash. Proper woodland management techniques, such as timber stand improvement, can increase yields in wooded areas. Plant competition is a management concern.

The seasonal high water table and moderately slow or slow permeability are the main limitations if this soil is used as a site for dwellings or septic tank absorption fields. The limitations on sites for dwellings can be minimized by correctly installed footer drains and upslope ditches, which can divert water. When footer drains are installed, clean, sized gravel should be used as fill close to the surface. Installing the absorption field on the contour and as shallow as possible, enlarging the absorption area, installing an alternative system (such as a mound system), or selecting adjacent soils that are better suited to onsite waste disposal can minimize or avoid the limitations affecting septic tank absorption fields. Erosion is a hazard in areas that are cleared for construction. Revegetating during or soon after construction reduces this hazard.

The wetness and the potential for frost action are limitations if this soil is used as a site for local roads and streets. Constructing the roads and streets on raised fill and properly installing culverts minimize these limitations.

The capability subclass is IIe.

Ms—Moshannon silt loam

This soil is nearly level, very deep, and well drained. It is on flood plains along streams throughout the survey area. The soil is subject to occasional flooding. Slopes range from 0 to 3 percent.

Typically, the surface layer is reddish brown silt loam about 10 inches thick. The subsoil is 28 inches thick. It is reddish brown, The upper 9 inches is silt loam, and the lower 19 inches is silty clay loam. The substratum is reddish brown silt loam. It extends to a depth of 65 inches.

Included with this soil in mapping are a few small areas of the well drained Hackers and Sensabaugh soils, the moderately well drained Senecaville soils, and the poorly drained Melvin soils. Also included are small areas of soils that have a higher sand content throughout than the Moshannon soil. Included soils make up about 5 percent of this map unit.

The available water capacity of the Moshannon soil

Figure 5.—Hay on Monongahela silt loam, 3 to 8 percent slopes.

is high. Permeability is moderate in the subsoil. Runoff is slow. Natural fertility is high. In unlimed areas the soil is moderately acid to neutral in the surface layer, slightly acid or moderately acid in the subsoil, and moderately acid to neutral in the substratum. The depth to bedrock is more than 60 inches.

Most areas of this soil are used for hay. A small acreage is wooded.

This soil is suited to cultivated crops, hay, and pasture. In some areas crops are subject to damage from flooding. Crops can be grown year after year, but the protection of a cover crop is needed. Working the residue from the cover crop into the soil and returning other crop residue to the soil help to maintain fertility and tilth. Proper stocking rates, which help to maintain desirable grasses and legumes, rotational grazing, and deferment of grazing until the soil is reasonably firm in the spring are the major pasture management needs. Establishing a plant cover on unprotected streambanks and providing proper access for livestock to streams help to control stream scouring and sedimentation.

This soil has moderately high potential productivity for trees. The tree species on this soil include boxelder, sycamore, yellow-poplar, and ash. Proper woodland management techniques, such as timber stand improvement, can increase yields in wooded areas. Plant competition is a management concern.

The flooding is the main limitation if this soil is used as a site for dwellings or septic tank absorption fields. Alternative sites should be selected.

The flooding restricts the use of this soil as a site for local roads and streets. Constructing the roads and streets on raised fill and properly installing culverts can minimize the hazard of flood damage.

The capability subclass is IIw.

PvE—Pineville loam, 25 to 35 percent slopes, very stony

This soil is steep, very deep, and well drained. It is in a small area along the eastern border of Calhoun County. It is south of Steer Creek, east of the West Fork of the Little Kanawha River, north of Left Fork, and west of the Gilmer County line. It is on colluvial footslopes and at the head of drainageways at the base of very steep areas of the Gilpin-Pineville complex. Stones 10 to 24 inches in diameter cover 1 to 3 percent of the surface.

Typically, the surface layer is dark brown loam about 3 inches thick. The subsoil is 53 inches thick. The upper 7 inches is yellowish brown channery loam, the next 12 inches is strong brown channery loam, the next 13 inches is strong brown channery clay loam, and the lower 21 inches is strong brown very channery clay loam. The substratum is yellowish brown very channery sandy loam. It extends to a depth of 65 inches.

Included with this soil in mapping are a few small areas of the well drained Gilpin and Vandalia soils and Udorthents, isolated areas of rock outcrop 5 to 15 feet high, soils that are similar to the Pineville soil but have a weak fragipan below a depth of 40 inches, and small areas of Sensabaugh soils in the drainageways that dissect this unit. Also included are small areas of soils with slopes of less than 25 percent and small areas of soils that have more than 35 percent rock fragments throughout. Included areas make up about 20 percent of this map unit.

The available water capacity of the Pineville soil is moderate or high. Permeability is moderate in the subsoil and moderately rapid in the substratum. Runoff is very rapid. Natural fertility is low or moderate. In unlimed areas the soil ranges from extremely acid to neutral in the surface layer and from extremely acid to strongly acid in the subsoil and substratum. The depth to bedrock is more than 60 inches.

Most areas of this soil are used as woodland.

This soil is not suited to cultivated crops or hay and is difficult to manage as pasture. The hazard of erosion is very severe in unvegetated areas and is a major management concern.

This soil has a moderately high potential productivity for trees. The tree species on this soil include northern red oak, white oak, chestnut oak, hickory, beech, sugar maple, and yellow-poplar. Proper woodland management techniques, such as timber stand improvement, can increase yields in wooded areas.

The use of equipment is restricted on this soil because of the slope. Erosion on logging roads and skid trails is a major management concern. It can be controlled by establishing roads and skid trails on a gentle grade across the slope. Diverting surface water from the logging road, establishing and maintaining a crown on the road, and establishing and maintaining sod on bare roadbanks also help to control erosion. Plant competition and seedling mortality are management concerns.

The steep slope is the main limitation if this soil is used as a site for dwellings or septic tank absorption fields. Alternative sites with fewer limitations should be selected for these uses.

The steep slope and other soil limitations require special attention in the development of local roads and streets.

The capability subclass is VIIs.

RpF3—Rock outcrop-Peabody-Gilpin complex, 35 to 70 percent slopes, severely eroded

This complex consists of nearly vertical rock outcrops and very steep, moderately deep, well drained soils on side slopes. The nearly vertical rock cliffs in areas of this unit are 10 to 50 feet tall. Most of the acreage in this unit is along the Little Kanawha River and its main tributaries. The unit is typically on the outside cutting curve of a river or larger stream, where water action has exposed resistant bedrock and left very steep slopes. Land slips are common. Erosion has removed most of the original surface layer of the Peabody and Gilpin soils, and in places the subsoil is exposed. The Rock outcrop and the Peabody and Gilpin soils occur as long, very narrow areas in alternating patterns on the contour. It was not practical to separate them in mapping. This complex is about 40 percent Rock outcrop, 30 percent Peabody soil, 20 percent Gilpin soil, and 10 percent other soils. Slopes are nearly vertical in the areas of Rock outcrop and range from 35 to 70 percent in the areas of Peabody and Gilpin soils.

Typically, the Rock outcrop consists of nearly vertical escarpments of horizontally bedded sandstone, siltstone, and shale.

Typically, the surface layer of the Peabody soil is reddish brown silt loam about 3 inches thick. The subsoil is 21 inches thick. It is reddish brown. The upper 6 inches is channery silty clay loam, and the lower 15 inches is channery silty clay. Bedrock is at a depth of 24 inches.

Typically, the surface layer of the Gilpin soil is dark brown silt loam about 3 inches thick. The subsoil is 22 inches thick. The upper 5 inches is yellowish brown silt loam, the next 10 inches is yellowish brown channery silty clay loam, and the lower 7 inches is brown very channery silty clay loam. The substratum is yellowish brown very channery silty clay loam. It extends to rippable bedrock at a depth of 32 inches.

Included in this unit in mapping are small areas of Vandalia and Upshur soils. Also included are small areas of soils that are more shallow to bedrock than the Gilpin and Peabody soils, less eroded areas, and some areas where stones 10 to 24 inches in diameter cover 3 to 15 percent of the surface.

The available water capacity of the Peabody soil is low or moderate. Permeability is slow or moderately slow in the subsoil. Runoff is very rapid. Natural fertility is moderate or high. In unlimed areas the soil ranges from very strongly acid to slightly acid in the solum. The root zone of some plants is restricted by bedrock at a depth of 20 to 40 inches. The subsoil has a high shrink-swell potential. The hazard of slippage is severe.

The available water capacity of the Gilpin soil is moderate. Permeability is moderate in the subsoil. Runoff is very rapid. Natural fertility is low or moderate. In unlimed areas the soil ranges from extremely acid to strongly acid. The root zone of some plants is restricted by bedrock at a depth of 20 to 40 inches.

Most areas of this unit are used as woodland.

The Peabody and Gilpin soils are not suited to cultivated crops, hay, or pasture, but they have moderately high potential productivity for trees. The tree species on these soils include northern red oak, white oak, chestnut oak, hickory, beech, yellow-poplar, and Virginia pine. The hazard of erosion is very severe in unvegetated areas and is a major management concern. Proper woodland management techniques, such as timber stand improvement, can increase yields in wooded areas.

Woodland management is very difficult. Traversing the unit with equipment is impossible in some areas because of rock outcrops as much as 50 feet high. If access is available, logging roads and skid trails can be constructed. Constructing them on a gentle grade across the slope helps to control erosion. Diverting surface water from the logging road, establishing and maintaining a crown on the road, and establishing and maintaining sod on bare roadbanks also help to control erosion. Plant competition is a management concern.

The Peabody and Gilpin soils are not suited to urban uses. They are better suited to woodland and wildlife habitat.

The Rock outcrop, the very steep slope, and other soil-related management concerns severely limit the use of this unit as a site for local roads and streets.

The capability subclass is VIIs.

Sc—Senecaville silt loam, rarely flooded

This soil is nearly level, very deep, and moderately well drained. It is on flood plains throughout the survey area. The soil is subject to rare flooding. Slopes range from 0 to 3 percent.

Typically, the surface layer is brown silt loam about 5 inches thick. The subsoil is reddish brown silt loam about 27 inches thick. It is mottled with pinkish gray and yellowish red in the lower 14 inches. The upper 23 inches of the substratum is brown silt loam mottled with pinkish gray. The lower part of the substratum is brown fine sandy loam mottled with pinkish gray. It extends to a depth of 65 inches.

Included with this soil in mapping are a few small areas of the well drained Vandalia, Moshannon, Sensabaugh, and Hackers soils. Also included are small areas of soils with slopes of more than 3 percent. Included soils make up about 15 percent of this map unit.

The available water capacity of the Senecaville soil is moderate or high. Permeability is moderate or moderately slow in the subsoil. Runoff is slow. Natural fertility is moderate. A seasonal high water table at a depth of 1.5 to 3.0 feet restricts the root zone of some types of plants. In unlimed areas the soil ranges from strongly acid to slightly acid. The depth to bedrock is more than 60 inches.

Most areas of this soil are used for hay (fig. 6). A small acreage is wooded.

This soil is suited to cultivated crops, hay, and pasture. The seasonal high water table becomes an important factor during the growing season. In dry years row crops, hay, and pasture plants grow well because of the available moisture. In wet years, however, growth can be inhibited by excess soil moisture and equipment access can be limited. Proper stocking rates, which help to maintain desirable grasses and legumes, rotational grazing, and deferment of grazing until the soil is reasonably firm in the spring are the major pasture management needs.

This soil has moderately high potential productivity for trees. The tree species on this soil include boxelder, sycamore, and ash. Proper woodland management techniques, such as timber stand improvement, can increase yields in wooded areas. Plant competition is a management concern.

The seasonal high water table, the flooding, and the moderate or moderately slow permeability are the main limitations if this soil is used as a site for dwellings or septic tank absorption fields. Soils that are not subject to flooding should be selected as sites for dwellings. Installing the absorption field as shallow as possible, enlarging the absorption area, installing an alternative system, or selecting adjacent soils that are better suited to onsite waste disposal can help to overcome or avoid the limitations affecting septic tank absorption fields.

The rare flooding, the potential for frost action, low soil strength, and wetness restrict the use of this soil as a site for local roads and streets. Constructing the roads and streets on raised fill and properly installing culverts can minimize these limitations.

The capability subclass is IIw.

Sm—Senecaville and Melvin silt loams, occasionally flooded

These soils are nearly level and very deep. The Senecaville soil is moderately well drained, and the Melvin soil is poorly drained. Both soils are on flood plains along streams throughout the survey area. Some areas consist mostly of Senecaville soil, some mostly of Melvin soil, and some of both soils. The total acreage of this unit is about 60 percent Senecaville soil, 35 percent Melvin soil, and 5 percent other soils. Slopes range from 0 to 3 percent.

Typically, the surface layer of the Senecaville soil is brown silt loam about 5 inches thick. The subsoil is reddish brown silt loam about 27 inches thick. It is mottled with pinkish gray and yellowish red in the lower 14 inches. The upper 23 inches of the substratum is brown silt loam mottled with pinkish gray. The lower part of the substratum is brown fine sandy loam mottled with pinkish gray. It extends to a depth of 65 inches.

Typically, the surface layer of the Melvin soil is

Figure 6.—Hay on Senecaville silt loam, rarely flooded.

about 7 inches of brown silt loam mottled with strong brown and light brownish gray. The subsoil is about 14 inches of gray silty clay loam mottled with strong brown. The upper 26 inches of the substratum is gray silty clay loam mottled with strong brown and brownish yellow. The lower part of the substratum is gray silty clay loam mottled with strong brown. It extends to a depth of 65 inches.

Included with these soils in mapping are a few small areas of the well drained Moshannon, Hackers, and Sensabaugh soils. Also included are small areas of very poorly drained soils.

The available water capacity of the Senecaville soil is moderate or high. Permeability is moderate or moderately slow in the subsoil. Runoff is slow. Natural fertility is moderate. A seasonal high water table at a depth of 1.5 to 3.0 feet restricts the root zone of some types of plants. In unlimed areas the soil ranges from strongly acid to slightly acid. The depth to bedrock is more than 60 inches.

The available water capacity of the Melvin soil is high. Permeability is moderate in the subsoil. Runoff is slow. Natural fertility is high. A seasonal high water table within a depth of 1.0 foot restricts the root zone of many types of plants and favors hydric plants. Crayfish crotovinas are common. In unlimed areas the soil ranges from moderately acid to mildly alkaline. The depth to bedrock is more than 60 inches.

Most areas of these soils are used for hay. A small acreage is wooded.

The Senecaville soil is suited to cultivated crops, hay, and pasture. In some areas crops are subject to damage from flooding. The seasonal high water table becomes an important factor during the growing season. In dry years row crops, hay, and pasture plants grow well because of the available moisture. In wet years, however, growth can be inhibited by excess soil moisture and equipment access can be limited.

Where drained, the Melvin soil is suited to cultivated crops, hay, and pasture. Where undrained, it is better suited to water-tolerant hay or pasture plants. In undrained areas, crop growth is inhibited by the excess moisture and most of the acreage supports hay that can be harvested only during the driest times of the year.

If these soils are used as pasture, rotational grazing and prevention of overstocking are the major management needs. Establishing a plant cover on unprotected streambanks and providing proper access for livestock to streams help to control stream scouring and sedimentation.

These soils have moderately high potential productivity for trees. The tree species on these soils include boxelder, sycamore, and willow. Because of the high water table in the Melvin soil, the use of equipment is restricted to periods when the soil is dry. Plant competition is a management concern on both soils, and seedling mortality is a management concern on the Melvin soil.

The flooding and the high water table are the main limitations if these soils are used as sites for dwellings or septic tank absorption fields. Alternative sites with fewer limitations should be selected for these uses.

The flooding, the potential for frost action, wetness, and low strength restrict the use of these soils as sites for local roads and streets. Constructing the roads and streets on raised fill and properly installing culverts can minimize these limitations.

The capability subclass is IIIw.

Ss—Sensabaugh silt loam

This soil is nearly level, very deep, and well drained. It is on flood plains and alluvial fans along small streams throughout the survey area. The soil is subject to occasional flooding. Slopes range from 0 to 3 percent.

Typically, the surface layer is reddish brown silt loam about 6 inches thick. The subsoil is 23 inches thick. It is reddish brown. The upper 14 inches is gravelly silt loam, and the lower 9 inches is very gravelly loam. The substratum is reddish brown very gravelly loam. It extends to a depth of 65 inches.

Included with this soil in mapping are small areas of the well drained Vandalia, Moshannon, and Hackers soils; the moderately well drained Senecaville soils; and the poorly drained Melvin soils. Also included are a few small areas of soils that have more than 35 percent rock fragments throughout the control section and, on alluvial fans at the mouth of hollows, soils that have slopes of 3 to 8 percent and are subject to rare flooding. Included soils make up about 25 percent of this map unit.

The available water capacity of the Sensabaugh soil is moderate or high. Permeability is moderate or moderately rapid in the subsoil. Runoff is slow. Natural fertility is moderate. In unlimed areas the soil ranges from moderately acid to mildly alkaline. The depth to bedrock is more than 60 inches.

Most areas of this soil are used for hay. Some areas are used as cropland, and some are reverting to woodland.

This soil is suited to cultivated crops, hay, and pasture (fig. 7). In some areas crops are subject to damage from flooding. Crops can be grown year after

Figure 7.—Cropland and pasture in an area of Sensabaugh silt loam.

year, but the protection of a cover crop is needed. Working the residue from the cover crop into the soil and returning other crop residue to the soil help to maintain fertility and tilth. Proper stocking rates, which help to maintain desirable grasses and legumes, and rotational grazing are the major pasture management needs. Establishing a plant cover on unprotected streambanks and providing proper access for livestock to streams help to control stream scouring and sedimentation.

This soil has moderately high potential productivity for trees. The tree species on this soil include boxelder, sycamore, yellow-poplar, ash, and black walnut. Proper woodland management techniques, such as timber stand improvement, can increase yields in wooded areas. Plant competition is a management concern.

The flooding is the main limitation if this soil is used as a site for dwellings or septic tank absorption fields. Alternative sites should be selected.

Many homesites are available in the rarely flooded included areas of this unit. These areas generally are on the higher alluvial fans at the mouth of hollows. Included areas that are not subject to flooding should be selected as sites for dwellings without basements. Correctly installed footer drains are important because of piping of water in the gravelly substratum. When footer drains are installed, clean, sized gravel should be used as fill close to the surface. Erosion is a hazard in areas that are cleared for construction. Revegetating during or soon after construction reduces this hazard.

The flooding restricts the use of this soil as a site for local roads and streets. Constructing the roads and streets on raised fill and properly installing culverts can minimize the hazard of flood damage.

The capability subclass is IIw.

TsB—Tilsit silt loam, 3 to 8 percent slopes

This soil is gently sloping, deep, and moderately well drained. It is on broad ridgetops throughout the survey area.

Typically, the surface layer is brown silt loam about 7 inches thick. The subsoil is 36 inches thick. The upper 3 inches is yellowish brown silt loam, the next 11 inches is yellowish brown silty clay loam, the next 6 inches is a fragipan of brownish yellow channery loam mottled with strong brown and light brownish gray, and the lower 16 inches is a fragipan of brownish yellow very channery loam mottled with strong brown and light brownish gray. Rippable, weathered shale bedrock is at a depth of 43 inches.

Included with this soil in mapping are a few small areas of the well drained Gilpin, Upshur, and Peabody soils. Also included are soils that are similar to Upshur soils but are moderately well drained, small areas of soils with slopes of less than 3 percent or more than 8 percent, and soils that have bedrock at a depth of 20 to 40 inches. Included soils make up about 30 percent of this map unit.

The available water capacity of the Tilsit soil is moderate. Permeability is moderate above the fragipan and slow in the fragipan. Runoff is medium. Natural fertility is low or moderate. A seasonal high water table at a depth of 1.5 to 2.5 feet restricts the root zone of some types of plants. In unlimed areas the soil ranges from extremely acid to strongly acid. The depth to bedrock ranges from 40 to 60 inches.

Most areas of this soil are used for pasture or hay. A small acreage is wooded.

This soil is suited to cultivated crops, hay, and pasture. The hazard of erosion is moderate in unprotected areas. Applying a system of conservation tillage, growing crops in contour strips, including hay in the crop rotation, maintaining sod in shallow drainageways, and returning crop residue to the soil help to control erosion and maintain fertility and tilth. The seasonal high water table becomes an important factor during the growing season. In dry years row crops and hay grow well because of the available moisture. In wet years, however, growth can be inhibited by excess soil moisture. Proper stocking rates, which help to maintain desirable grasses and legumes, rotational grazing, and deferment of grazing until the soil is reasonably firm in the spring are the major pasture management needs.

This soil has moderately high potential productivity for trees. The tree species on this soil include red oak, white oak, cherry, and ash. Proper woodland management techniques, such as timber stand improvement, can increase yields in wooded areas. Plant competition is a management concern.

The seasonal high water table and slow permeability are the main limitations if this soil is used as a site for dwellings or septic tank absorption fields. The wetness is the main limitation on sites for dwellings. The limitations on sites for dwellings can be overcome by correctly installed footer drains and upslope ditches, which can divert water. When footer drains are installed, clean, sized gravel should be used as fill close to the surface. Installing the absorption field on the contour and as shallow as possible, enlarging the absorption area, installing an alternative system (such as a mound system), or selecting adjacent soils that are better suited to onsite waste disposal can minimize or avoid the limitations affecting septic tank absorption fields. Erosion is a hazard in areas that are cleared for construction. Revegetating during or soon after construction reduces this hazard.

Low soil strength and the potential for frost action in this soil require special attention in the development of local roads and streets. Constructing the roads and streets on raised fill and properly installing culverts can minimize these limitations.

The capability subclass is IIe.

Ud—Udorthents, smoothed

These well drained, nearly level to very steep soils are in areas that have been disturbed by road construction and urban development. Commonly called cut and fill, these soils are mainly along Interstate 79 in southern Roane County and in smaller areas near the towns of Spencer and Grantsville.

A typical profile of Udorthents is not described because of the variability of these soils.

Included with these soils in mapping are small areas of the well drained Gilpin, Peabody, Upshur, and Vandalia soils. Included soils make up about 5 percent of this map unit.

In many areas the surface of the Udorthents has been covered with concrete or asphalt. Shale, siltstone, and sandstone bedrock are exposed in cut areas. These exposed highwalls along Interstate 79 can reach heights of more than 100 feet. The highwalls are divided into a series of vertical escarpments and nearly level bench areas, which serve to catch any talus or rock fragments that fall from the weathering bedrock.

It is impractical to estimate the physical and chemical properties of the soils in this unit because of surface disturbance and high variability. In most fill areas, however, the soils are more than 65 inches deep over bedrock. Runoff ranges from medium in nearly level areas to very rapid in very steep areas. Natural fertility generally is high.

Most areas that are not covered with concrete or asphalt have been seeded to fescue, crown vetch, sericea lespedeza, and birdsfoot trefoil. The trees that are naturally invading this unit include sycamore, yellow-poplar, and sumac.

A few areas have limited suitability for pasture, but most areas are better suited to wildlife habitat and woodland. Onsite investigation is necessary to determine the limitations of specific areas for most uses.

This map unit is not assigned a capability subclass.

UgC3—Upshur-Gilpin complex, 8 to 15 percent slopes, severely eroded

This complex consists of strongly sloping, well drained soils on ridgetops and benches throughout the survey area. The benches are commonly dissected by drainageways, and land slips are common in some areas. Erosion has removed most of the original surface layer of these soils, and in places the subsoil is exposed. The two soils occur as long, narrow areas in a repeating, alternating pattern, and it was not practical to separate them in mapping. This complex is about 50 percent Upshur soil, 40 percent Gilpin soil, and 10 percent other soils.

Typically, the surface layer of the Upshur soil is brown silt loam about 6 inches thick. The subsoil is 28 inches thick. The upper 5 inches is yellowish red silty clay, the next 16 inches is dark red clay, and the lower 7 inches is dusky red channery clay. The substratum is about 10 inches of dusky red very channery clay. It extends to rippable bedrock at a depth of 44 inches.

Typically, the surface layer of the Gilpin soil is dark brown silt loam about 3 inches thick. The subsoil is 22 inches thick. The upper 5 inches is yellowish brown silt loam, the next 10 inches is yellowish brown channery silty clay loam, and the lower 7 inches is brown very channery silty clay loam. The substratum is yellowish brown very channery silty clay loam. It extends to rippable bedrock at a depth of 32 inches.

Included with these soils in mapping are a few small areas of the moderately well drained Tilsit and well drained Vandalia soils. Also included are areas of Peabody soils, which have bedrock at a depth of 20 to 40 inches; areas of Udorthents, which have more than 35 percent rock fragments in the control section; a few areas where 1 to 3 percent of the surface is covered with stones; and less eroded areas.

The available water capacity of the Upshur soil is moderate or high. Permeability is slow in the subsoil. Runoff is rapid. Natural fertility is moderate or high. In unlimed areas the soil ranges from very strongly acid to slightly acid in the surface layer, from very strongly acid to moderately alkaline in the subsoil, and from strongly acid to moderately alkaline in the substratum. The depth to bedrock ranges from 40 to 60 inches. The subsoil has a high shrink-swell potential. The hazard of slippage is severe.

The available water capacity of the Gilpin soil is moderate. Permeability is moderate in the subsoil. Runoff is rapid. Natural fertility is low or moderate. In unlimed areas the soil ranges from extremely acid to strongly acid. The root zone of some plants is restricted by bedrock at a depth of 20 to 40 inches.

Most areas of these soils are used for hay (fig. 8). Some areas are used as pasture, and some have reverted to woodland. A very small percentage is used as cropland.

These soils have limited suitability for cultivated crops and are better suited to hay or pasture. The hazard of erosion is very severe in unvegetated areas and is a major management concern. Applying a system of conservation tillage, growing crops in contour strips, including hay in the crop rotation, and returning crop residue to the soil help to control erosion and maintain fertility and tilth. Proper stocking rates, which help to maintain desirable grasses and legumes, rotational grazing, and deferment of grazing until the Upshur soil is reasonably firm in the spring are the major pasture management needs.

The Upshur soil has moderate potential productivity and the Gilpin soil moderately high potential productivity for trees. The tree species on these soils include northern red oak, white oak, hickory, beech, sugar maple, yellow-poplar, and Virginia pine. Proper woodland management techniques, such as timber stand improvement, can increase yields in wooded areas. Plant competition is a management concern.

In areas of the Upshur soil, erosion on logging roads and trails is a management concern. It can be controlled by establishing roads and trails on a gentle grade across the slope. Diverting surface water from the logging road, establishing and maintaining a crown on the road, and establishing and maintaining sod on bare roadbanks also help to control erosion.

On sites for dwellings with or without basements and on sites for septic tank absorption fields, the Upshur soil is limited by a high shrink-swell potential in the subsoil and slow permeability and the Gilpin soil is limited by the slope and the depth to bedrock.

Wide, reinforced footers and foundations, reinforced upslope walls, correctly installed footer drains, and ditches, which can divert water, can help to minimize the limitations affecting the Upshur soil as a site for dwellings. Even though it is generally rippable, the bedrock under the Gilpin soil may hinder excavations and increase excavation costs. When footer drains are installed, clean, sized gravel should be used as fill close to the surface. The deepest, least sloping soils should be selected as sites for septic tank absorption fields. The absorption fields should be installed on the contour, and the absorption area should be enlarged. Land shaping, grading, and landscaping that conforms to the lay of the land help to overcome the slope. Maintaining lawns can be difficult. Erosion is a hazard in areas that are cleared for construction. Designing dwellings so that they conform to the natural slope and setting helps to keep erosion to a minimum. Revegetating during or soon after construction also helps to control erosion.

The shrink-swell potential, low soil strength, the slope, and the potential for frost action may require additional grading and special attention in the development of local roads and streets.

The capability subclass is IVe.

UgD3—Upshur-Gilpin complex, 15 to 25 percent slopes, severely eroded

This complex consists of moderately steep, well drained soils on ridgetops and benches throughout the survey area. The benches are commonly dissected by drainageways, and land slips are common in some areas. Erosion has removed most of the original surface layer of these soils, and in places the subsoil is exposed. The two soils occur as long, narrow areas in a repeating, alternating pattern, and it was not practical to separate them in mapping. This complex is about 50 percent Upshur soil, 45 percent Gilpin soil, and 5 percent other soils.

Typically, the surface layer of the Upshur soil is brown silt loam about 6 inches thick. The subsoil is 28 inches thick. The upper 5 inches is yellowish red silty clay, the next 16 inches is dark red clay, and the lower 7 inches is dusky red channery clay. The substratum is 10 inches of dusky red very channery clay. It extends to rippable bedrock at a depth of 44 inches.

Typically, the surface layer of the Gilpin soil is dark brown silt loam about 3 inches thick. The subsoil is 22 inches thick. The upper 5 inches is yellowish brown silt loam, the next 10 inches is yellowish brown channery

Figure 8.—Hay in an area of Upshur-Gilpin complex, 8 to 15 percent slopes, severely eroded, on a ridgetop.

Figure 9.—Log landing in an area of Upshur-Gilpin complex, 15 to 25 percent slopes, severely eroded.

silty clay loam, and the lower 7 inches is brown very channery silty clay loam. The substratum is yellowish brown very channery silty clay loam. It extends to rippable bedrock at a depth of 32 inches.

Included with these soils in mapping are a few small areas of the moderately well drained Tilsit and well drained Vandalia soils. Also included are areas of Peabody soils, which have bedrock at a depth of 20 to 40 inches; areas of Udorthents, which have more than 35 percent rock fragments in the control section; a few areas where 1 to 3 percent of the surface is covered with stones; and less eroded areas.

The available water capacity of the Upshur soil is moderate or high. Permeability is slow in the subsoil. Runoff is rapid. Natural fertility is moderate or high. In unlimed areas the soil ranges from very strongly acid to slightly acid in the surface layer, from very strongly acid to moderately alkaline in the subsoil, and from strongly acid to moderately alkaline in the substratum. The depth to bedrock ranges from 40 to 60 inches. The subsoil has a high shrink-swell potential. The hazard of slippage is severe.

The available water capacity of the Gilpin soil is moderate. Permeability is moderate in the subsoil. Runoff is rapid. Natural fertility is low or moderate. In unlimed areas the soil ranges from extremely acid to strongly acid. The root zone of some plants is restricted by bedrock at a depth of 20 to 40 inches.

Most areas of these soils are used as woodland (fig. 9). Some areas are used for hay and pasture.

These soils are not suited to cultivated crops. They are better suited to permanent hay or pasture. The hazard of erosion is very severe in unvegetated areas and is a major management concern. Proper stocking rates, which help to maintain desirable grasses and legumes, rotational grazing, and deferment of grazing until the Upshur soil is reasonably firm in the spring are the major pasture management needs.

These soils have moderately high potential productivity for trees. The tree species on these soils include northern red oak, white oak, hickory, beech, sugar maple, yellow-poplar, and Virginia pine. Proper woodland management techniques, such as timber stand improvement, can increase yields in wooded areas.

The use of equipment is restricted on these soils because of low soil strength during wet periods. Restricting the use of heavy equipment to dry periods can minimize this limitation. The severe hazard of slippage on the Upshur soil is a problem. Minimizing road cuts can help to prevent slippage. Erosion on logging roads and trails is a major management concern. It can be controlled by establishing roads and trails on a gentle grade across the slope. Diverting surface water from the logging road, establishing and maintaining a crown on the road, and establishing and maintaining sod on bare roadbanks also help to control erosion. Plant competition and seedling mortality are management concerns.

On sites for dwellings with or without basements and on sites for septic tank absorption fields, the Upshur soil is limited by the slope, slow permeability, a high shrink-swell potential in the subsoil, and slippage and the Gilpin soil is limited by the slope and the depth to bedrock.

Wide, reinforced footers and foundations, reinforced upslope walls, correctly installed footer drains, and ditches, which can divert water, can help to minimize the limitations affecting the Upshur soil as a site for dwellings. Even though it is generally rippable, the bedrock under the Gilpin soil may hinder excavations and increase excavation costs. When footer drains are installed, clean, sized gravel should be used as fill close to the surface. The deepest, least sloping soils should be selected as sites for septic tank absorption fields. The absorption fields should be installed on the contour, and the absorption area should be enlarged. Land shaping, grading, and landscaping that conforms to the lay of the land help to overcome the slope. Maintaining lawns can be difficult. Erosion is a hazard in areas that are cleared for construction. Designing dwellings so that they conform to the natural slope and setting helps to keep erosion to a minimum. Revegetating during or soon after construction also helps to control erosion.

The moderately steep slope and other soil limitations require additional grading and special attention in the development of local roads and streets.

The capability subclass is VIe.

UgE3—Upshur-Gilpin complex, 25 to 35 percent slopes, severely eroded

This complex consists of steep, well drained soils on ridgetops and benches throughout the survey area. The benches are commonly dissected by drainageways, and land slips are common in some areas. Erosion has removed most of the original surface layer of these soils, and in places the subsoil is exposed. The two soils occur as long, narrow areas in a repeating, alternating pattern, and it was not practical to separate them in mapping. This complex is about 45 percent Upshur soil, 40 percent Gilpin soil, and 15 percent other soils.

Typically, the surface layer of the Upshur soil is brown silt loam about 6 inches thick. The subsoil is 28 inches thick. The upper 5 inches is yellowish red silty clay, the next 16 inches is dark red clay, and the lower 7 inches is dusky red channery clay. The substratum is 10 inches of dusky red very channery clay. It extends to rippable bedrock at a depth of 44 inches.

Typically, the surface layer of the Gilpin soil is dark brown silt loam about 3 inches thick. The subsoil is 22 inches thick. The upper 5 inches is yellowish brown silt loam, the next 10 inches is yellowish brown channery silty clay loam, and the lower 7 inches is brown very channery silty clay loam. The substratum is yellowish brown very channery silty clay loam. It extends to rippable bedrock at a depth of 32 inches.

Included with these soils in mapping are a few small areas of the moderately well drained Tilsit and well drained Vandalia soils. Also included are areas of Peabody soils, which have bedrock at a depth of 20 to 40 inches; areas of Udorthents, which have more than 35 percent rock fragments in the control section; a few areas where 1 to 3 percent of the surface is covered with stones; and less eroded areas.

The available water capacity of the Upshur soil is moderate or high. Permeability is slow in the subsoil. Runoff is very rapid. Natural fertility is moderate or high. In unlimed areas the soil ranges from very strongly acid to slightly acid in the surface layer, from very strongly acid to moderately alkaline in the subsoil, and from strongly acid to moderately alkaline in the substratum. The depth to bedrock ranges from 40 to 60 inches. The subsoil has a high shrink-swell potential. The hazard of slippage is severe.

The available water capacity of the Gilpin soil is moderate. Permeability is moderate in the subsoil. Runoff is very rapid. Natural fertility is low or moderate. In unlimed areas the soil ranges from extremely acid to strongly acid. The root zone of some plants is restricted by bedrock at a depth of 20 to 40 inches.

Most areas of these soils are used as woodland.

These soils are not suited to cultivated crops or hay and are difficult to manage as pasture. Many areas have reverted to woodland. The hazard of erosion is very severe in unvegetated areas and is a major management concern. Proper stocking rates, which help to maintain desirable grasses and legumes, rotational grazing, and deferment of grazing until the Upshur soil is reasonably firm in the spring are the major pasture management needs.

These soils have moderately high potential productivity for trees. The tree species on these soils include northern red oak, white oak, hickory, beech, sugar maple, yellow-poplar, and Virginia pine. Proper woodland management techniques, such as timber stand improvement, can increase yields in wooded areas.

The use of equipment is restricted on these soils because of the slope and low soil strength during wet periods. The severe hazard of slippage on the Upshur soil is a problem. Minimizing road cuts can help to prevent slippage. The use of heavy equipment should be restricted to dry periods. Erosion on logging roads and trails is a major management concern. It can be controlled by establishing roads and trails on a gentle grade across the slope. Diverting surface water from the logging road, establishing and maintaining a crown on the road, and establishing and maintaining sod on bare roadbanks also help to control erosion. Plant competition is a management concern.

On sites for dwellings and septic tank absorption fields, the Upshur soil is limited by the slope, slow permeability, a high shrink-swell potential in the subsoil, and the hazard of slippage and the Gilpin soil is limited by the slope and the depth to bedrock. Alternative sites with fewer limitations should be selected for these uses.

The steep slope, slippage, and other soil limitations require special attention in the development of local roads and streets.

The capability subclass is VIIe.

VaD—Vandalia silt loam, 15 to 25 percent slopes

This soil is moderately steep, very deep, and well drained. It is throughout the survey area. It is on footslopes and at the head of drainageways at the base of very steep areas of the Gilpin-Peabody complex. Land slips and water seeps are common.

Typically, the surface layer is reddish brown silt loam about 6 inches thick. The subsoil is 48 inches thick. The upper 7 inches is reddish brown silt loam, the next 18 inches is yellowish red silty clay loam, the next 15 inches is reddish brown channery silty clay, and the lower 8 inches is reddish brown channery silty clay. The substratum is dark reddish brown very channery silty clay loam. It extends to a depth of 65 inches.

Included with this soil in mapping are a few small areas of the well drained Gilpin, Upshur, Peabody, and Pineville soils and Udorthents. Also included are soils that are similar to the Vandalia soil but are less than 65 inches deep over bedrock, small areas of Sensabaugh soils in the drainageways that dissect this unit, small areas of soils with slopes of less than 15 percent or more than 25 percent, areas where 1 to 3 percent of the surface is covered with stones, and areas where erosion has removed much of the surface layer and may have exposed the subsoil. Included soils make up about 20 percent of this map unit.

The available water capacity of the Vandalia soil is moderate or high. Permeability is moderately slow or slow in the subsoil. Runoff is rapid. Natural fertility is moderate or high. In unlimed areas the soil ranges from very strongly acid to moderately acid in the upper part of the solum and from strongly acid to neutral in the lower part of the solum and in the substratum. The depth to bedrock is more than 60 inches. The subsoil has a high shrink-swell potential, and the soil is subject to slippage.

Most areas of this soil are used as pasture or woodland.

This soil has limited suitability for cultivated crops. It is better suited to hay and pasture. The hazard of erosion is severe in unvegetated areas and is a major management concern. Proper stocking rates, which help to maintain desirable grasses and legumes, rotational grazing, and deferment of grazing until the soil is reasonably firm in the spring are the major pasture management needs. If the soil is cultivated, applying a system of conservation tillage, growing crops in contour strips, including hay in the crop rotation, maintaining shallow drainageways in sod, and returning crop residue to the soil help to control erosion and maintain fertility and good tilth.

This soil has moderately high potential productivity for trees. The tree species on this soil include yellow-poplar, black walnut, American beech, and sugar maple. Proper woodland management techniques, such as timber stand improvement, can increase yields in wooded areas.

The use of equipment is restricted on this soil because of low soil strength during wet periods. Restricting the use of heavy equipment to dry periods can minimize this limitation. Erosion and the hazard of slippage on logging roads and skid trails are major management concerns. Building the roads and skid trails on a gentle grade across the slope helps to control erosion. Keeping roadbank cuts to a minimum helps to control slippage. Plant competition is a management concern.

The slope, a high shrink-swell potential in the subsoil, and slow or moderately slow permeability severely limit the use of this soil as a site for dwellings and septic tank absorption fields. Water seeps and land slips are common, and land disturbance increases the hazard of slippage. Alternative sites with fewer limitations should be selected for these uses.

The moderately steep slope and other soil limitations require special attention in the development of local roads and streets.

The capability subclass is IVe.

VbD—Vandalia silt loam, 15 to 25 percent slopes, extremely bouldery

This soil is moderately steep, very deep, and well drained. It is throughout the survey area. It is on footslopes and at the head of drainageways at the base of very steep areas of the Gilpin-Peabody complex and the Rock outcrop-Peabody-Gilpin complex. About 3 to 15 percent of the surface of this soil is covered with boulders more than 2 feet in diameter (fig. 10). Land slips and water seeps are common in some areas.

Typically, the surface layer is reddish brown silt loam about 6 inches thick. The subsoil is 48 inches thick. The upper 7 inches is reddish brown silt loam, the next 18 inches is yellowish red silty clay loam, the next 15 inches is reddish brown channery silty clay, and the lower 8 inches is reddish brown very channery

Figure 10.—An area of Vandalia silt loam, 15 to 25 percent slopes, extremely bouldery.

silty clay. The substratum is dark reddish brown channery silty clay loam. It extends to a depth of 65 inches.

Included with this soil in mapping are a few small areas of the well drained Gilpin, Upshur, Peabody, and Pineville soils. Also included soils that are similar to the Vandalia soil but are less than 65 inches deep over bedrock, small areas of Sensabaugh soils in the drainageways that dissect this unit, small areas of soils with slopes of less than 15 percent or more than 25 percent, small areas that are not bouldery, and areas where erosion has removed much of the surface layer and may have exposed the subsoil. Included soils make up about 20 percent of this map unit.

The available water capacity of the Vandalia soil is moderate or high. Permeability is moderately slow or slow in the subsoil. Runoff is rapid. Natural fertility is moderate or high. In unlimed areas the soil ranges from very strongly acid to moderately acid in the upper part of the solum and from strongly acid to neutral in the lower part of the solum and in the substratum. The depth to bedrock is more than 60 inches. The subsoil has a high shrink-swell potential, and the soil is subject to slippage.

Most areas of this soil are used as woodland or pasture.

This soil is not suited to cultivated crops or hay and is difficult to manage as pasture. The hazard of erosion is severe in unvegetated areas and is a major management concern. Proper stocking rates, which help to maintain desirable grasses and legumes, rotational grazing, and deferment of grazing until the soil is reasonably firm in the spring are the major pasture management needs.

This soil has moderately high potential productivity for trees. The tree species on this soil include yellow-poplar, black walnut, American beech, and sugar maple. Proper woodland management techniques, such as timber stand improvement, can increase yields in wooded areas.

The use of equipment is restricted on this soil because of the surface boulders. During wet periods it also is restricted by low soil strength. Restricting the use of heavy equipment to dry periods can minimize this limitation. Erosion and the hazard of slippage on logging roads and skid trails are major management concerns. The larger boulders should be avoided when logging roads are constructed. Building the roads and skid trails on a gentle grade across the slope helps to control erosion. Keeping roadbank cuts to a minimum helps to control slippage. Plant competition is a management concern.

The slope, a high shrink-swell potential in the subsoil, and slow or moderately slow permeability severely limit the use of this soil as a site for dwellings and septic tank absorption fields. Water seeps and land slips are common, and land disturbance increases the hazard of slippage. Alternative sites with fewer limitations should be selected for these uses.

The moderately steep slope and other soil limitations require special attention in the development of local roads and streets.

The capability subclass is VIIs.

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. Slopes range 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.

About 22,285 acres in the survey area, or more than 4.5 percent of the total acreage, meets the soil requirements for prime farmland. The map units in the survey area that are considered prime farmland are listed in table 5. This list does not constitute a recommendation for a particular land use. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps. The soil qualities that affect use and management are described under the heading “Detailed Soil Map Units.”

Use and Management of the Soils

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

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

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

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

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

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

Crops and Pasture

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

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

Some general principles of management apply to all soils suitable for farm crops and pasture. Some individual soils or groups of soils, however, may require special management.

Most of the soils in the survey area have a moderate or low supply of basic plant nutrients. As a result, applications of lime and fertilizer are needed. The amounts to be applied depend on the type of soil, the cropping history, the severity of erosion, the type of crop to be grown, the level of desired yields, and the results of tests and analyses of soils and plants.

The content of organic matter is low in most of the soils in the survey area. Increasing the content is not feasible. In soils that are suitable for crops, it is important to maintain the current level by adding farm manure, by returning crop residue to the soil, and by growing sod crops, cover crops, and green-manure crops. Organic matter can be retained in pastured soils by proper pasture management, which prevents overgrazing and excessive erosion.

Tillage tends to break down soil structure and should be kept to the minimum necessary to prepare the seedbed and control weeds. Maintaining the content of organic matter in the plow layer also helps to protect soil structure.

Some soils are not suitable for crops or pasture because of a high water table. These soils are generally used for hay, which is harvested only during the driest summer months. Wetland protection regulations limit the feasibility of draining these soils for agricultural purposes.

In cultivated areas runoff and erosion occur mainly while a crop is growing or soon after it has been harvested. In Calhoun and Roane Counties, 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 the proper rotation of crops, minimum tillage, mulch planting, crop residue management, cover crops and green-manure crops, and applications of lime and fertilizer. Other major erosion-control practices are contour cultivation, contour stripcropping, measures that divert runoff, and grassed waterways. The effectiveness of a particular combination of these measures can differ from one soil to another.

Proper pasture management is the key to controlling erosion in pastures. A high level of pasture management, including applications of lime and fertilizer, controlled grazing, and careful selection of pasture mixtures, is needed on most soils to provide enough plant cover to prevent excessive erosion and maintain long-term productivity. Grazing is controlled by rotating the livestock from one pasture to another and providing recovery periods, which allow the regrowth of forage species. Different soil types may require different pasture mixtures, depending on the level of fertility, the severity of erosion, and the amount of available moisture. The amount of available moisture can be increased in many soils by subsoiling, which improves infiltration and slows surface runoff. Much of the erosion in pastured areas can be prevented by properly locating watering facilities and by limiting the access of livestock to creeks.

Specialty crops are grown on an increasing acreage in the survey area because of an increased demand for these crops. Such crops as bell peppers, tomatoes, squash, sweet corn, and brambles (blackberries and raspberries) are grown for both commercial food production and fresh markets (fig. 11). A strong demand for organic foods, along with new State certification for organic farmers, has led to increased organic food production in the survey area. The local office of the Natural Resources Conservation Service or of the West Virginia University Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Yields per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 6. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. The land capability classification of map units in the survey area 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 also are considered.

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

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

Crops other than those shown in table 6 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small.

Land Capability Classification

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

In the capability system, soils are generally grouped at three levels—capability class, subclass, and unit (USDA, 1961). 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.

Figure 11.—Specialty crops in an area of Sensabaugh silt loam.

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

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

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

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

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

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

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

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

The acreage of soils in each capability class and subclass is shown in table 7. The capability classification of map units in this survey area is given in the section “Detailed Soil Map Units” and in the yields table.

Woodland Management and Productivity

C. Lewis Rowan, State Staff Forester, Natural Resources Conservation Service, helped prepare this section.

Forest land in Calhoun and Roane Counties makes up nearly 390,000 acres, or 80 percent of the total area (fig. 12). The tracts generally are privately owned.

Figure 12.—Young stand of yellow-poplar on Vandalia silt loam, 15 to 25 percent slopes.

The common forest types, or natural associations of tree species, and their percent of the wooded area are the oak-hickory type, about 87 percent; the oak-pine type, 5 percent; northern hardwoods, 3 percent; the elm-ash-red maple type, 3 percent; and the loblolly-shortleaf type, 2 percent. Nearly 49 percent of the woodland in the survey area is classified as sawtimber (Bones, 1978).

By 1900, nearly all of the virgin hardwood forest had been cut and 85 percent of the survey area was cleared and used for either crops or pasture. Currently, the woodland is all second-growth forest that has regenerated since the turn of the century.

Table 8 can be help woodland owners or forest managers plan the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table gives 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. The larger the number, the greater the potential productivity. The number 1 indicates low productivity; 2 and 3, moderate; 4 and 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 that affects use and management. The letter *R* indicates steep slopes; *X*, 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 another restrictive layer; *C*, clay in the upper part of the soil; *S*, sandy texture; and *F*, high content of rock fragments in the soil. The letter *A* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: R, X, W, T, D, C, S, and F.

In table 8 *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Erosion hazard is the probability that erosion will occur as a result of site preparation or following cutting where the soil is exposed along roads, skid trails, and fire lanes and in log-handling areas. Forests that have been burned or overgrazed also are 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 16. A rating of *slight* indicates that no particular prevention measures are needed under ordinary conditions. A rating of *moderate* indicates that erosion-control measures are needed in certain silvicultural activities. A rating of *severe* indicates that special precautions are needed to control erosion in most silvicultural activities. The proper construction and maintenance of roads, trails, landings, and fire lanes can reduce the erosion hazard.

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

Seedling mortality refers to the death of naturally occurring or planted tree seedlings, as influenced by kinds of soil, soil wetness, or topographic conditions. The factors considered in rating the soils for seedling mortality are texture of the surface layer, depth to a seasonal high water table and the length of the period when the water table is high, rock fragments in the surface layer, rooting depth, and slope aspect. A rating of *slight* indicates that under normal conditions the expected mortality rate is less than 25 percent. A rating of *moderate* indicates that the expected mortality rate is 25 to 50 percent. Extra precautions are advisable. A rating of *severe* indicates that the expected mortality rate is more than 50 percent. Extra precautions are important. Replanting may be necessary. Selection of special planting stock and special site preparation, such as bedding, furrowing, or a surface drainage system, can reduce the seedling mortality rate.

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 of the soil. A rating of *slight* indicates that competition from unwanted plants is not likely to suppress the more desirable species or prevent their natural regeneration. Seedlings can become established without undue competition. A rating of *moderate* indicates that competition may delay the natural regeneration of desirable species or establishment of planted trees and 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 natural regeneration or restrict the growth of planted seedlings unless precautionary measures are applied. Adequate site preparation before a new crop is planted helps to control plant competition.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as *site index*. This index is the average height, in feet, that dominant and codominant trees of a given species attain in 50 years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability. The first species listed under *common trees* for a soil is the indicator species for that soil. It generally is the most common species on the soil and is the one that determines the ordination class.

Average annual growth of the common trees is expressed as cubic feet, board feet, and cords per acre per year (Schnur, 1937).

Recreation

Randall Jones and Sam Sheets, District Conservationists, Natural Resources Conservation Service, Calhoun and Roane Counties, helped prepare this section.

Calhoun and Roane Counties have a growing number of recreational facilities that are open to the public. Arnoldsburg Community Park, home of the Fall Molasses Festival, and Calhoun County Park are family-oriented facilities in Calhoun County. Roane County has three public fishing lakes—Charles Fork Lake, Silcott Lake, and Miletree Lake. Miletree Lake is stocked with trout during the winter. Roane County also has the Wallback and Taylor public hunting areas and two public golf courses—the Roane County Country Club and Sandy Brae Golf Course. Camp Sheppard, a 4-H campground in Roane County, offers conference facilities along with many forms of recreation. The Bluegrass Riding Club in Roane County has horse rentals and riding trails. Spencer, home of the Black Walnut Festival, has the Robey Theater, which is on the National Registry of Historic Places. Municipalities in both counties have city parks, pools, and playgrounds.

The soils of the survey area are rated in table 9 according to limitations that affect their suitability for recreation. Their 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 also are important. Soils that are 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 9, 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 reclamation, special design, intensive maintenance, limited use, or a combination of these measures.

The information in table 9 can be supplemented by other information in the survey, for example, interpretations for septic tank absorption fields in table 12 and interpretations for dwellings without basements and for local roads and streets in table 11.

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

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, 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 or a hardpan should be considered.

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

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

Wildlife Habitat

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

The wildlife habitat in Calhoun and Roane Counties is best suited to the needs of woodland wildlife species. About 80 percent of the survey area is forested. As a result, woodland species, such as whitetail deer, wild turkey, gray and red squirrels, and ruffed grouse, are common. The black bear population is growing because the bears are protected in Calhoun and Roane Counties and because transplanted bears are released into the more remote areas.

The population of openland wildlife species, such as bobwhite quail, dove, and meadowlark, is limited because of a decrease in the extent of cultivated farmland. Cottontail rabbits are in areas that are reverting to brush and in border areas between woodland and open fields.

Native furbearers and most indigenous nongame species are common in all parts of the survey area. The populations of fox, muskrat, skunks, and opossums are large, as are those of groundhogs, crows, small mammals, and songbirds. The beaver population is growing. The river otter was successfully reintroduced to the survey area in 1984, and reported sightings are increasing. Fur prices have a direct effect on the local population of furbearers.

Large waterfowl species, such as Canadian geese, do not occur in large numbers in the survey area, but the smaller waterfowl, such as teal, wood duck, and mallards, are in small flocks along the larger tributaries. Wading birds, such as the great blue heron and lesser herons, are in areas along streams and waterways throughout Calhoun and Roane Counties.

Local streams, rivers, and ponds support various species of warm-water fish. The most common game species include smallmouth bass, largemouth bass, channel catfish, crappie, muskie, and assorted sunfish. Most streams also support numerous nongame species. Experiments in aquaculture with hybrid striped bass and channel catfish may prove successful in the future. In many streams the population of fish and other aquatic species has been seriously affected by salt water, which has escaped from the numerous oil and gas wells in the survey area. Better oil and gas well containment structures and stricter enforcement of water-quality regulations have improved water quality and increased the fish population in recent years.

Local landowners can manipulate habitats on their properties in a manner designed to increase the carrying capacity of specific types of wildlife. While openland species are not expected to become predominant unless major land use changes are made, local populations of such species can be increased through careful planning.

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

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates the 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, stoniness, and flooding. Soil temperature and soil moisture also are 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 also are considerations. Examples of grasses and legumes are fescue, timothy, 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 also are considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggartick, quackgrass, ragweed, foxtail, and wild carrot.

Hardwood trees and shrubs produce nuts and 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, birch, cherry, maple, apple, hawthorn, dogwood, hickory, blackberry, and blueberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are gray dogwood 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, yew, 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, arrowhead, bur reed, pickerelweed, cordgrass, rushes, and sedges.

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, swamps, and ponds.

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

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. Wildlife attracted to these areas include meadow vole, meadowlark, field sparrow, cottontail, and red fox.

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

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrats, frogs, and tree swallows.

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 seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, soil density, shear strength, bearing strength, and consolidation. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kinds of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and topsoil; plan irrigation systems, ponds, facilities for storage of agricultural waste, 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 11 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, or other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and depth to the water table.

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

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

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, 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 12 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

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

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

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

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

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

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

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

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

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

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

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

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

Construction Materials

Table 13 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

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

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

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

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

Sand and *gravel* are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. In table 13, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

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

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

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

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

Soils rated *good* have friable, loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are 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 seasonal high water table at or near the surface.

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

Water Management

Table 14 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and for embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

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

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

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

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

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

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

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

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A low available water capacity, restricted rooting depth, toxic substances, 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 15 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

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

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as about 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (ASTM, 1993) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 1986).

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

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

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

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

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

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at $^1/_3$-bar moisture tension. Weight is determined after the soil is dried 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 water movement when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems and septic tank absorption fields.

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

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

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

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

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

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.02 to 0.64. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

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

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

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

Soil and Water Features

Table 17 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

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

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

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

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

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

The table gives the estimated frequency of flooding. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions (the chance of flooding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs, on the average, once or less in 2 years (the chance of flooding is 5 to 50 percent in any year); and *frequent* that it occurs, on the average, more than once in 2 years (the chance of flooding is more than 50 percent in any year).

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

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

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

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

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

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

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

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

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

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

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (USDA, 1975). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 18 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

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

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

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; type of saturation; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Hapludalfs (*Hapl*, meaning minimal horizonation, plus *udalf*, the suborder of the Alfisols that has a udic moisture regime).

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

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

SERIES. The series consists of soils within a family that have horizons similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile.

Soil Series and Their Morphology

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

In this section, each soil series recognized in the survey area is described. Characteristics of the soil and the material in which it formed are identified for each series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the “Soil Survey Manual” (USDA, 1993). Many of the technical terms used in the descriptions are defined in “Soil Taxonomy” (USDA, 1975). Unless otherwise indicated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section “Detailed Soil Map Units.”

Gilpin Series

The Gilpin series consists of moderately deep, well drained soils formed in material weathered from shale, siltstone, and sandstone. These soils are on ridgetops, benches, shoulders, and backslopes throughout the survey area. Slopes range from 8 to 70 percent.

Gilpin soils are associated on the landscape with Peabody, Upshur, Vandalia, Tilsit, and Pineville soils and with Udorthents. Gilpin soils have less clay in the subsoil than Peabody, Upshur, and Vandalia soils and typically have a lower content of rock fragments in the control section than Udorthents. Gilpin and Peabody soils are moderately deep, Upshur and Tilsit soils are deep, and Vandalia and Pineville soils are very deep. Gilpin soils are well drained, whereas Tilsit soils are moderately well drained. Gilpin soils are not subject to flooding.

Typical pedon of Gilpin silt loam, in an area of Gilpin-Peabody complex, 35 to 70 percent slopes, severely eroded, on a wooded hillside, 2.1 miles west of Vineyard Gap, near the head of Cranenest Run; USGS Looneyville topographic quadrangle; lat. 38 degrees 38 minutes 36 seconds N. and long. 81 degrees 17 minutes 55 seconds W.

Oi—2 inches to 0; hardwood leaf litter and slightly decomposed organic material.

A—0 to 3 inches; dark brown (10YR 3/3) silt loam; weak fine granular structure; friable; many very fine, fine, and medium roots; 5 percent rock fragments; strongly acid; clear wavy boundary.

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

Bt1—8 to 18 inches; yellowish brown (10YR 5/6) channery silty clay loam; moderate medium subangular blocky structure; firm; common medium and coarse roots; few distinct clay films on faces of peds; 30 percent rock fragments; extremely acid; clear wavy boundary.

Bt2—18 to 25 inches; brown (7.5YR 4/4) very channery silty clay loam; moderate medium subangular blocky structure; firm; common medium and coarse roots; common distinct clay films on faces of peds; 35 percent rock fragments; very strongly acid; clear wavy boundary.

C—25 to 32 inches; yellowish brown (10YR 5/4) very channery silty clay loam; relict rock structure; firm; few coarse roots; 50 percent rock fragments; very strongly acid; abrupt wavy boundary.

R—32 inches; olive yellow siltstone.

The thickness of the solum ranges from 18 to 36 inches, and the depth to bedrock ranges from 20 to 40 inches. The content of sandstone, siltstone, and shale fragments ranges, by volume, from 5 to 40 percent in individual horizons of the solum and from 30 to 90 percent in the C horizon. 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 4. The fine-earth fraction is silt loam or loam.

The BA horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 to 5. The fine-earth fraction is silt loam or loam.

The Bt horizon has hue of 2.5Y, 10YR, or 7.5YR, value of 4 to 6, and chroma of 4 to 8. The fine-earth fraction is silt loam, loam, clay loam, or silty clay loam.

The C horizon has hue of 2.5Y, 10YR, or 7.5YR, value of 3 to 5, and chroma of 2 to 6. The fine-earth fraction is silt loam, loam, or silty clay loam.

Hackers Series

The Hackers series consists of very deep, well drained soils formed in alluvial material washed from reddish soils on uplands. Hackers soils are on high flood plains and along the major streams in the survey area. These soils are subject to rare flooding. Slopes range from 0 to 3 percent.

Hackers soils are associated on the landscape with the well drained Moshannon, Vandalia, and Sensabaugh soils; the moderately well drained Monongahela and Senecaville soils; and the poorly drained Melvin soils. Hackers soils have a B horizon that is better developed than that in Moshannon and Sensabaugh soils; have less clay in the control section than the colluvial Vandalia soils; are better drained than Monongahela, Senecaville, and Melvin soils; and have a lower content of rock fragments in the control section than Sensabaugh soils.

Typical pedon of Hackers silt loam, along the Little Kanawha River, 0.65 mile east on Route 5 from the junction of Yellow Creek and the Little Kanawha River, in a meadow, 100 yards east of Brooksville Missionary Baptist Church; USGS Annamoriah topographic quadrangle; lat. 38 degrees 57 minutes 25 seconds N. and long. 81 degrees 09 minutes 16 seconds W.

Ap—0 to 8 inches; brown (7.5YR 4/2) silt loam; moderate medium granular structure; friable; many very fine and fine roots; mildly alkaline; abrupt smooth boundary.

BA—8 to 12 inches; reddish brown (5YR 4/4) silt loam; weak fine subangular blocky structure; friable; common very fine roots; neutral; clear wavy boundary.

Bt1—12 to 30 inches; reddish brown (5YR 4/4) silty clay loam; moderate medium subangular blocky structure; firm; few fine and very fine roots; common distinct clay films on faces of peds; strongly acid; gradual wavy boundary.

Bt2—30 to 50 inches; reddish brown (5YR 4/4) silty clay loam; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; few very fine roots; common distinct clay films on faces of peds; strongly acid; clear wavy boundary.

C—50 to 65 inches; reddish brown (5YR 4/4) silty clay loam; massive; firm; strongly acid.

The thickness of the solum ranges from 30 to 60 inches, and the depth to bedrock is more than 60 inches. The content of gravel ranges, by volume, from 0 to 5 percent in the solum and from 0 to 30 percent in the substratum. In unlimed areas reaction ranges from strongly acid to slightly acid.

The Ap horizon has hue of 10YR, 7.5YR, or 5YR, value of 3 or 4, and chroma of 2 to 4. The fine-earth fraction is silt loam.

The BA horizon has hue of 7.5YR or 5YR, value of 4, and chroma of 4 to 6. The fine-earth fraction is silt loam.

The Bt horizon generally has hue of 5YR or 2.5YR, value of 3 to 5, and chroma of 3 to 8. Subhorizons with hue of 7.5YR can occur. The fine-earth fraction is dominantly silt loam or silty clay loam. Thin subhorizons of loam or clay loam can occur in the lower part of the horizon.

The C horizon generally has hue of 5YR or 2.5YR and value and chroma of 3 or 4. Subhorizons with hue of 7.5YR can occur. The fine-earth fraction is loam, silt loam, or silty clay loam with strata of clay loam, sandy loam, or fine sandy loam.

Melvin Series

The Melvin series consists of very deep, poorly drained soils formed in alluvial material washed from soils on uplands. Melvin soils are on flood plains throughout the survey area. These soils are subject to occasional flooding. Slopes range from 0 to 3 percent.

Melvin soils are associated on the landscape with the well drained Moshannon, Sensabaugh, Vandalia, and Hackers soils and the moderately well drained Senecaville soils. Melvin soils are more poorly drained than all of the associated soils, have a lower content of rock fragments in the control section than Sensabaugh soils, and have a B horizon that is less well developed than that in Hackers soils.

Typical pedon of Melvin silt loam, in an area of Senecaville and Melvin silt loams, occasionally flooded, 0.55 mile west of the junction of U.S. Route 119 and Pocatalico River Road in Walton; USGS Walton topographic quadrangle; lat. 38 degrees 38 minutes 21 seconds N. and long. 81 degrees 24 minutes 44 seconds W.

Ap—0 to 7 inches; brown (10YR 4/3) silt loam; few medium distinct strong brown (7.5YR 5/6) and light brownish gray (10YR 6/2) mottles; weak medium granular structure; very friable; many fine and medium roots; moderately acid; clear wavy boundary.

Bg—7 to 24 inches; gray (10YR 5/1) silty clay loam; common medium distinct strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; firm; common fine and medium roots; moderately acid; clear wavy boundary.

Cg1—24 to 50 inches; gray (5Y 5/1) silty clay loam; many medium distinct strong brown (7.5YR 5/6) and brownish yellow (10YR 6/6) mottles; massive; firm; moderately acid; clear wavy boundary.

Cg2—50 to 65 inches; gray (10YR 5/1) silty clay loam; common medium distinct strong brown (7.5YR 5/6) mottles; massive; firm; moderately acid.

The thickness of the solum ranges from 20 to 40 inches, and the depth to bedrock is more than 60 inches. The content of gravel ranges, by volume, from 0 to 5 percent to a depth of 30 inches and from 0 to 20 percent in individual subhorizons below a depth of 30 inches. In unlimed areas reaction ranges from moderately acid to mildly alkaline.

The A horizon has hue of 5Y, 2.5Y, or 10YR, value of 4 to 7, and chroma of 1 to 4. The fine-earth fraction is silt loam.

The Bg horizon has hue of N to 10YR, value of 4 to 7, and chroma of 2 or less. It has mottles in shades of brown or red. The fine-earth fraction is silt loam or silty clay loam.

The Cg horizon has hue of N to 10YR, value of 4 to 7, and chroma of 2 or less. It has mottles in shades of brown or red. The fine-earth fraction is silt loam, silty clay loam, or loam.

Monongahela Series

The Monongahela series consists of very deep, moderately well drained soils formed in old alluvium washed from acid soils on uplands. Monongahela soils are on terraces along the major streams throughout the survey area. They are along the Little Kanawha River in the northern part of Calhoun County and along Reedy and Spring Creeks in the northern part of Roane County. Slopes range from 3 to 8 percent.

Monongahela soils are associated on the landscape with the well drained Moshannon and Hackers soils. Monongahela soils have a B horizon that is better developed than that in Moshannon soils and have a fragipan in the B horizon. Monongahela soils are not subject to flooding, whereas Hackers soils are subject to rare flooding.

Typical pedon of Monongahela silt loam, 3 to 8 percent slopes, 0.15 mile northwest of the junction of the Left Fork of Spring Creek and the Charles Fork, 1.45 mile south on State Route 36 from its intersection with U.S. Route 119; USGS Spencer topographic quadrangle; lat. 38 degrees 46 minutes 43 seconds N. and long. 81 degrees 20 minutes 31 seconds W.

Ap—0 to 8 inches; brown (10YR 4/3) silt loam; weak medium granular structure; friable; many very fine and fine roots; neutral; abrupt smooth boundary.

BA—8 to 12 inches; yellowish brown (10YR 5/6) silt loam; weak fine subangular blocky structure; friable; many very fine and fine roots; neutral; clear wavy boundary.

Bt—12 to 23 inches; yellowish brown (10YR 5/6) silt loam; moderate fine subangular blocky structure; friable; common very fine and fine roots; common distinct clay films on faces of peds; neutral; clear wavy boundary.

Btx1—23 to 34 inches; yellowish brown (10YR 5/6) silt loam; common medium distinct light brownish gray (10YR 6/2) mottles and black manganese concretions; weak very coarse prismatic structure parting to weak thick platy; firm and brittle; common very fine roots on faces of peds; common distinct clay films on faces of peds; strongly acid; clear wavy boundary.

Btx2—34 to 65 inches; strong brown (7.5YR 5/6) silt loam; many medium distinct brown (7.5YR 5/2) mottles and black manganese concretions; moderate very coarse prismatic structure parting to moderate thick platy; firm and brittle; few very fine roots on faces of peds in the upper part; common distinct clay films on faces of peds; strongly acid.

The thickness of the solum ranges from 40 to 72 inches, and the depth to bedrock is more than 60 inches. The depth to a fragipan ranges from 18 to 30 inches. The content of rounded gravel and cobbles ranges, by volume, from 0 to 30 percent above the fragipan, from 0 to 35 percent in the fragipan, and from 10 to 40 percent in the C horizon. In unlimed areas reaction is strongly acid or very strongly acid.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. The fine-earth fraction is silt loam.

The BA horizon has hue of 10YR, value of 4 or 5, and chroma of 4 to 8. The fine-earth fraction is silt loam.

The Bt horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 4 to 8. The fine-earth fraction is silt loam, loam, silty clay loam, clay loam, or sandy clay loam.

The Btx horizon has hue of 2.5Y, 10YR, or 7.5YR, value of 4 to 6, and chroma of 2 to 8. The fine-earth fraction is dominantly silt loam, loam, or sandy clay loam, but in some pedons it is clay loam or fine sandy loam.

The C horizon, if it occurs, has hue of 2.5Y, 10YR, or 7.5YR, value of 4 to 7, and chroma of 2 to 8. The fine-earth fraction occurs as strata of sandy loam, loam, silt loam, silty clay loam, or clay loam.

Moshannon Series

The Moshannon series consists of very deep, well drained soils formed in alluvial material washed from reddish soils on uplands. Moshannon soils are on flood plains along streams throughout the survey area. They generally are along Reedy Creek in the northern part of Roane County. These soils are subject to occasional flooding. Slopes range from 0 to 3 percent.

Moshannon soils are associated on the landscape with the well drained Hackers, Sensabaugh, and Vandalia soils; the moderately well drained Monongahela and Senecaville soils; and the poorly drained Melvin soils. Moshannon soils have a B horizon that is less well developed than that in Hackers, Vandalia, and Monongahela soils; have a lower content of rock fragments in the control section than Sensabaugh soils; and are better drained than Senecaville and Melvin soils.

Typical pedon of Moshannon silt loam, in a meadow south of the town of Reedy, 0.15 mile northeast of the junction of Reedy Creek and the Middle Fork of Reedy Creek; USGS Reedy topographic quadrangle; lat. 38 degrees 53 minutes 50 seconds N. and long. 81 degrees 25 minutes 21 seconds W.

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

Bw1—10 to 19 inches; reddish brown (5YR 4/4) silt loam; moderate fine and medium subangular blocky structure; friable; common fine and very fine roots; moderately acid; clear wavy boundary.

Bw2—19 to 38 inches; reddish brown (5YR 4/4) silty clay loam; moderate medium subangular blocky structure; friable; few fine and very fine roots; moderately acid; clear wavy boundary.

C—38 to 65 inches; reddish brown (5YR 4/4) silt loam; massive; friable; moderately acid.

The thickness of the solum ranges from 32 to 48 inches, and the depth to bedrock is more than 60 inches. The content of gravel is less than 5 percent, by volume, throughout the solum and can be as high as 20 percent in the substratum. In unlimed areas reaction is moderately acid to neutral in the A horizon, slightly acid or moderately acid in the Bw horizon, and moderately acid to neutral in the C horizon.

The Ap horizon has hue of 7.5YR or 5YR and value and chroma of 3 or 4. The fine-earth fraction is silt loam.

The Bw horizon has hue of 5YR or 2.5YR and value and chroma of 3 to 6. The fine-earth fraction is dominantly silty clay loam and silt loam, but strata of loam are in some pedons.

The C horizon has hue of 5YR or 2.5YR, value of 3 to 5, and chroma of 2 to 4. The fine-earth fraction is commonly silt loam, but the horizon is stratified in some pedons and the range includes silty clay loam, fine sandy loam, and loam.

Peabody Series

The Peabody series consists of moderately deep, well drained soils formed in material weathered from siltstone and shale. These soils are on very steep backslopes throughout the survey area. Slopes range from 35 to 70 percent.

Peabody soils are associated on the landscape with Gilpin, Upshur, Vandalia, Tilsit, and Pineville soils and with Udorthents. Peabody soils are moderately deep, whereas Upshur and Tilsit soils are deep and Vandalia and Pineville soils are very deep. Peabody soils typically contain more clay and are redder in the subsoil than Gilpin and Pineville soils and have a lower content of rock fragments in the control section than Udorthents. Peabody soils are well drained, whereas Tilsit soils are moderately well drained.

Typical pedon of Peabody silt loam, in a wooded area of Gilpin-Peabody complex, 35 to 70 percent slopes, severely eroded, at the head of Lemuels Run, near the fork of a jeep trail, 0.15 mile west of Bryner Road; USGS Annamoriah topographic quadrangle; lat. 38 degrees 55 minutes 03 seconds N. and long. 81 degrees 10 minutes 40 seconds W.

Oi—1 inch to 0; slightly decomposed organic material.

A—0 to 3 inches; reddish brown (5YR 4/3) silt loam; weak very fine granular structure; friable; many very fine and fine roots; slightly acid; abrupt wavy boundary.

Bt1—3 to 9 inches; reddish brown (5YR 4/4) channery silty clay loam; moderate medium subangular blocky structure; friable; 20 percent rock fragments; many fine, medium, and coarse roots; common distinct clay films on faces of peds; strongly acid; clear wavy boundary.

Bt2—9 to 19 inches; reddish brown (2.5YR 4/4) channery silty clay; moderate medium subangular blocky structure; firm; 15 percent rock fragments; common medium roots; common distinct clay films on faces of peds; strongly acid; clear wavy boundary.

Bt3—19 to 24 inches; reddish brown (2.5YR 4/4) channery silty clay; moderate medium subangular blocky structure between relict rock structure; firm; 25 percent rock fragments; few fine and medium roots; common distinct clay films on faces of peds; very strongly acid; abrupt wavy boundary.

R—24 inches; light olive brown, sandy siltstone and shale.

The thickness of the solum and the depth to bedrock range from 20 to 40 inches. The content of weathered siltstone and shale fragments ranges, by volume, from 0 to 15 percent in the A, BA, and Bt1 horizons, from 0 to 25 percent in the Bt2 and Bt3 horizons, and from 15 to 70 percent in the C horizon. In unlimed areas reaction ranges from very strongly acid to slightly acid in the solum and from very strongly acid to neutral in the substratum.

The A horizon has hue of 10YR, 7.5YR, or 5YR and value and chroma of 2 to 4. The fine-earth fraction is silt loam.

Some pedons have a BA horizon. This horizon has hue of 7.5YR or 5YR, value of 4 or 5, and chroma of 4 to 6. The fine-earth fraction is silt loam.

The Bt horizon has hue of 5YR or 2.5YR, value of 3 or 4, and chroma of 3 to 6. The fine-earth fraction is silty clay loam, silty clay, or clay.

Some pedons have a C horizon. This horizon has hue of 5YR or 2.5YR, value of 3 or 4, and chroma of 3 to 6. The fine-earth fraction is silty clay loam or silty clay.

Pineville Series

The Pineville series consists of very deep, well drained soils formed in colluvium derived from sandstone, shale, and siltstone. These soils are in mountain coves, on the steep lower backslopes, and on footslopes. Slopes range from 25 to 70 percent.

Pineville soils are associated on the landscape with Gilpin, Peabody, and Upshur soils and with Udorthents. Pineville soils are very deep, whereas Gilpin and Peabody soils are moderately deep and Upshur soils are deep. Pineville soils have less clay in the subsoil than Upshur and Peabody soils and have a lower content of rock fragments in the control section than Udorthents.

Typical pedon of Pineville loam, in an area of Gilpin-Pineville complex, 35 to 70 percent slopes, very stony, on a wooded side slope about 0.85 mile east-southeast of the junction of Pigeon Run and Big Sandy Creek and 0.5 mile south of Pigeon Run; USGS

Newton topographic quadrangle; lat. 38 degrees 32 minutes 43 seconds N. and long. 81 degrees 14 minutes 30 seconds W.

Oi—3 inches to 1 inch; hardwood leaf litter.
Oe—1 inch to 0; decomposed hardwood leaf litter.
A—0 to 3 inches; dark brown (10YR 3/3) loam; weak fine granular structure; very friable; many very fine, fine, and medium roots; 10 percent rock fragments; moderately acid; abrupt wavy boundary.
BA—3 to 10 inches; yellowish brown (10YR 5/6) channery loam; weak medium subangular blocky structure; friable; common medium and coarse roots; 15 percent rock fragments; very strongly acid; clear wavy boundary.
Bt1—10 to 22 inches; strong brown (7.5YR 5/6) channery loam; moderate medium subangular blocky structure; friable; common medium and fine roots; few distinct clay films on faces of peds; 20 percent rock fragments; very strongly acid; clear wavy boundary.
Bt2—22 to 35 inches; strong brown (7.5YR 5/6) channery clay loam; moderate medium subangular blocky structure; firm; few fine roots; common distinct clay films on faces of peds; 25 percent rock fragments; very strongly acid; clear wavy boundary.
Bt3—35 to 56 inches; strong brown (7.5YR 5/8) very channery clay loam; moderate medium subangular blocky structure; firm; few fine and very fine roots; few distinct clay films on faces of peds; 40 percent rock fragments; very strongly acid; clear wavy boundary.
C—56 to 65 inches; yellowish brown (10YR 5/6) very channery sandy loam; massive; firm; 50 percent rock fragments; strongly acid.

The thickness of the solum ranges from 40 to 60 inches, and the depth to bedrock is more than 60 inches. The content of rock fragments ranges, by volume, from 10 to 60 percent in individual horizons. It averages 15 to 35 percent in the control section. In unlimed areas reaction ranges from extremely acid to neutral in the A horizon and from extremely acid to strongly acid in the B and C horizons. Most pedons have stony or very stony surfaces.

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

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

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

Senecaville Series

The Senecaville series consists of very deep, moderately well drained soils formed in alluvial material washed from soils on uplands. Senecaville soils are on low- and high-bottom flood plains throughout the survey area. These soils are subject to occasional flooding on low bottoms and to rare flooding on high bottoms. Slopes range from 0 to 3 percent.

Senecaville soils are associated on the landscape with the well drained Moshannon, Sensabaugh, Vandalia, and Hackers soils and the poorly drained Melvin soils. Senecaville soils are less well drained than Moshannon, Sensabaugh, Vandalia, and Hackers soils and better drained than Melvin soils; have a lower content of rock fragments in the control section than Sensabaugh soils; and have a B horizon that is less well developed than that in Hackers soils.

Typical pedon of Senecaville silt loam, in an area of Senecaville and Melvin silt loams, occasionally flooded, along the Right Fork of Reedy Creek, 0.5 mile north-northwest of its intersection with Seaman Fork; USGS Reedy topographic quadrangle; lat. 38 degrees 54 minutes 03 seconds N. and long. 81 degrees 27 minutes 30 seconds W.

Ap—0 to 5 inches; brown (7.5YR 4/4) silt loam; moderate medium granular structure; very friable; many fine and medium roots; slightly acid; abrupt smooth boundary.
Bw1—5 to 18 inches; reddish brown (5YR 4/4) silt loam; weak medium subangular blocky structure; friable; common fine roots; slightly acid; clear wavy boundary.
Bw2—18 to 32 inches; reddish brown (5YR 4/4) silt loam; common medium distinct pinkish gray (7.5YR 6/2) and yellowish red (5YR 4/6) mottles; weak medium subangular blocky structure; friable; few fine roots; slightly acid; clear wavy boundary.
C1—32 to 55 inches; brown (7.5YR 4/2) silt loam; common medium distinct pinkish gray (7.5YR 6/2) mottles; massive; very friable; slightly acid; clear wavy boundary.
C2—55 to 65 inches; brown (7.5YR 4/2) fine sandy loam; common medium distinct pinkish gray (7.5YR 6/2) mottles; massive; very friable; slightly acid.

The thickness of the solum ranges from 30 to 50 inches, and the depth to bedrock is more than 60 inches. The content of gravel ranges, by volume, from 0 to 5 percent in the A and B horizons and from 0 to 20 percent in the C horizon. In unlimed areas reaction ranges from strongly acid to slightly acid.

The A horizon has hue of 7.5YR or 5YR, value of 4 or 5, and chroma of 2 to 4. The fine-earth fraction is silt loam.

The Bw horizon has hue of 5YR or 2.5YR, value of 3 to 5, and chroma of 3 to 6. It has mottles in shades of brown or red. The fine-earth fraction is silt loam or silty clay loam.

The C horizon has hue of 7.5YR, 5YR, or 2.5YR, value of 2 to 5, and chroma of 2 to 6. It has mottles in shades of brown or red. The fine-earth fraction is silt loam, loam, or fine sandy loam.

Sensabaugh Series

The Sensabaugh series consists of very deep, well drained soils formed in alluvial material washed from reddish soils on uplands. Sensabaugh soils are on narrow flood plains, high-bottom flood plains, and alluvial fans at the mouth of hollows throughout the survey area. These soils are subject to occasional flooding on low bottoms and to rare flooding on high bottoms and alluvial fans. Slopes range from 0 to 3 percent.

Sensabaugh soils are associated on the landscape with the well drained Moshannon and Vandalia soils, the moderately well drained Senecaville soils, and the poorly drained Melvin soils. Sensabaugh soils have a B horizon that is less well developed than that in Hackers and Vandalia soils and have more rock fragments in the control section than all of the associated soils.

Typical pedon of Sensabaugh silt loam, along Charles Fork, in a meadow, 0.5 mile south of the south end of Charles Fork Lake; USGS Looneyville topographic quadrangle; lat. 38 degrees 44 minutes 23 seconds N. and long. 81 degrees 20 minutes 31 seconds W.

Ap—0 to 6 inches; reddish brown (5YR 4/3) silt loam; moderate medium granular structure; friable; many fine and medium roots; 5 percent rock fragments; slightly acid; abrupt smooth boundary.

Bw1—6 to 20 inches; reddish brown (5YR 4/4) gravelly silt loam; weak medium subangular blocky structure; friable; common very fine and fine roots; 15 percent rock fragments; moderately acid; clear wavy boundary.

Bw2—20 to 29 inches; reddish brown (5YR 4/3) very gravelly loam; weak fine and medium subangular blocky structure; firm; few very fine and fine roots; 35 percent rock fragments; moderately acid; clear wavy boundary.

C—29 to 65 inches; reddish brown (5YR 4/3) very gravelly loam; massive; 50 percent rock fragments; neutral.

The thickness of the solum ranges from 24 to 55 inches, and the depth to bedrock is more than 60 inches. The content of gravel ranges, by volume, from 0 to 25 percent in the A horizon, from 15 to 40 percent in the B horizon, and from 15 to 70 percent in the C horizon. The control section averages between 15 and 35 percent gravel fragments. In unlimed areas reaction ranges from moderately acid to mildly alkaline.

The A horizon has hue of 10YR, 7.5YR, or 5YR, value of 4, and chroma of 2 to 4. The fine-earth fraction is silt loam.

The B and C horizons have hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6 or have hue of 5YR or 2.5YR and value and chroma of 3 or 4. Mottles in shades of gray, brown, or yellow can occur below a depth of 24 inches. The fine-earth fraction is loam, fine sandy loam, clay loam, sandy clay loam, silt loam, or silty clay loam.

Tilsit Series

The Tilsit series consists of deep, moderately well drained soils formed in acid material weathered from siltstone, shale, and sandstone. These soils are on broad upland ridgetops throughout the survey area. Slopes range from 3 to 8 percent.

Tilsit soils are associated on the landscape with the well drained Gilpin, Peabody, and Upshur soils. Tilsit soils are deep, whereas Gilpin and Peabody are moderately deep. Tilsit soils have less clay in the subsoil than Peabody and Upshur soils and have a fragipan in the subsoil. They are less well drained than all of the associated soils.

Typical pedon of Tilsit silt loam, 3 to 8 percent slopes, along the Middle Fork of Reedy Creek, above a pasture on a broad ridgetop, 0.2 mile north of Stony Point Church and 0.15 mile east of Roach Cemetery; USGS Reedy topographic quadrangle; lat. 38 degrees 52 minutes 27 seconds N. and long. 81 degrees 26 minutes 13 seconds W.

Ap—0 to 7 inches; brown (10YR 4/3) silt loam; weak fine granular structure; friable; many fine and medium roots; moderately alkaline; abrupt smooth boundary.

BA—7 to 10 inches; yellowish brown (10YR 5/6) silt loam; weak fine and medium subangular blocky structure; friable; common very fine and fine roots; moderately alkaline; clear wavy boundary.

Bt—10 to 21 inches; yellowish brown (10YR 5/8) silty clay loam; moderate medium subangular blocky structure; friable; common very fine and fine roots; common distinct clay films on faces of peds; strongly acid; gradual wavy boundary.
Btx1—21 to 27 inches; brownish yellow (10YR 6/6) channery loam; common medium distinct strong brown (7.5YR 5/6) and light brownish gray (10YR 6/2) mottles and common black manganese concretions; moderate medium prismatic and weak medium platy structure; firm; occasional fine roots on faces of peds in the upper part of the fragipan; 15 percent sandstone fragments; common distinct clay films on faces of peds; very strongly acid; clear wavy boundary.
Btx2—27 to 43 inches; brownish yellow (10YR 6/6) very channery loam; many medium distinct strong brown (7.5YR 5/6) and light brownish gray (10YR 6/2) mottles and common black manganese concretions; moderate coarse prismatic structure; very firm; 40 percent sandstone fragments; common distinct clay films on faces of peds; very strongly acid; abrupt smooth boundary.
Cr—43 inches; rippable, light gray shale bedrock.

The thickness of the solum and the depth to bedrock range from 40 to 60 inches. The depth to a fragipan ranges from 18 to 28 inches. The content of rock fragments ranges, by volume, from 0 to 10 percent in the upper part of the solum, from 0 to 40 percent in the lower part of the solum, and from 10 to 50 percent in the C horizon. In unlimed areas reaction is very strongly acid or strongly acid above the fragipan and extremely acid to strongly acid below the fragipan.

The A horizon has hue of 2.5Y or 10YR, value of 4 or 5, and chroma of 2 to 4. The fine-earth fraction is silt loam.

The BA horizon has hue of 2.5Y or 10YR, value of 4 to 6, and chroma of 4 to 8. The fine-earth fraction is silt loam.

The Bt horizon has hue of 2.5Y, 10YR, or 7.5YR, value of 4 to 6, and chroma of 4 to 8. The fine-earth fraction is loam, silt loam, or silty clay loam.

The Btx horizon has hue of 2.5Y, 10YR, or 7.5YR, value of 4 to 6, and chroma of 2 to 8. It has mottles in shades of gray, brown, olive, or yellow. The fine-earth fraction is loam, silt loam, or silty clay loam. The horizon can be channery or very channery.

Some pedons have a C horizon. This horizon has hue of 2.5Y, 10YR, or 7.5YR, value of 4 to 6, and chroma of 4 to 8. The fine-earth fraction is silt loam, silty clay loam, sandy clay loam, clay loam, or silty clay. The horizon can be channery or very channery.

Udorthents

Udorthents generally are very deep, well drained soils in areas that have been disturbed by cutting, filling, or other kinds of earth moving during road construction and urban development. These soils are mainly along Interstate 79 in the southern part of Roane County and in smaller areas near the towns of Spencer and Grantsville. The soils formed in a mixture of soil material and rock fragments. Bedrock is exposed in cut areas. In many areas the surface is covered with concrete or asphalt.

Udorthents are associated on the landscape with the well drained Gilpin, Peabody, Upshur, Vandalia, and Pineville soils.

A typical pedon of Udorthents is not described because of the variability of these soils. The depth to bedrock ranges from 0 inches in cut areas to more than 60 inches in fill areas. Rock fragments range in type from soft shale to hard sandstone. The soils have hue of 10YR to 10R, value of 3 to 6, and chroma of 2 to 8. The fine-earth fraction is silt loam, loam, clay loam, silty clay loam, silty clay, or clay.

Upshur Series

The Upshur series consists of deep, well drained soils formed in material weathered from claystone, siltstone, and shale. These soils are on ridgetops, backslopes, shoulders, and benches throughout the survey area. Slopes range from 8 to 35 percent.

Upshur soils are associated on the landscape with Gilpin, Peabody, Vandalia, Tilsit, and Pineville soils and with Udorthents. Upshur soils are deep, whereas Gilpin and Peabody soils are moderately deep and Vandalia and Pineville soils are very deep. Upshur soils contain more clay in the subsoil than Gilpin, Tilsit, and Pineville soils; contain more clay in the upper part of the solum than Vandalia soils; and typically have a lower content of rock fragments in the control section than Udorthents. Upshur soils are well drained, whereas Tilsit soils are moderately well drained.

Typical pedon of Upshur silt loam, in an area of Upshur-Gilpin complex, 15 to 25 percent slopes, severely eroded, on a wooded ridgetop, 0.2 mile northwest of Joker; USGS Annamoriah topographic quadrangle; lat. 38 degrees 54 minutes 26 seconds N. and long. 81 degrees 10 minutes 23 seconds W.

Oi—2 inches to 1 inch; slightly decomposed organic material.
Oe—1 inch to 0; highly decomposed organic material and humus.

Ap—0 to 6 inches; brown (7.5YR 4/4) silt loam; weak medium granular structure; friable; many fine, medium, and coarse roots; strongly acid; abrupt smooth boundary.
Bt1—6 to 11 inches; yellowish red (5YR 4/6) silty clay; moderate medium subangular blocky structure; friable; many medium and coarse roots; common distinct clay films on faces of peds; very strongly acid; clear wavy boundary.
Bt2—11 to 27 inches; dark red (2.5YR 3/6) clay; moderate medium subangular blocky structure; firm; common medium and coarse roots; common distinct clay films on faces of peds; very strongly acid; clear wavy boundary.
Bt3—27 to 34 inches; dusky red (10R 3/4) channery clay; moderate medium subangular blocky structure; firm; few medium and coarse roots; common distinct clay films on faces of peds; 25 percent soft shale fragments; very strongly acid; clear wavy boundary.
C—34 to 44 inches; dusky red (10R 3/4) very channery clay; massive; firm; 40 percent soft shale fragments; strongly acid; clear wavy boundary.
Cr—44; rippable, red shale and olive siltstone.

The thickness of the solum ranges from 26 to 50 inches, and the depth to bedrock ranges from 40 to more than 60 inches. The content of soft shale fragments ranges, by volume, from 0 to 15 percent in the Ap and Bt1 horizons, from 0 to 25 percent in the Bt2 and Bt3 horizons, and from 0 to 75 percent in the C horizon. Most of the shale fragments break down during lab analysis. In unlimed areas reaction ranges from very strongly acid to slightly acid in the A horizon, from very strongly acid to moderately alkaline in the Bt and BC horizons, and from strongly acid to moderately alkaline in the C horizon.

The A horizon has hue of 10YR to 2.5YR and value and chroma of 2 to 4. The fine-earth fraction is silt loam.

Some pedons have a BA horizon. This horizon has hue of 7.5YR or 5YR, value of 4 or 5, and chroma of 4 to 6. The fine-earth fraction is silt loam.

The Bt horizon has hue of 5YR, 2.5YR, or 10R, value of 3 or 4, and chroma of 3 to 6. The fine-earth fraction is silty clay or clay.

The C horizon has hue of 5YR, 2.5YR, or 10R, value of 3 or 4, and chroma of 3 to 6. In some pedons it has variegated colors of olive, olive brown, or yellow. The fine-earth fraction is dominantly silty clay loam, silty clay, or clay, but the range includes silt loam and clay loam.

Vandalia Series

The Vandalia series consists of very deep, well drained soils formed in colluvial material weathered from upland soils underlain by shale, siltstone, and sandstone. Vandalia soils are on colluvial footslopes and fans. Slopes range from 15 to 25 percent.

Vandalia soils are associated on the landscape with the well drained Gilpin, Peabody, and Upshur soils and Udorthents; the moderately well drained Senecaville soils; and the poorly drained Melvin soils. Vandalia soils are very deep, whereas Gilpin and Peabody soils are moderately deep and Upshur soils are deep. Vandalia soils have more clay in the control section than Hackers soils, have less clay in the upper part of the subsoil than the Upshur soils, have a lower content of rock fragments in the control section than Udorthents, and are better drained the Senecaville and Melvin soils.

Typical pedon of Vandalia silt loam, 15 to 25 percent slopes, along the Left Fork of Reedy Creek, 1.1 miles southwest on County Route 10 from its junction with State Route 14, in a pasture, 0.15 mile west of County Route 10; USGS Peniel topographic quadrangle; lat. 38 degrees 50 minutes 50 seconds N. and long 81 degrees 25 minutes 5 seconds W.

Ap—0 to 6 inches; reddish brown (5YR 4/3) silt loam; moderate medium granular structure; friable; many fine and medium roots; 5 percent fine grained sandstone fragments; neutral; abrupt smooth boundary.
BA—6 to 13 inches; reddish brown (5YR 4/4) silt loam; weak medium and coarse subangular blocky structure; friable; many fine and very fine roots; 10 percent fine grained sandstone fragments; slightly acid; clear wavy boundary.
Bt1—13 to 31 inches; yellowish red (5YR 4/6) silty clay loam; moderate medium subangular blocky structure; friable; common fine and very fine roots; common distinct clay films on faces of peds; 5 percent soft shale fragments; very strongly acid; clear wavy boundary.
Bt2—31 to 46 inches; reddish brown (2.5YR 4/4) channery silty clay; moderate medium and coarse subangular blocky structure; firm; few fine and very fine roots; common distinct clay films on faces of peds; occasional black concretions; 20 percent soft shale fragments; very strongly acid; clear wavy boundary.
Bt3—46 to 54 inches; reddish brown (2.5YR 4/4) channery silty clay; weak medium subangular blocky structure; common distinct clay films on

faces of peds; occasional black concretions; 30 percent soft shale fragments; strongly acid; clear wavy boundary.

C—54 to 65 inches; dark reddish brown (2.5YR 3/4) very channery silty clay loam; massive; firm; occasional black concretions; 40 percent soft shale fragments; moderately acid.

The thickness of the solum ranges from 40 to 80 inches, and the depth to bedrock is more than 60 inches. The content of rock fragments ranges, by volume, from 5 to 15 percent in the A horizon, from 5 to 40 percent in the individual subhorizons of the B horizon, and from 5 to 50 percent in the C horizon. In unlimed areas reaction ranges from very strongly acid to moderately acid in the subsoil and from strongly acid to neutral in the substratum.

The A horizon has hue of 10YR, 7.5YR, or 5YR, value of 4 or 5, and chroma of 2 to 4. The fine-earth fraction is silt loam or silty clay loam.

The BA horizon and the upper part of the Bt horizon have hue of 7.5YR, 5YR, or 2.5YR, value of 4 or 5, and chroma of 3 to 6. They are silt loam or silty clay loam in the fine-earth fraction. The lower part of the Bt horizon has hue of 5YR, 2.5YR, or 10R, value of 3 or 4, and chroma of 3 to 6. It is silty clay loam, silty clay, or clay in the fine-earth fraction.

The C horizon has hue of 5YR, 2.5YR, or 10R and value and chroma of 3 to 6. The fine-earth fraction is silty clay loam, silty clay, clay loam, or clay.

Formation of the Soils

This section explains the origin and development of the soils in Calhoun and Roane Counties. It describes the influence of the five factors of soil formation on the soils in the two counties. It also describes the morphology of the soils as it applies to horizon nomenclature and the processes of horizon development.

Factors of Soil Formation

The soils in Calhoun and Roane Counties have resulted from the interaction of five major factors of soil formation—parent material, time, climate, living organisms, and topography. Each factor modifies the effects of the other factors. Parent material, topography, and time have produced the major differences among the soils in Calhoun and Roane Counties. Climate and living organisms generally show their influence throughout broad areas, and their effects are relatively uniform throughout the two counties.

Parent Material, Time, and Climate

The character of the parent material strongly influences the time required for soil formation and the nature of the soil produced. The soils in Calhoun and Roane Counties formed in residual, colluvial, and alluvial materials.

The residual material is the oldest parent material in the two counties. Most of the parent material is residual material derived from rocks of the Dunkard, Monongahela, and Conemaugh Groups. The formation of soils in this material is greatly influenced by resistance of the bedrock, slope, and continual soil erosion. The dominant residual soils in the survey area are Gilpin, Peabody, and Upshur soils, which formed in material weathered from interbedded shale, siltstone, sandstone, or claystone.

Colluvial material is along footslopes and at the head of drainageways. This material has moved downslope from areas of acid, lime-influenced residual soils. Vandalia soils, which are in areas below Gilpin and Peabody soils on the landscape, formed in colluvium.

The parent material on terraces and flood plains has washed from acid, lime-influenced soils on uplands. The soil-forming processes have had considerable time to act on the material on terraces. Many additions, losses, and alterations have taken place. The resulting Monongahela soils have a well developed profile. The alluvium on flood plains is the youngest parent material in Calhoun and Roane Counties. Most of this material is physically well suited to soil formation, but the soil-forming processes have had little time to operate. The soils on flood plains generally have a weakly developed profile. Moshannon, Sensabaugh, and Senecaville soils are examples of soils on flood plains. Hackers and other soils on high flood plains, or second bottoms, have moderately developed profiles.

Climate generally is relatively uniform throughout the survey area and is not responsible for any major differences among the soils. Rainfall and temperature affect the development of horizons in the soil profile. A detailed description of the climate is given in the section “General Nature of the Survey Area.”

Living Organisms

Living organisms, mainly vegetation, animals, bacteria, and fungi, affect soil formation. The kind and amount of vegetation generally are responsible for the amount of organic matter in the soil, the color of the surface layer, and, in part, the amount of nutrients in the soil. Earthworms and burrowing animals help to keep the soil open and porous, and they mix organic and mineral material by moving the soil to the surface. Bacteria and fungi decompose organic material and have some influence on the weathering and decomposition of minerals, which cause a release of plant nutrients.

Topography

Topography affects soil formation through its effect on the amount of water moving through the soil, the amount of runoff, and the rate of erosion. Large amounts of water have moved through gently sloping to strongly sloping soils. This water movement favors the formation of deep, moderately well developed or well developed soils. On steep and very steep hillsides, more water runs off the surface and thus less water moves through the soils. In addition, the soil material is washed away almost as rapidly as a soil forms. In many places the soils on the steeper hillsides are shallower to bedrock than the soils on the gentler slopes.

The topography of Calhoun and Roane Counties favors the formation of soils on flood plains and terraces. Formation is progressing at a rapid rate. The soils on flood plains are weakly developed, however, mainly because too little time has elapsed since the parent material was deposited.

Morphology of the Soils

The results of the soil-forming processes can be observed in the different layers, or soil horizons, in the soil profile. The profile extends from the surface downward to materials that have been little changed by the soil-forming processes. Most soils have three major horizons, called the A, B, and C horizons. These horizons can be further subdivided by the use of numbers and letters that indicate changes within a major horizon.

The A horizon is the surface layer. It has the maximum accumulation of organic matter.

The B horizon underlies the A horizon (or the A and E horizons) and commonly is called the subsoil. It is the horizon of maximum accumulation, or illuviation, of clay, iron, aluminum, or other compounds leached from the surface layer. The B horizon commonly has blocky structure and generally is more firm and lighter in color than the A horizon.

The C horizon is below the A and B horizons. It consists of material that has been modified by weathering but is little altered by the soil-forming processes.

Many processes are involved in the formation of soil horizons in Calhoun and Roane Counties. The more important of these are the accumulation of organic matter, the formation of structure, the translocation of clay minerals, and the reduction, oxidation, and transfer of iron. Such processes have been taking place continually for thousands of years.

In most of the soils on uplands, the B horizon is yellowish brown, reddish brown, or dark reddish brown. Iron oxides are the main contributors to these colors. The B horizon has blocky structure and has translocated clay minerals.

A fragipan has formed in the B horizon of the moderately well drained Monongahela soils on terraces and the moderately well drained Tilsit soils on flats in the uplands. This layer is dense and brittle, is mottled, and is slowly or very slowly permeable to water and air. Most fragipans are grayish or mottled with gray.

Moderately well drained to poorly drained soils commonly have gray colors. When drainage is restricted, water replaces air in the pore space of the soils. The resultant lack of oxygen gives rise to intensive reduction, dissolution, and removal of iron during soil formation. The removal of iron exposes the gray color of the mineral surfaces. The gray mottles in moderately well drained to poorly drained soils are evidence of this process.

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Glossary

ABC soil. A soil having an A, a B, and a C horizon.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

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

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

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

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

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.

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

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

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

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

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

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

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

Catsteps. Very small, irregular terraces on steep hillsides, especially in pasture, formed by the trampling of cattle or the slippage of saturated soil.

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.

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

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

Coarse textured soil. Sand or loamy sand.

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

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

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. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

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

Consistence, soil. 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.

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

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Crotovina. A burrow or cavity within the soil, caused by the burrowing activity of an animal, such as a crayfish.

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

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.

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

Drainage class (natural). Refers to the frequency and duration of 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.

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

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

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

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

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

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.

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

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

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

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

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

Footer. On a building site, a concrete foundation that is poured below the soil surface.

Footer drain. A subsurface drain that is installed along the outside edge of the footer to drain away subsurface water.

Footslope. The inclined surface at the base of a hill.

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

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

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

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

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

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

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

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

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

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

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

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

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

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

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

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

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

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

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

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

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

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

Infiltration 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.

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

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

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

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

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

Low strength. The soil is not strong enough to support loads.

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

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

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

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

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

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

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

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).

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.)

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

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

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

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

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

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

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affects the specified use.

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:

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

Phase, soil. A subdivision of a soil series based on features that affect its use and management, 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.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

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.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer. 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.

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.

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.

Slippage (in tables). Soil mass susceptible to movement downslope when loaded, excavated, or wet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to 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.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the material below the solum. The living roots and plant and animal activities are largely confined to the solum.

Stone line. A concentration of coarse fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to wind erosion and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons, considered collectively. It includes all subdivisions of these horizons.

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.

Toeslope. The outermost inclined surface at the base of a hill; part of a footslope.

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.

Undifferentiated group. A map unit in which two or more soil types are combined because of similar use and management. Each delineation may have only one of the major soil types, or it may have all of the major soil types. The soil types in an undifferentiated group do not occur in a regular pattern.

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.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth’s surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Tables

Table 1.--Temperature and Precipitation

(Recorded in the period 1951-86 at Spencer, West Virginia)

Month	Temperature						Precipitation				
				2 years in 10 will have--				2 years in 10 will have--			
	Average daily maximum	Average daily minimum	Average	Maximum temperature higher than--	Minimum temperature lower than--	Average number of growing degree days*	Average	Less than--	More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January-----	41.9	21.4	31.7	69	-10	61	3.23	1.83	4.46	9	11.4
February----	45.7	23.0	34.4	72	-6	77	2.87	1.63	3.95	8	9.4
March-------	55.3	30.9	43.1	82	8	194	3.71	2.25	5.02	9	3.2
April-------	67.4	40.5	54.0	88	19	420	3.44	2.25	4.52	9	.1
May---------	76.0	49.0	62.5	91	29	698	3.82	2.09	5.33	9	.0
June--------	82.4	57.1	69.8	93	39	894	3.44	1.90	4.79	7	.0
July--------	85.0	61.4	73.2	95	45	1,029	4.80	2.81	6.57	9	.0
August------	84.1	60.3	72.2	94	42	998	4.13	2.26	5.78	7	.0
September---	78.9	53.5	66.2	93	32	786	3.21	1.67	4.55	6	.0
October-----	68.6	42.2	55.4	86	20	477	3.03	1.04	4.67	6	.0
November----	56.0	33.4	44.7	79	9	181	3.12	1.68	4.38	8	1.0
December----	45.6	25.9	35.8	73	1	101	3.16	1.62	4.49	8	3.1
Yearly:											
Average----	65.6	41.6	53.6	---	---	---	---	---	---	---	---
Extreme----	---	---	---	96	-12	---	---	---	---	---	---
Total------	---	---	---	---	---	5,916	41.96	36.26	47.69	95	28.2

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temteratures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the survey area (40 degrees F).

Table 2.--Freeze Dates in Spring and Fall

(Recorded in the period 1951-86 at Spencer, 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. 24	May 11	May 19
2 years in 10 later than------	Apr. 18	Apr. 26	May 13
5 years in 10 later than------	Apr. 7	Apr. 17	May 1
First freezing temperature in fall:			
1 year in 10 earlier than----	Oct. 1	Oct. 8	Sept. 21
2 years in 10 earlier than----	Oct. 22	Oct. 13	Sept. 27
5 years in 10 earlier than----	Nov. 2	Oct. 22	Oct. 8

Table 3.--Growing Season

(Recorded in the period 1951-86 at Spencer, 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	184	171	138
8 years in 10	192	176	145
5 years in 10	208	187	159
2 years in 10	224	198	173
1 year in 10	232	204	181

Table 4.--Acreage and Proportionate Extent of the Soils

Map symbol	Soil name	Calhoun County	Roane County	Total-- Area	Total-- Extent
		Acres	Acres	Acres	Pct
GpF3	Gilpin-Peabody complex, 35 to 70 percent slopes, severely eroded	110,700	189,060	299,760	61.3
GvF	Gilpin-Pineville complex, 35 to 70 percent slopes, very stony	5,935	14,190	20,125	4.1
Ha	Hackers silt loam	1,515	850	2,365	0.5
MoB	Monongahela silt loam, 3 to 8 percent slopes	650	880	1,530	0.3
Ms	Moshannon silt loam	2,225	5,825	8,050	1.6
PvE	Pineville loam, 25 to 35 percent slopes, very stony	2,850	0	2,850	0.6
RpF3	Rock outcrop-Peabody-Gilpin complex, 35 to 70 percent slopes, severely eroded	1,950	3,370	5,320	1.1
Sc	Senecaville silt loam, rarely flooded	90	125	215	*
Sm	Senecaville and Melvin silt loams, occasionally flooded	115	250	365	0.1
Ss	Sensabaugh silt loam	3,995	7,660	11,655	2.4
TsB	Tilsit silt loam, 3 to 8 percent slopes	410	840	1,250	0.3
Ud	Udorthents, smoothed	150	1,360	1,510	0.3
UgC3	Upshur-Gilpin complex, 8 to 15 percent slopes, severely eroded	2,390	2,170	4,560	0.9
UgD3	Upshur-Gilpin complex, 15 to 25 percent slopes, severely eroded	21,935	41,130	63,065	12.9
UgE3	Upshur-Gilpin complex, 25 to 35 percent slopes, severely eroded	7,790	16,030	23,820	4.9
VaD	Vandalia silt loam, 15 to 25 percent slopes	14,765	21,395	36,160	7.4
VbD	Vandalia silt loam, 15 to 25 percent slopes, extremely bouldery	1,105	3,800	4,905	1.0
	Water	930	765	1,695	0.3
	Total	179,500	309,700	489,200	100.0

* Less than 0.1 percent.

Table 5.--Prime Farmland

(Only the soils considered prime farmland are listed. Urban or built-up areas of the soils listed are not considered prime farmland.)

Map symbol	Soil name
Ha	Hackers silt loam
Ms	Moshannon silt loam
Sc	Senecaville silt loam, rarely flooded
Ss	Sensabaugh silt loam

Table 6.--Land Capability Classification 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	Oats	Wheat	Grass-legume hay	Alfalfa hay	Kentucky bluegrass	Tobacco
		Bu	Bu	Bu	Tons	Tons	AUM*	Lbs
GpF3------------ Gilpin-Peabody	VIIe	---	---	---	---	---	---	---
GvF------------ Gilpin-Pineville	VIIs	---	---	---	---	---	---	---
Ha-------------- Hackers	I	135	80	50	3.5	5.0	5.5	3,000
MoB------------- Monongahela	IIe	110	65	40	3.0	3.5	4.5	2,500
Ms-------------- Moshannon	IIw	125	75	45	3.5	5.0	5.5	3,000
PvE------------- Pineville	VIIs	---	---	---	---	---	---	---
RpF3------------ Rock outcrop-Peabody-Gilpin	VIIs	---	---	---	---	---	---	---
Sc-------------- Senecaville	IIw	125	80	45	3.5	4.5	5.5	2,000
Sm-------------- Senecaville and Melvin	IIIw	110	60	35	3.5	3.0	4.5	---
Ss-------------- Sensabaugh	IIw	105	65	45	3.5	3.0	4.5	2,600
TsB------------- Tilsit	IIe	100	60	35	3.0	3.5	4.5	2,500
Ud. Udorthents								
UgC3------------ Upshur-Gilpin	IVe	85	60	35	3.0	3.5	4.5	2,200
UgD3------------ Upshur-Gilpin	VIe	---	---	---	3.0	3.0	3.5	---
UgE3------------ Upshur-Gilpin	VIIe	---	---	---	---	---	---	---
VaD------------- Vandalia	IVe	90	55	30	2.5	4.0	4.0	---
VbD------------- Vandalia	VIIs	---	---	---	---	---	---	---

* Animal unit month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

Table 7.--Capability Classes and Subclasses

(Miscellaneous areas are excluded. Dashes indicate no acreage.)

Class	Total acreage	Major management concerns (Subclass) Erosion (e)	Wetness (w)	Soil problem (s)
		Acres	Acres	Acres
I:				
Calhoun County	1,515	---	---	---
Roane County	850	---	---	---
II:				
Calhoun County	7,370	1,060	6,310	---
Roane County	15,330	1,720	13,610	---
III:				
Calhoun County	115	---	115	---
Roane County	250	---	250	---
IV:				
Calhoun County	17,155	17,155	---	---
Roane County	23,565	23,565	---	---
V:				
Calhoun County	---	---	---	---
Roane County	---	---	---	---
VI:				
Calhoun County	21,935	21,935	---	---
Roane County	41,130	41,130	---	---
VII:				
Calhoun County	130,330	118,490	---	11,840
Roane County	226,575	205,090	---	21,485
VIII:				
Calhoun County	---	---	---	---
Roane County	---	---	---	---

Table 8.--Woodland Management and Productivity

(Only the soils suitable for the 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 will generally be 5 to 10 points lower.)

Soil name and map symbol	Ordi-nation symbol	Management concerns: Erosion hazard	Equip-ment limita-tion	Seedling mortal-ity	Plant competi-tion	Potential productivity: Common trees	Site index	Average annual growth*: Cubic feet/ac	Board feet/ac	Cords/ac
GpF3:										
Gilpin---------	4R	Severe	Severe	Slight	Moderate	Northern red oak----	80	62	250	0.81
						Yellow-poplar-------	95	98	510	1.14
						Virginia pine-------	66	102	---	.96
Peabody--------	4R	Severe	Severe	Slight	Moderate	Northern red oak----	70	52	180	.67
						White oak-----------	65	48	145	.60
						Yellow-poplar-------	90	90	440	1.04
						Virginia pine-------	66	102	---	.96
GvF:										
Gilpin---------	4R	Severe	Severe	Slight	Moderate	Northern red oak----	80	62	250	.81
						Yellow-poplar-------	95	98	510	1.14
						Virginia pine-------	66	102	---	.96
Pineville------	5R	Severe	Severe	Slight	Severe	Northern red oak----	86	68	292	.89
						Yellow-poplar-------	108	121	720	1.42
						Black oak-----------	85	67	285	.88
Ha-------------- Hackers	5A	Slight	Slight	Slight	Severe	Northern red oak----	85	67	285	.88
						Yellow-poplar-------	95	98	510	1.14
						White ash-----------	85	111	463	.86
MoB------------- Monongahela	4A	Slight	Slight	Slight	Moderate	Northern red oak----	70	52	180	.67
						Yellow-poplar-------	85	81	380	.93
						Eastern white pine--	72	131	545	1.12
						Virginia pine-------	66	102	---	.96
Ms-------------- Moshannon	5A	Slight	Slight	Slight	Severe	Northern red oak----	85	67	285	.88
						Yellow-poplar-------	95	98	510	1.14
						Sugar maple---------	85	53	221	.41
PvE------------- Pineville	5R	Moderate	Moderate	Moderate	Severe	Northern red oak----	86	68	292	.89
						Yellow-poplar-------	108	121	720	1.42
						Black oak-----------	85	67	285	.88
RpF3:										
Rock outcrop.										
Peabody--------	4R	Severe	Severe	Slight	Moderate	Northern red oak----	70	52	180	.67
						White oak-----------	65	48	145	.60
						Yellow-poplar-------	90	90	440	1.04
Gilpin---------	4R	Severe	Severe	Slight	Moderate	Northern red oak----	80	62	250	.81
						Yellow-poplar-------	95	98	510	1.14
						Virginia pine-------	66	102	---	.96
Sc-------------- Senecaville	5A	Slight	Slight	Slight	Severe	Northern red oak----	85	67	285	.88
						Yellow-poplar-------	95	98	510	1.14
						White ash-----------	85	111	463	.86
						White oak-----------	85	67	285	.88

See footnote at end of table.

Table 8.--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/ac	Average annual growth*: Board feet/ac	Average annual growth*: Cords/ac
Sm:										
Senecaville----	5A	Slight	Slight	Slight	Severe	Northern red oak----	85	67	285	0.88
						Yellow-poplar-------	95	98	510	1.14
						White ash-----------	85	111	463	.86
						White oak-----------	85	67	285	.88
Melvin---------	5W	Slight	Moderate	Moderate	Severe	Pin oak-------------	99	125	522	.97
						Sweetgum------------	89	103	430	.80
Ss-------------- Sensabaugh	5A	Slight	Slight	Slight	Severe	Northern red oak----	85	67	285	.88
						Yellow-poplar-------	100	107	580	1.23
						White oak-----------	80	62	250	.81
						Shortleaf pine------	80	130	543	1.01
						Virginia pine-------	75	115	---	1.58
TsB------------- Tilsit	4A	Slight	Slight	Slight	Moderate	Northern red oak----	74	56	208	.73
						Shortleaf pine------	72	114	476	.89
						White oak-----------	68	50	166	.64
						Yellow-poplar-------	90	90	440	1.04
						Black oak-----------	74	56	208	.73
						Virginia pine-------	73	113	---	1.41
						Scarlet oak---------	74	56	208	.73
						Pitch pine----------	67	103	430	.80
UgC3:										
Upshur---------	3C	Moderate	Slight	Slight	Moderate	Northern red oak----	65	48	145	.60
						Yellow-poplar-------	80	71	320	.83
						Eastern white pine--	80	144	628	1.41
						Virginia pine-------	66	102	---	.96
Gilpin---------	4A	Slight	Slight	Slight	Moderate	Northern red oak----	80	62	250	.81
						Yellow-poplar-------	95	98	510	1.14
						Virginia pine-------	66	102	---	.96
UgD3:										
Upshur---------	4R	Moderate	Severe	Moderte	Moderate	Northern red oak----	70	52	180	.67
						Yellow-poplar-------	90	90	440	1.04
						Eastern white pine--	90	166	743	1.67
						Virginia pine-------	70	109	---	1.16
Gilpin---------	4R	Moderate	Moderate	Moderate	Moderate	Northern red oak----	80	62	250	.81
						Yellow-poplar-------	95	98	510	1.14
						Virginia pine-------	66	102	---	.96
UgE3:										
Upshur---------	4R	Severe	Severe	Moderate	Moderate	Northern red oak----	70	52	180	.67
						Yellow-poplar-------	90	90	440	1.04
						Eastern white pine--	90	166	743	1.67
						Virginia pine-------	70	109	---	1.16
Gilpin---------	4R	Moderate	Moderate	Moderate	Moderate	Northern red oak----	80	62	250	.81
						Yellow-poplar-------	95	98	510	1.14
						Virginia pine-------	66	102	---	.41
VaD, VbD-------- Vandalia	4R	Moderate	Severe	Slight	Moderate	Northern red oak----	77	59	229	.77
						Yellow-poplar-------	90	90	440	1.04
						Virginia pine-------	80	122	---	1.99

* 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. The International 1/4 Log Rule is used for board feet. Cords are standard rough cords. This information should be used for planning only.

Table 9.--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
GpF3:					
Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Peabody	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
GvF:					
Gilpin	Severe: slope, small stones.	Severe: slope, small stones.	Severe: large stones, slope, small stones.	Severe: slope.	Severe: small stones, large stones, slope.
Pineville	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Severe: slope.	Severe: slope.
Ha Hackers	Severe: flooding.	Slight	Slight	Slight	Slight.
MoB Monongahela	Moderate: wetness.	Moderate: wetness.	Moderate: slope, small stones.	Severe: erodes easily.	Moderate: wetness.
Ms Moshannon	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: flooding.
PvE Pineville	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Severe: slope.	Severe: slope.
RpF3:					
Rock outcrop.					
Peabody	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Sc Senecaville	Severe: flooding.	Moderate: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
Sm:					
Senecaville	Severe: flooding.	Moderate: wetness, percs slowly.	Moderate: wetness, flooding.	Moderate: wetness.	Moderate: wetness, flooding.
Melvin	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Ss Sensabaugh	Severe: flooding.	Slight	Moderate: small stones.	Slight	Moderate: flooding.

Table 9.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
TsB------------------- Tilsit	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
Ud. Udorthents					
UgC3:					
Upshur---------------	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
Gilpin---------------	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----------	Moderate: slope, thin layer.
UgD3:					
Upshur---------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
Gilpin---------------	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
UgE3:					
Upshur---------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
Gilpin---------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
VaD------------------- Vandalia	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
VbD------------------- Vandalia	Severe: slope, large stones.	Severe: slope, large stones.	Severe: large stones, slope, small stones.	Moderate: slope.	Severe: slope.

Table 10.--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
GpF3:										
Gilpin	Very poor.	Poor	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Peabody	Very poor.	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
GvF:										
Gilpin	Very poor.	Poor	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Pineville	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
Ha Hackers	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
MoB Monongahela	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Ms Moshannon	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
PvE Pineville	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
RpF3:										
Rock outcrop.										
Peabody	Very poor.	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Gilpin	Very poor.	Poor	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Sc Senecaville	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Sm:										
Senecaville	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Melvin	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Ss Sensabaugh	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
TsB Tilsit	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Ud. Udorthents										
UgC3:										
Upshur	Fair	Good	Fair	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Gilpin	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.

Table 10.--Wildlife Habitat--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Hardwood trees	Conif- erous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
UgD3:										
Upshur	Poor	Fair	Fair	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Gilpin	Poor	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
UgE3:										
Upshur	Very poor.	Fair	Fair	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Gilpin	Very poor.	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
VaD Vandalia	Poor	Fair	Fair	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
VbD Vandalia	Very poor.	Poor	Fair	Good	Good	Very poor.	Very poor.	Poor	Fair	Very poor.

Table 11.--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
GpF3:						
Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Peabody	Severe: slope, slippage.	Severe: shrink-swell, slope, slippage.	Severe: slope, shrink-swell, slippage.	Severe: shrink-swell, slope, slippage.	Severe: shrink-swell, slippage, slope.	Severe: slope.
GvF:						
Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, large stones, slope.
Pineville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Ha Hackers	Slight	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: low strength, flooding, frost action.	Slight.
MoB Monongahela	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness, slope.	Moderate: wetness, frost action.	Moderate: wetness.
Ms Moshannon	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding, frost action.	Moderate: flooding.
PvE Pineville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
RpF3:						
Rock outcrop.						
Peabody	Severe: slope, slippage.	Severe: shrink-swell, slope, slippage.	Severe: slope, shrink-swell, slippage.	Severe: shrink-swell, slope, slippage.	Severe: shrink-swell, slippage, slope.	Severe: slope.
Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Sc Senecaville	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: low strength, frost action, wetness, flooding.	Moderate: wetness.
Sm:						
Senecaville	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: low strength, flooding, frost action, wetness.	Moderate: wetness, flooding.

Table 11.--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
Sm:						
Melvin-----------	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding, frost action.	Severe: wetness.
Ss---------------- Sensabaugh	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
TsB--------------- Tilsit	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: slope, wetness.	Severe: low strength, frost action.	Moderate: wetness.
Ud. Udorthents						
UgC3:						
Upshur-----------	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: slope, shrink-swell, slippage.	Severe: shrink-swell, low strength.	Moderate: slope.
Gilpin-----------	Moderate: slope, depth to rock.	Moderate: slope.	Moderate: slope, depth to rock.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope, thin layer.
UgD3, UgE3:						
Upshur-----------	Severe: slope, slippage.	Severe: slope, shrink-swell, slippage.	Severe: slope, shrink-swell, slippage.	Severe: slope, shrink-swell, slippage.	Severe: shrink-swell, low strength, slope.	Severe: slope.
Gilpin-----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
VaD, VbD---------- Vandalia	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.

Table 12.--Sanitary Facilities

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "poor," 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
GpF3:					
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.
Peabody	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope, slippage.	Poor: depth to rock, too clayey, hard to pack.
GvF:					
Gilpin	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, small stones, slope.
Pineville	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: slope.
Ha: Hackers	Moderate: flooding.	Slight	Moderate: flooding, too clayey.	Moderate: flooding.	Fair: too clayey.
MoB: Monongahela	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Moderate: wetness.	Fair: small stones, wetness.
Ms: Moshannon	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Fair: too clayey.
PvE: Pineville	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: slope.
RpF3:					
Rock outcrop.					
Peabody	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope, slippage.	Poor: depth to rock, too clayey, hard to pack.
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.
Sc: Senecaville	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: wetness.

Table 12.--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
Sm:					
Senecaville	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: wetness.
Melvin	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
Ss: Sensabaugh	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage.	Poor: small stones.
TsB: Tilsit	Severe: percs slowly, wetness.	Severe: wetness.	Severe: depth to rock, wetness.	Moderate: wetness, depth to rock.	Fair: area reclaim, too clayey.
Ud. Udorthents					
UgC3:					
Upshur	Severe: percs slowly.	Severe: slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock, slope.	Poor: too clayey, hard to pack.
Gilpin	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, thin layer.
UgD3, UgE3:					
Upshur	Severe: slope, percs slowly, slippage.	Severe: slope.	Severe: depth to rock, slope, too clayey.	Severe: slope, slippage.	Poor: too clayey, hard to pack, slope.
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.
VaD, VbD: Vandalia	Severe: percs slowly, slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.

Table 13.--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
GpF3:				
Gilpin	Poor: thin layer, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
Peabody	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
GvF:				
Gilpin	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Pineville	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Ha Hackers	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
MoB Monongahela	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
Ms Moshannon	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.
PvE Pineville	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
RpF3:				
Rock outcrop.				
Peabody	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
Gilpin	Poor: thin layer, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
Sc Senecaville	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, area reclaim.
Sm:				
Senecaville	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, area reclaim.

Table 13.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Sm:				
Melvin	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Ss Sensabaugh	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
TsB Tilsit	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Ud. Udorthents				
UgC3:				
Upshur	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Gilpin	Poor: thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
UgD3:				
Upshur	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
Gilpin	Poor: thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
UgE3:				
Upshur	Poor: shrink-swell, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
Gilpin	Poor: thin layer, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
VaD, VbD Vandalia	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, slope.

Table 14.--Water Management

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition butdoes not eliminate the need for onsite investigation.)

Soil name and map symbol	Limitations for--		Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Terraces and diversions	Grassed waterways
GpF3:					
Gilpin	Severe: slope.	Severe: thin layer.	Deep to water	Slope, depth to rock, large stones.	Slope, depth to rock, large stones.
Peabody	Severe: slope.	Severe: thin layer.	Deep to water	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
GvF:					
Gilpin	Severe: slope.	Severe: piping.	Deep to water	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
Pineville	Severe: seepage, slope.	Severe: piping.	Deep to water	Slope	Slope.
Ha: Hackers	Moderate: seepage.	Severe: piping.	Deep to water	Favorable	Favorable.
MoB: Monongahela	Moderate: seepage, slope.	Severe: piping.	Percs slowly, slope.	Erodes easily, wetness.	Erodes easily, rooting depth.
Ms: Moshannon	Moderate: seepage.	Severe: piping.	Deep to water	Erodes easily	Erodes easily.
PvE: Pineville	Severe: seepage, slope.	Severe: piping.	Deep to water	Slope	Slope.
RpF3:					
Rock outcrop.					
Peabody	Severe: slope.	Severe: thin layer.	Deep to water	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Gilpin	Severe: slope.	Severe: thin layer.	Deep to water	Slope, depth to rock, large stones.	Slope, depth to rock, large stones.
Sc: Senecaville	Moderate: seepage.	Severe: piping, wetness.	Frost action	Erodes easily, wetness.	Favorable.
Sm:					
Senecaville	Moderate: seepage.	Severe: piping, wetness.	Flooding, frost action.	Erodes easily, wetness.	Favorable.
Melvin	Moderate: seepage.	Severe: piping, wetness.	Flooding, frost action.	Erodes easily, wetness.	Wetness, erodes easily.

Table 14.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Limitations for-- Embankments, dikes, and levees	Features affecting-- Drainage	Features affecting-- Terraces and diversions	Features affecting-- Grassed waterways
Ss---------------- Sensabaugh	Severe: seepage.	Moderate: large stones.	Deep to water----	Large stones-----	Large stones.
TsB--------------- Tilsit	Moderate: depth to rock, seepage.	Severe: piping.	Percs slowly, slope, frost action.	Erodes easily, wetness.	Erodes easily, rooting depth.
Ud. Udorthents					
UgC3, UgD3, UgE3:					
Upshur----------	Severe: slope, slippage.	Severe: hard to pack.	Deep to water----	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
Gilpin----------	Severe: slope.	Severe: thin layer.	Deep to water----	Slope, depth to rock, large stones.	Slope, depth to rock, large stones.
VaD--------------- Vandalia	Severe: slope.	Moderate: thin layer, piping, hard to pack.	Deep to water----	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
VbD--------------- Vandalia	Severe: slope.	Moderate: hard to pack.	Deep to water----	Slope, percs slowly.	Slope, percs slowly.

Table 15.--Engineering Index Properties

(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	
GpF3:											
Gilpin----------	0-3	Silt loam--------	CL, CL-ML, ML	A-4, A-6	0-5	80-95	75-90	70-85	65-80	20-40	4-15
	3-25	Channery silty clay loam, silt loam, very channery 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
	25-32	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
	32	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Peabody---------	0-3	Silt loam--------	CL-ML, CL	A-4, A-6	0	95-100	95-100	85-100	70-90	25-35	5-14
	3-24	Channery silty clay loam, channery silty clay, clay.	CL, CH	A-6, A-7	0	95-100	90-100	80-100	75-95	35-55	15-30
	24	Weathered bedrock	---	---	---	---	---	---	---	---	---
GvF:											
Gilpin----------	0-3	Very stony silt loam.	GC, CL, SC, CL-ML	A-2, A-4, A-6	10-40	50-90	45-85	35-75	30-70	20-40	4-15
	3-25	Channery silty clay loam, silt loam, very channery silty clay loam.	GM-GC, CL, CL-ML, SC	A-2, A-4, A-5	0-30	50-95	45-90	35-85	30-80	20-40	4-15
	25-32	Channery loam, very channery silt loam, very channery silty clay loam.	GC, GM-GC	A-1, A-2, A-4, A-5	0-35	25-55	20-50	15-45	15-40	20-40	4-15
	32	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Pineville-------	0-3	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
	3-56	Channery loam, channery clay loam, very channery clay loam.	CL, CL-ML, SC, SC-SM, GM-GC	A-2, A-4, A-6	0-10	55-85	50-80	45-75	30-65	25-40	6-15
	56-65	Very channery loam, very channery clay loam, very channery sandy 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

Table 15.--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	
Ha---------------Hackers	0-8	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	90-100	90-100	75-100	60-90	20-35	3-12
	8-50	Silt loam, clay loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6	0	90-100	90-100	90-100	75-95	25-40	4-18
	50-65	Stratified fine sandy loam to silty clay loam.	ML, CL, SM, SC	A-4, A-6	0	85-100	60-100	55-95	40-85	20-40	1-15
MoB--------------Monongahela	0-8	Silt loam--------	ML, SM, CL-ML, SC-SM	A-4	0-5	90-100	85-100	75-100	45-90	20-35	1-10
	8-23	Silt loam, clay loam, gravelly loam.	ML, CL, CL-ML	A-4, A-6	0-15	90-100	80-100	75-100	70-90	20-40	5-15
	23-65	Silt loam, sandy clay loam, gravelly loam.	ML, CL, SM, SC	A-4, A-6	0-10	80-100	60-100	55-95	45-95	20-40	3-15
Ms---------------Moshannon	0-10	Silt loam--------	ML, CL-ML, CL	A-4, A-6	0	95-100	95-100	90-100	70-95	22-40	3-15
	10-38	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6	0	95-100	90-100	90-100	80-95	25-40	3-15
	38-65	Silt loam, clay loam, gravelly fine sandy loam.	ML, CL, CL-ML, SC	A-4, A-6	0	80-100	70-100	55-100	35-80	25-40	3-15
PvE--------------Pineville	0-3	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
	3-56	Channery loam, channery clay loam, very channery clay loam.	CL, CL-ML, SC, SC-SM, GM-GC	A-2, A-4, A-6	0-10	55-85	50-80	45-75	30-65	25-40	6-15
	56-65	Very channery loam, very channery clay loam, very channery sandy 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
RpF3: Rock outcrop.											
Peabody---------	0-3	Silt loam--------	CL-ML, CL	A-4, A-6	0	95-100	95-100	85-100	70-90	25-35	5-14
	3-24	Channery silty clay loam, channery silty clay, clay.	CL, CH	A-6, A-7	0	95-100	90-100	80-100	75-95	35-55	15-30
	24	Weathered bedrock	---	---	---	---	---	---	---	---	---

Table 15.--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	
RpF3:											
Gilpin----------	0-3	Silt loam--------	CL, CL-ML, ML	A-4, A-6	0-5	80-95	75-90	70-85	65-80	20-40	4-15
	3-25	Channery silty clay loam, silt loam, very channery 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
	25-32	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
	32	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Sc--------------- Senecaville	0-5	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	90-100	85-100	75-100	60-90	20-35	3-12
	5-32	Silty clay loam, silt loam.	CL, ML, CL-ML	A-4, A-6	0	90-100	90-100	85-100	75-95	25-40	4-18
	32-65	Silt loam, fine sandy loam, loam.	ML, SM, SC, CL	A-4, A-6	0-5	90-100	70-100	65-95	45-90	20-40	1-15
Sm:											
Senecaville-----	0-5	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	90-100	85-100	75-100	60-90	20-35	3-12
	5-32	Silty clay loam, silt loam.	CL, ML, CL-ML	A-4, A-6	0	90-100	90-100	85-100	75-95	25-40	4-18
	32-65	Silt loam, fine sandy loam, loam.	ML, SM, SC, CL	A-4, A-6	0-5	90-100	70-100	65-95	45-90	20-40	1-15
Melvin----------	0-7	Silt loam--------	CL, CL-ML, ML	A-4	0	95-100	90-100	80-100	80-95	25-35	4-10
	7-24	Silt loam, silty clay loam.	CL, CL-ML, ML	A-4, A-6	0	95-100	90-100	80-100	80-98	25-40	5-20
	24-65	Silt loam, silty clay loam, loam.	CL, CL-ML, ML	A-4, A-6	0	85-100	80-100	70-100	60-98	25-40	5-20
Ss--------------- Sensabaugh	0-6	Silt loam--------	CL-ML, CL, ML	A-4	0-5	90-100	75-95	65-85	55-75	16-29	3-9
	6-29	Gravelly loam, gravelly silt loam, very gravelly loam.	CL-ML, CL, SC-SM, GC, GM-GC	A-4, A-6	2-18	70-95	55-90	45-75	35-65	20-35	5-14
	29-65	Very gravelly loam, very gravelly clay loam, gravelly fine sandy loam.	SC-SM, SC, GM-GC, GC	A-4, A-6, A-2	5-30	55-90	25-75	25-65	20-55	20-36	6-15
TsB-------------- Tilsit	0-7	Silt loam--------	CL, CL-ML, ML	A-4, A-6	0	90-100	85-100	75-100	60-100	20-35	4-15
	7-21	Silt loam, silty clay loam, loam.	CL, CL-ML, ML	A-4, A-6	0	90-100	85-100	75-100	65-100	25-40	5-20
	21-43	Channery loam, silty clay loam, very channery loam.	CL, CL-ML, GM-GC	A-4, A-6, A-7	0	90-100	85-100	75-100	65-100	25-45	5-25
	43	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

Table 15.--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											
UgC3, UgD3, UgE3:											
Upshur---------	0-6	Silt loam--------	CL-ML, ML, CL	A-6, A-4	0	95-100	95-100	85-100	65-90	25-40	5-15
	6-34	Silty clay, clay, channery clay.	MH, CH, CL	A-7	0	95-100	95-100	90-100	85-100	45-70	20-40
	34-44	Very channery silty clay loam, very channery silty clay, very channery clay.	CL, ML, GC, MH, CH	A-6, A-7	0	80-100	65-100	60-100	55-95	35-55	11-25
	44	Weathered bedrock	---	---	---	---	---	---	---	---	---
Gilpin---------	0-3	Silt loam--------	CL, CL-ML, ML	A-4, A-6	0-5	80-95	75-90	70-85	65-80	20-40	4-15
	3-25	Channery silty clay loam, silt loam, very channery 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
	25-32	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
	32	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
VaD-------------- Vandalia	0-6	Silt loam--------	ML, CL	A-4, A-6, A-7	0-5	80-100	75-100	70-95	50-90	25-45	5-20
	6-54	Silty clay loam, channery silty clay, silt loam.	CL, CH, ML	A-6, A-7	0-5	75-100	70-95	65-90	60-85	35-55	15-30
	54-65	Silty clay, clay, very channery silty clay loam.	CL, CH, ML, MH	A-6, A-7	0-5	70-100	65-100	60-100	55-100	30-55	10-30
VbD-------------- Vandalia	0-6	Extremely bouldery silt loam.	ML, CL, CL-ML	A-4, A-6, A-7	5-10	65-95	60-80	55-75	55-65	25-45	5-20
	6-54	Silty clay loam, channery silty clay, silt loam.	CL, CH	A-6, A-7	0-5	75-100	70-95	65-90	60-85	35-55	15-30
	54-65	Silty clay, clay, very channery silty clay loam.	CL, CH	A-6, A-7	0-5	70-100	65-95	60-90	55-85	30-55	10-30

Table 16.--Physical and Chemical Properties of the Soils

(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
GpF3:										
Gilpin----------	0-3	15-27	1.20-1.40	0.6-2.0	0.12-0.18	3.6-5.5	Low----------	0.32	3	.5-4
	3-25	18-35	1.20-1.50	0.6-2.0	0.12-0.16	3.6-5.5	Low----------	0.24		
	25-32	15-35	1.20-1.50	0.6-2.0	0.08-0.12	3.6-5.5	Low----------	0.24		
	32	---	---	0.2-2.0	---	---	-------------	----		
Peabody---------	0-3	15-27	1.20-1.40	0.6-2.0	0.12-0.16	4.5-6.5	Low----------	0.43	3	1-4
	3-24	35-50	1.30-1.60	0.06-0.6	0.10-0.14	4.5-6.5	High---------	0.32		
	24	---	---	---	---	---	-------------	----		
GvF:										
Gilpin----------	0-3	15-27	1.20-1.40	0.6-2.0	0.08-0.14	3.6-5.5	Low----------	0.24	3	.5-4
	3-25	18-35	1.20-1.50	0.6-2.0	0.12-0.16	3.6-5.5	Low----------	0.24		
	25-32	15-35	1.20-1.50	0.6-2.0	0.08-0.12	3.6-5.5	Low----------	0.24		
	32	---	---	0.2-2.0	---	---	-------------	----		
Pineville-------	0-3	15-25	1.00-1.30	0.6-2.0	0.12-0.18	3.6-7.3	Low----------	0.20	4	.5-5
	3-56	18-30	1.30-1.60	0.6-2.0	0.08-0.14	3.6-5.5	Low----------	0.15		
	56-65	15-30	1.30-1.60	0.6-6.0	0.06-0.14	3.6-5.5	Low----------	0.15		
Ha--------------- Hackers	0-8	15-27	1.20-1.40	0.6-2.0	0.18-0.24	5.1-7.8	Low----------	0.32	4	2-4
	8-50	18-35	1.30-1.50	0.6-2.0	0.12-0.18	5.1-7.3	Moderate-----	0.37		
	50-65	18-35	1.30-1.50	0.6-2.0	0.12-0.18	5.1-6.5	Low----------	0.28		
MoB-------------- Monongahela	0-8	10-27	1.20-1.40	0.6-2.0	0.18-0.24	4.5-7.3	Low----------	0.43	3	2-4
	8-23	18-35	1.30-1.50	0.6-2.0	0.14-0.18	4.5-7.3	Low----------	0.43		
	23-65	18-35	1.30-1.60	0.06-0.6	0.08-0.12	4.5-5.5	Low----------	0.43		
Ms--------------- Moshannon	0-10	15-27	1.20-1.50	0.6-2.0	0.20-0.24	5.6-7.3	Low----------	0.37	5	1-3
	10-38	18-32	1.20-1.50	0.6-2.0	0.18-0.22	5.6-6.5	Low----------	0.37		
	38-65	12-32	1.20-1.50	0.6-2.0	0.14-0.18	5.6-7.3	Low----------	0.37		
PvE-------------- Pineville	0-3	15-25	1.00-1.30	0.6-2.0	0.12-0.18	3.6-7.3	Low----------	0.20	4	.5-5
	3-56	18-30	1.30-1.60	0.6-2.0	0.08-0.14	3.6-5.5	Low----------	0.15		
	56-65	15-30	1.30-1.60	0.6-6.0	0.06-0.14	3.6-5.5	Low----------	0.15		
RpF3:										
Rock outcrop.										
Peabody---------	0-3	15-27	1.20-1.40	0.6-2.0	0.12-0.16	4.5-6.5	Low----------	0.43	3	1-4
	3-24	35-50	1.30-1.60	0.06-0.6	0.10-0.14	4.5-6.5	High---------	0.32		
	24	---	---	---	---	---	-------------	----		
Gilpin----------	0-3	15-27	1.20-1.40	0.6-2.0	0.12-0.18	3.6-5.5	Low----------	0.32	3	.5-4
	3-25	18-35	1.20-1.50	0.6-2.0	0.12-0.16	3.6-5.5	Low----------	0.24		
	25-32	15-35	1.20-1.50	0.6-2.0	0.08-0.12	3.6-5.5	Low----------	0.24		
	32	---	---	0.2-2.0	---	---	-------------	----		
Sc--------------- Senecaville	0-5	15-27	1.20-1.40	0.6-2.0	0.18-0.24	5.1-6.5	Low----------	0.32	5	2-4
	5-32	18-35	1.20-1.40	0.2-2.0	0.12-0.18	5.1-6.5	Moderate-----	0.37		
	32-65	18-35	1.20-1.40	0.6-2.0	0.12-0.18	5.1-6.5	Low----------	0.28		

Table 16.--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
Sm:										
Senecaville-----	0-5	15-27	1.20-1.40	0.6-2.0	0.18-0.24	5.1-6.5	Low----------	0.32	5	2-4
	5-32	18-35	1.20-1.40	0.2-2.0	0.12-0.18	5.1-6.5	Moderate-----	0.37		
	32-65	18-35	1.20-1.40	0.6-2.0	0.12-0.18	5.1-6.5	Low----------	0.28		
Melvin----------	0-7	12-17	1.20-1.60	0.6-2.0	0.18-0.23	5.6-7.8	Low----------	0.43	5	.5-3
	7-24	12-35	1.30-1.60	0.6-2.0	0.18-0.23	5.6-7.8	Low----------	0.43		
	24-65	7-40	1.40-1.70	0.6-2.0	0.16-0.23	5.6-7.8	Low----------	0.43		
Ss--------------- Sensabaugh	0-6	8-25	1.25-1.40	0.6-6.0	0.12-0.18	5.6-7.8	Low----------	0.24	5	1-3
	6-29	18-35	1.30-1.50	0.6-6.0	0.10-0.16	5.6-7.8	Low----------	0.20		
	29-65	12-38	1.25-1.50	0.6-6.0	0.08-0.14	5.6-7.8	Low----------	0.17		
TsB-------------- Tilsit	0-7	10-25	1.20-1.55	0.6-2.0	0.16-0.22	4.5-7.8	Low----------	0.43	3	1-3
	7-21	18-35	1.30-1.55	0.6-2.0	0.16-0.22	4.5-7.8	Low----------	0.43		
	21-43	18-35	1.40-1.65	0.06-0.2	0.08-0.12	3.6-5.5	Low----------	0.43		
	43	---	---	0.0-0.2	---	---	-------------	----		
Ud. Udorthents										
UgC3, UgD3, UgE3:										
Upshur---------	0-6	15-27	1.20-1.40	0.6-2.0	0.12-0.16	4.5-6.5	Moderate-----	0.43	3	1-4
	6-34	40-55	1.30-1.60	0.06-0.2	0.10-0.14	4.5-8.4	High---------	0.32		
	34-44	27-45	1.30-1.60	0.06-0.2	0.08-0.12	5.1-8.4	Moderate-----	0.32		
	44	---	---	---	---	---	-------------	----		
Gilpin---------	0-3	15-27	1.20-1.40	0.6-2.0	0.12-0.18	3.6-5.5	Low----------	0.32	3	.5-4
	3-25	18-35	1.20-1.50	0.6-2.0	0.12-0.16	3.6-5.5	Low----------	0.24		
	25-32	15-35	1.20-1.50	0.6-2.0	0.08-0.12	3.6-5.5	Low----------	0.24		
	32	---	---	0.2-2.0	---	---	-------------	----		
VaD-------------- Vandalia	0-6	20-35	1.20-1.50	0.2-2.0	0.12-0.18	4.5-7.3	Moderate-----	0.37	4	1-3
	6-54	35-50	1.30-1.60	0.06-0.6	0.12-0.15	4.5-6.5	High---------	0.32		
	54-65	27-50	1.30-1.60	0.06-0.6	0.08-0.12	5.1-7.3	High---------	0.32		
VbD-------------- Vandalia	0-6	20-35	1.20-1.50	0.2-2.0	0.12-0.18	4.5-7.3	Moderate-----	0.32	4	1-3
	6-54	35-50	1.30-1.60	0.06-0.6	0.12-0.15	4.5-6.5	High---------	0.32		
	54-65	27-50	1.30-1.60	0.06-0.6	0.08-0.12	5.1-7.3	High---------	0.32		

Table 17.--Soil and Water Features

("Flooding," "water table," and such terms as "rare," "apparent," and "perched" are explained in the text. The symbol > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated.)

Soil name and map symbol	Hydrologic group	Flooding	High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
			Ft			In				
GpF3:										
Gilpin	C	None	>6.0	---	---	20-40	Soft	Moderate	Low	High.
Peabody	D	None	>6.0	---	---	20-40	Soft	Moderate	High	Moderate.
GvF:										
Gilpin	C	None	>6.0	---	---	20-40	Soft	Moderate	Low	High.
Pineville	B	None	>6.0	---	---	>60	---	Moderate	Low	High.
Ha Hackers	B	Rare	>6.0	---	---	>60	---	Moderate	Low	Moderate.
MoB Monongahela	C	None	1.5-3.0	Perched	Dec-Apr	>60	---	Moderate	High	High.
Ms Moshannon	B	Occasional	4.0-6.0	Apparent	Feb-Mar	>60	---	High	Low	Moderate.
PvE Pineville	B	None	>6.0	---	---	>60	---	Moderate	Low	High.
RpF3: Rock outcrop.										
Peabody	D	None	>6.0	---	---	20-40	Soft	Moderate	High	Moderate.
Gilpin	C	None	>6.0	---	---	20-40	Soft	Moderate	Low	High.
Sc Senecaville	B	Rare	1.5-3.0	Apparent	Dec-Apr	>60	---	High	Moderate	Moderate.
Sm:										
Senecaville	B	Occasional	1.5-3.0	Apparent	Dec-Apr	>60	---	High	Moderate	Moderate.
Melvin	D	Occasional	0-1.0	Apparent	Dec-May	>60	---	High	High	Low.
Ss Sensabaugh	B	Occasional	4.0-6.0	Apparent	Jan-Apr	>60	---	Moderate	Low	Low.
TsB Tilsit	C	None	1.5-2.5	Perched	Jan-Apr	>40	Soft	High	High	High.
Ud. Udorthents										
UgC3, UgD3, UgE3:										
Upshur	D	None	>6.0	---	---	>40	Soft	Moderate	High	Moderate.
Gilpin	C	None	>6.0	---	---	20-40	Soft	Moderate	Low	High.
VaD, VbD Vandalia	D	None	4.0-6.0	Perched	Feb-Apr	>60	---	Moderate	High	Moderate.

Table 18.--Classification of the Soils

Soil name	Family or higher taxonomic class
Gilpin	Fine-loamy, mixed, mesic Typic Hapludults
Hackers	Fine-silty, mixed, mesic Typic Hapludalfs
Melvin	Fine-silty, mixed, nonacid, mesic Typic Fluvaquents
Monongahela	Fine-loamy, mixed, mesic Typic Fragiudults
Moshannon	Fine-silty, mixed, mesic Dystric Fluventic Eutrochrepts
Peabody	Fine, mixed, mesic Ultic Hapludalfs
Pineville	Fine-loamy, mixed, mesic Typic Hapludults
Senecaville	Fine-silty, mixed, mesic Fluvaquentic Eutrochrepts
Sensabaugh	Fine-loamy, mixed, mesic Dystric Fluventic Eutrochrepts
Tilsit	Fine-silty, mixed, mesic Typic Fragiudults
Udorthents	Udorthents
Upshur	Fine, mixed, mesic Typic Hapludalfs
Vandalia	Fine, mixed, mesic Typic Hapludalfs

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