United States Department of Agriculture

Natural Resources Conservation Service

In cooperation with West Virginia Agricultural and Forestry Experiment Station

Soil Survey of Gilmer County, West Virginia

How To Use This Soil Survey

General Soil Map

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

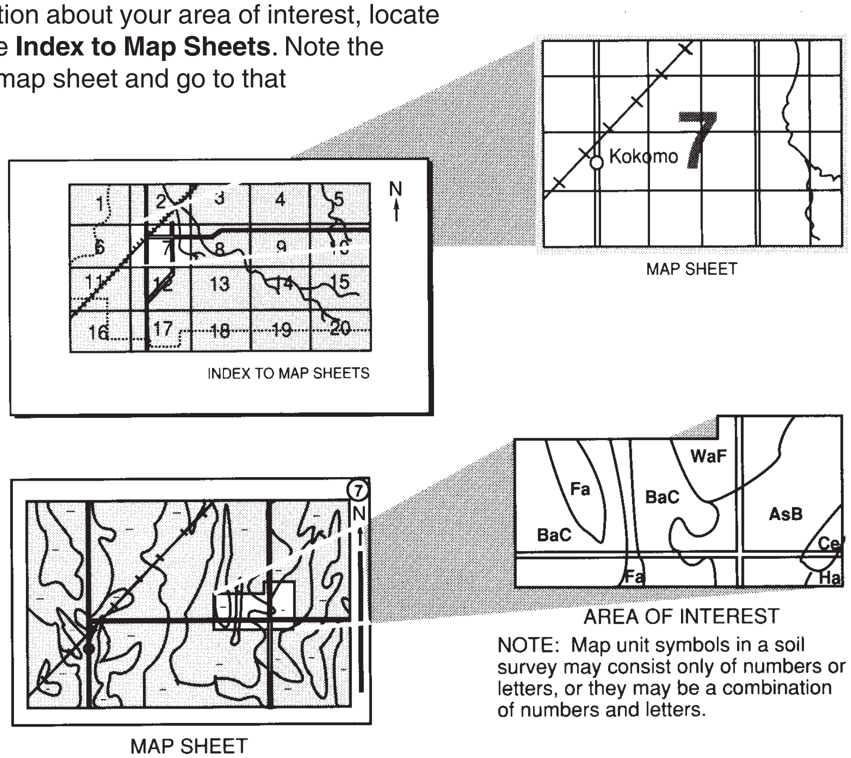
To find information about your area of interest, locate that area on the map, identify the name of the map unit in the area on the color-coded map legend, then refer to the section **General Soil Map Units** for a general description of the soils in your area.

Detailed Soil Maps

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

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

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



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

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

Major fieldwork for this soil survey was completed from 1991 to 1994. Soil names and descriptions were approved in 1994. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1994. 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 West Fork Soil Conservation District.

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

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Cover: Typical land use pattern of hayland, pasture, and woodland in Gilmer County. The well managed hayfield in the foreground is in an area of Gilpin-Upshur, 8 to 15 percent slopes, severely eroded.

Additional information about the Nation's natural resources is available online from the Natural Resources Conservation Service at http://www.nrcs.usda.gov.

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Foreword

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

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

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

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. 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.

Lillian V. Woods
State Conservationist
Natural Resources Conservation Service

Soil Survey of Gilmer County, West Virginia

By Robert N. Pate, Natural Resources Conservation Service

Fieldwork by Robert N. Pate and Walter C. George,
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United States Department of Agriculture,
Natural Resources Conservation Service,
in cooperation with
West Virginia Agricultural and Forestry Experiment Station

Gilmer County is in the north-central part of West Virginia (fig. 1). It is about 340 square miles, or 217,400 acres, in size. The Little Kanawha River flows from east to west through the center of the county. It is the dominant drainage system.

This soil survey updates an earlier survey of Lewis and Gilmer Counties (USDA 1917). It provides additional information and has larger maps, which show the soils in greater detail.

General Nature of the County

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

Settlement

The first pioneers in Gilmer County were William Lowther, Jesse Hughs, and Ellis Hughs, who explored the region in the fall of 1772 (Davis 1938). The first settlers arrived in the early 1800s. They included Henry Heckert, who settled near Troy; Peter McCune, who settled at the mouth of Leading Creek; Adam Bush, who settled at the mouth of Cedar Creek; and George Collins, who settled along Stewarts Creek. In 1845, Gilmer County was formed from Lewis and Kanawha

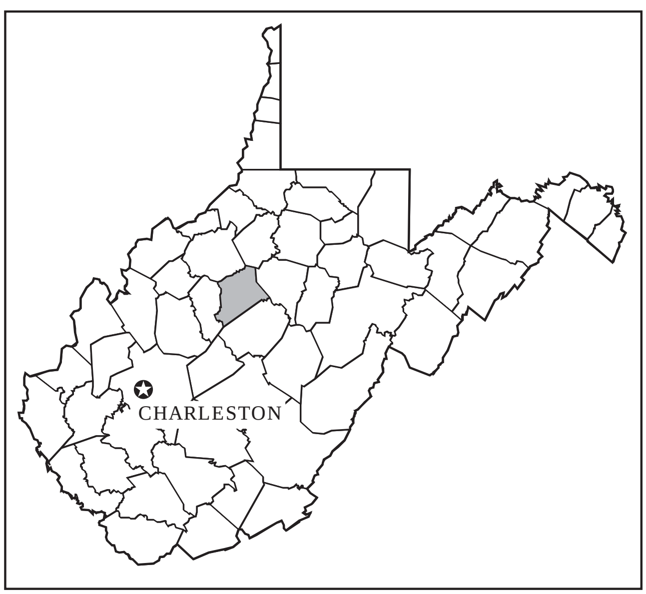

Figure 1.—Location of Gilmer County in West Virginia.

Counties, Virginia, and was named for the Honorable Thomas Walker Gilmer, a Governor of Virginia. It originally included the land that is now Calhoun County.

Glenville, the county seat, was first known as “Ford of the River” (Comstock 1974) and later as Hartford. The name was finally changed to Glenville in 1856. The Glenville Normal School was established in 1872 and opened for admissions in 1873. This school is now known as Glenville State College.

Population

The population of Gilmer County in 1990 was 7,669 (U.S. Department of Commerce 1992). Glenville, the county seat, had a population of 1,923, making it the largest incorporated town in the county. The only other incorporated town is Sand Fork, which has a population of 196. Many small, unincorporated communities are scattered throughout the county. The major enterprises in the county are oil, gas, and coal production; timber and related wood product industries; and businesses associated with Glenville State College. There are also a small number of manufacturers in the incorporated areas.

Transportation

The transportation needs of Gilmer County are served by U.S. Routes 33 and 119, which follow the same route; State Routes 5, 16, 18, and 47; and numerous West Virginia county routes. Interstate 79 runs for about 1 mile in the eastern corner of Gilmer County, but it does not have any exits within the county. A short section of railroad extends into the southeast corner of Gilmer County, along the Little Kanawha River and through the town of Gilmer.

Farming

In 1987, there were 237 farms in Gilmer County, with an average farm size of 244 acres. In1992, there were only 220 farms in the county, with an average farm size of 240 acres, and 52,748 acres was used as farmland (U.S. Department of Commerce 1994).

The main type of farming is raising beef cattle and sheep in conjunction with the production of hay and pasture. Some small acreages are planted to corn. Most of the farms are operated on a part-time basis.

Relief and Drainage

Gilmer County is in the highly dissected Central Allegheny Plateau Major Land Resource Area. It is characterized by moderately steep ridgetops and very steep side slopes that are broken by narrow bench areas. This is called “bench-break” topography. The flood plains are narrow but widen out along the major streams. Stream terraces are along the larger streams. They are evidence of the various stream levels through the ages.

The elevation in Gilmer County ranges from almost 1,600 feet at the highest point (on an unnamed knob just south of Locust Knob, north of the Little Kanawha River and adjacent to the Braxton County line) to 680 feet (in an area where the Little Kanawha River enters Calhoun County). The Little Kanawha River is the largest waterway in the survey area. It flows from east to west through the center of Gilmer County.

Geology

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

The soils in Gilmer County are weathered from sedimentary rocks that are part of the Dunkard, Monongahela, and Conemaugh Groups (Reger and White 1916). These rocks are considered to be between 280 and 320 million years old. They consist of red and olive yellow shale interbedded with acid, gray and brown siltstone and sandstone. Soils along the drainageways are Quaternary alluvial deposits. Pleistocene-age river terraces are at the higher elevations along the Little Kanawha River and its larger tributaries. Limestone seams are thin and scattered and are of no commercial value. Coal seams occur in all of these Groups, with only one seam being of commercial value. Pittsburgh Coal is the lowest member of the Monongahela Group. It is both strip mined and deep mined in the eastern part of Gilmer County.

The shales, siltstones, and sandstones weather to form the Gilpin, Peabody, and Upshur soils found throughout most of Gilmer County. A small area of sandier strata weathers into Gilpin and Pineville soils in the southwestern corner of the survey area. Rock outcrops of the more resistant sandstone occur throughout the survey area.

The Dunkard Group, which covers about 25 percent of the survey area, is at the higher elevations. The Conemaugh Group is exposed at the lower elevations along the major drainageways. It makes up approximately 25 percent of the survey area. The Monongahela Group is found in the remainder of the survey area. It covers approximately 50 percent of the county.

These nearly horizontal sedimentary rocks are typical of the Appalachian Plateau Province. Subtle synclines and anticlines are found in certain areas of Gilmer County. The major oil and gas fields in the ocunty are in these structural areas.

Climate

Table 1 gives data on temperature and precipitation for the survey area as recorded at Glenville in the period 1961 to 1990. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on the length of the growing season.

In winter, the average temperature is 32 degrees F and the average daily minimum temperature is 21 degrees F. The lowest temperature on record, which occurred at Glenville on January 24, 1936, is -25 degrees. In summer, the average temperature is 71 degrees and the average daily maximum temperature is 84 degrees. The highest temperature, which occurred at Glenville on August 4, 1930, is 105 degrees.

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

The total annual precipitation is 44.29 inches. Of this, 24.07 inches, or nearly 55 percent, usually falls in April through September. The growing season for most crops falls within this period. The heaviest 1-day rainfall during the period of record was 5.09 inches at Glenville on July 24, 1951. Thunderstorms occur on about 44 days each year, and most occur in July.

The average seasonal snowfall is 27.6 inches. The greatest snow depth at any one time during the period of record was 31 inches recorded on November 27, 1950. On an average, 27 days per year have at least 1 inch of snow on the ground. The heaviest 1-day snowfall on record was 28 inches recorded on November 25, 1950.

The average relative humidity in midafternoon is about 56 percent. Humidity is higher at night, and the average at dawn is about 82 percent. The sun shines

60 percent of the time in summer and 36 percent in winter. The prevailing wind is from the southwest. Average wind speed, 8 miles per hour, is highest in March.

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

How This Survey Was Made

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

The soils and miscellaneous areas in the survey area are in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept or model of how they 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 at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, it consists of one or more major soils or miscellaneous areas and some minor soils or miscellaneous areas. It is named for the major soils or miscellaneous areas. The components of one map unit can occur in another but in a different pattern.

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

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

Areas of the general soil map are joined with the general soil maps of Braxton, Calhoun, Lewis, and Ritchie Counties, West Virginia. Doddridge County to the north is not surveyed at this time. Differences in map unit names and proportions of component soils are a result of differences in map scale and the degree of generalization.

1. Gilpin-Peabody-Upshur

Moderately deep and deep, well drained, strongly sloping to very steep soils formed mainly in residuum on uplands

This map unit consists of upland soils on ridgetops, benches, and very steep side slopes that are usually broken by a series of moderately steep to steep bench areas (fig. 2). This type of landscape is commonly referred to as bench-break topography. This unit is dissected by many small, intermittent streams, which form narrow, nearly level flood plains and alluvial fans. It also includes soils that formed in colluvium on footslopes. The Gilpin and Peabody soils and the Gilpin and Upshur soils occur in long, narrow areas of each soil in a repeating, alternating pattern. It was not practical to separate them in mapping. Slopes range from 15 to 70 percent.

This map unit makes up about 93 percent of the survey area. It is about 50 percent Gilpin soils, 17 percent Peabody soils, 7 percent Upshur soils, and 26 percent soils of minor extent.

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

The moderately deep, well drained, very steep Peabody soils are on side slopes. They have a dark brown, medium textured surface layer and a reddish brown and dark reddish brown, fine textured subsoil. Peabody soils formed in material weathered from shale and siltstone.

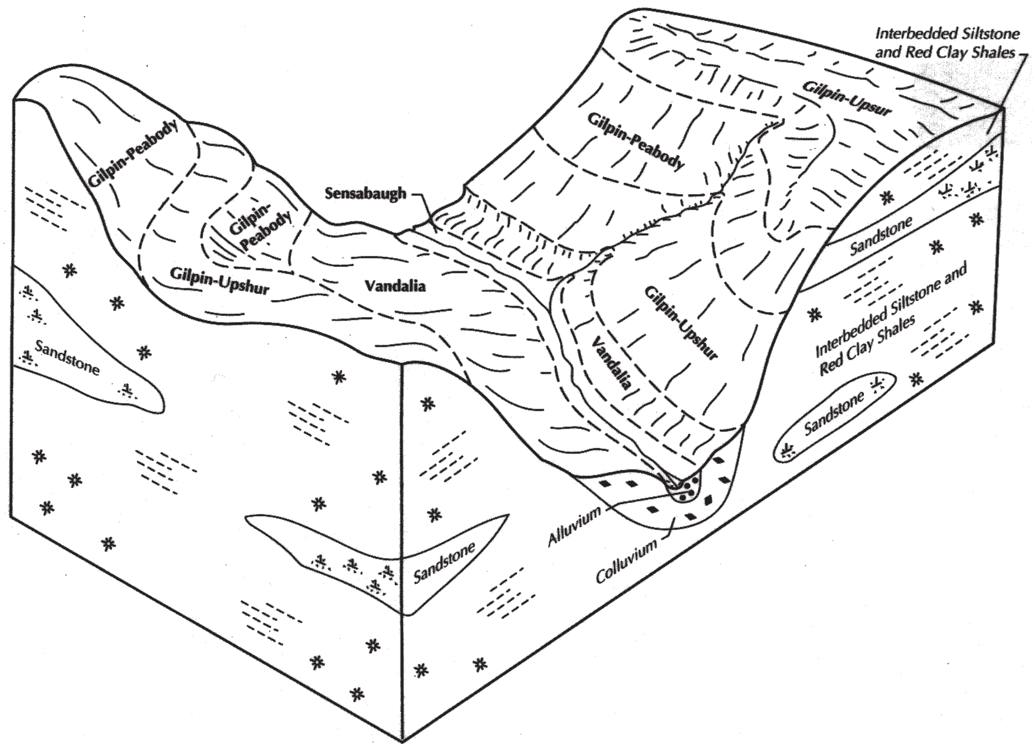

Figure 2.—Typical pattern of soils and parent material in the Gilpin-Peabody-Upshur general soil map unit.

The deep, well drained, strongly sloping to steep Upshur soils are on ridgetops and benches. They have a dark brown, medium textured surface layer and a reddish brown and dark reddish brown, fine textured subsoil. Upshur soils formed in material weathered from shale and siltstone.

Of minor extent in this map unit are the well drained Vandalia soils on colluvial footslopes and the well drained Chagrin, Kanawha, and Sensabaugh soils on flood plains.

About 20 percent of this unit has been cleared for hay and pasture.

Most farms are managed for the production of beef cattle (cow-calf operations). Timber and woodland products are also important farm enterprises. Generally, the soils on ridgetops and benches are suited to the production of hay, while the soils on footslopes and bottom land are suited to pasture. The very steep side slopes are suited to woodland. The hazard of erosion, the hazard of soil slippage, the steepness of slope, and the depth to bedrock are the main management concerns.

This unit is suited to trees. About 80 percent of the unit is wooded. Productivity is moderately high on northern aspects and moderate or moderately high on southern aspects. Proper woodland management techniques can increase yields and production. The slope, the hazard of soil slippage, and the hazard of erosion are the main limitations affecting the use of equipment.

Areas on ridgetops, gently sloping to strongly sloping footslopes, and rarely flooded bottom land are commonly used as homesites. These areas are limited as sites for homes and septic tank absorption fields because of the slope, slow permeability, the depth to bedrock, a high shrink-swell potential, flooding, and the hazard of soil slippage.

2. Gilpin-Pineville-Upshur

Moderately deep to very deep, well drained, moderately steep to very steep soils formed in residuum on rugged uplands and in colluvium on footslopes

This map unit consists of upland soils on moderately steep and steep ridgetops and benches, very steep side slopes, and steep colluvial footslopes. It is in the southwestern part of the survey area, in the Bear Fork drainageway along the Calhoun County line. The unit is characterized by rugged, mostly inaccessible, steep and very steep side slopes with narrow ridgetops and benches. It is dissected by small, intermittent streams that form narrow, nearly level flood plains and alluvial fans. Slope ranges from 25 to 70 percent.

This map unit makes up about 4 percent of the survey area. It is about 47 percent Gilpin soils, 29 percent Pineville soils, 13 percent Upshur soils, and 11 percent soils of minor extent.

The moderately deep, well drained Gilpin soils are on moderately steep or steep ridgetops and benches and on very steep side slopes. They have a very dark grayish brown, medium textured surface layer and a yellowish brown, medium textured to moderately fine textured subsoil. Gilpin soils formed in acid material weathered from interbedded sandstone, siltstone, and shale.

The very deep, well drained, very steep Pineville soils are on side slopes and colluvial footslopes. They have a very dark grayish brown, medium textured surface layer and a yellowish brown and strong brown, medium textured or moderately fine textured subsoil. Pineville soils formed in colluvial material derived from sandstone, siltstone, and shale.

The deep, well drained, strongly sloping to steep Upshur soils are on ridgetops and benches. They have a dark brown, medium textured surface layer and a reddish brown and dark reddish brown, fine textured subsoil. Upshur soils formed in material weathered from shale and siltstone.

Of minor extent in this map unit are the well drained Peabody soils on side slopes, ridgetops, and benches; the well drained Vandalia soils on colluvial footslopes; and the well drained Chagrin and Sensabaugh soils on flood plains.

Most areas are used as woodland. This map unit is used for the production of timber and woodland products and for outdoor recreational activities. Oil and gas production is also an important industry in areas of the map unit. The hazard of erosion, the steepness of slope, and the depth to bedrock are the main management concerns.

This map unit is suited to trees. About 95 percent of the unit is wooded. Productivity is moderately high on northern aspects and moderate or moderately high on southern aspects. Proper woodland management techniques can increase yields and production. The hazard of erosion, the steepness of slope, and the limited accessibility are the main limitations affecting the use of equipment.

3. Vandalia-Hackers-Chagrin

Very deep, well drained, nearly level to steep soils formed in colluvium on footslopes and flood plains

This map unit consists of colluvial soils on footslopes and alluvial soils on frequently flooded or rarely flooded bottoms. This unit is along the Little Kanawha River. Slope ranges from 0 to 15 percent.

This map unit makes up 3 percent of the survey area. It is about 54 percent Vandalia soils, 12 percent Hackers soils, 11 percent Chagrin soils, and 23 percent soils of minor extent.

The very deep, well drained, steep Vandalia soils are on colluvial footslopes. They have a dark brown, medium textured surface layer and a fine textured, reddish brown subsoil. Vandalia soils formed in colluvial materail derived from reddish soils on uplands.

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

The very deep, well drained, nearly level Chagrin soils are on low flood plains. They have a dark brown, coarse textured surface layer and a dark brown, dark yellowish brown, and brown, coarse textured subsoil. Chagrin soils formed in alluvial material washed from yellowish soils in the uplands.

Of minor extent in this map unit are the well drained Sensabaugh 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 90 percent of this map unit has been cleared and is used for hay, pasture, or cultivated crops or as a site for dwellings. Most cleared areas are used for hay. The main cultivated crops are corn and garden produce. Most of the wooded acreage is in areas of the Chagrin soils. The included areas of Gilpin, Peabody, and Upshur soils, which are between the rarely flooded Hackers soils and the Monongahela soils on terraces, also are wooded.

Most farms in areas of this map unit are intensively managed for the production of hay or beef cattle (cow-calf operations). Generally, the cattle are kept in pastured areas of the Gilpin-Peabody-Upshur general soil map unit during the summer grazing months. Generally, only two cuttings of hay are taken in a year in areas of this map unit. The meadows are then grazed later in the fall or left idle until next years growing season. Many farmers use areas on bottom land to feed cattle in the winter because of the close proximity to the barns where the hay is stored.

This map unit is suited to trees, but only about 10 percent of it is wooded. Productivity is moderately high. Proper woodland management techniques can increase yields and production. Poor traction and low soil strength during wet seasons and flooding are the main limitations affecting the use of equipment.

Areas on high flood plains and stream terraces are commonly used as homesites. These areas are limited as sites for homes and septic tank absorption fields because of the flooding, a high shrink-swell potential, the slow permeability, and the hazard of soil slippage.

Detailed Soil Map Units

Dr. John Sencindiver, professor of agronomy, West Virginia Agricultural and Forestry Experiment Station, helped to prepare this section.

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

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

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

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

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

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

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Vandalia silt loam, 15 to 35 percent slopes, very stony, 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. 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-Upshur complex, 15 to 25 percent slopes, severely eroded, 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

Cg—Chagrin loam

This nearly level, well drained soil is on flood plains throughout most of the survey area. It is not, however, along the Little Kanawha River. The soil is subject to occasional flooding. Slope ranges from 0 to 3 percent.

Typically, the surface layer of this Chagrin soil is brown loam about 6 inches thick. The subsoil is brown loam from a depth of 6 to 20 inches, dark yellowish brown sandy loam from a depth of 20 to 26 inches, and brown loam from a depth of 26 to 41 inches. The substratum is dark yellowish brown loamy fine sand from a depth of 41 to 45 inches, brown loam from a depth of 45 to 59 inches, and brown loamy fine sand with brown mottles from a depth of 59 to 65 inches.

Included with this soil in mapping are a few small areas of the well drained Hackers, Pineville, Sensabaugh, and Vandalia soils. Also included are a few small areas of soils that are wetter than the Chagrin soil, have a solum that is thinner than that of the Chagrin soil, or contain more silt or have redder colors than are typical for the Chagrin series and areas of soils that have slopes of more than 3 percent. Included soils make up about 20 percent of the map unit.

The available water capacity of this Chagrin soil is high. Permeability is moderate. Runoff is slow, the potential for frost action is moderate, and natural fertility is high. In unlimed areas reaction is medium acid to neutral. The depth to bedrock is more than 60 inches.

Most areas of this soil are used for cultivated crops, meadow, or pasture (fig. 3). Some areas are used as woodland.

This soil is suited to cultivated crops, hay, and pasture. Crops can be grown continuously on this soil, but a cover crop is needed to help control erosion. Incorporating crop residue from cover crops into the soil helps to control erosion and to maintain fertility and tilth. In places crops are subject to damage from flooding. Proper stocking rates that help to maintain desirable grasses and legumes and a rotation grazing system are major pasture management needs.

This potential productivity for trees is moderately high in areas of this soil. Common tree species on this unit include red oak, sycamore, basswood, boxelder, and yellow-poplar. Plant competition is a management concern. Intensive management to keep undesirable plants from competing with native plants or planted seedlings is necessary for the establishment of a desirable stand.

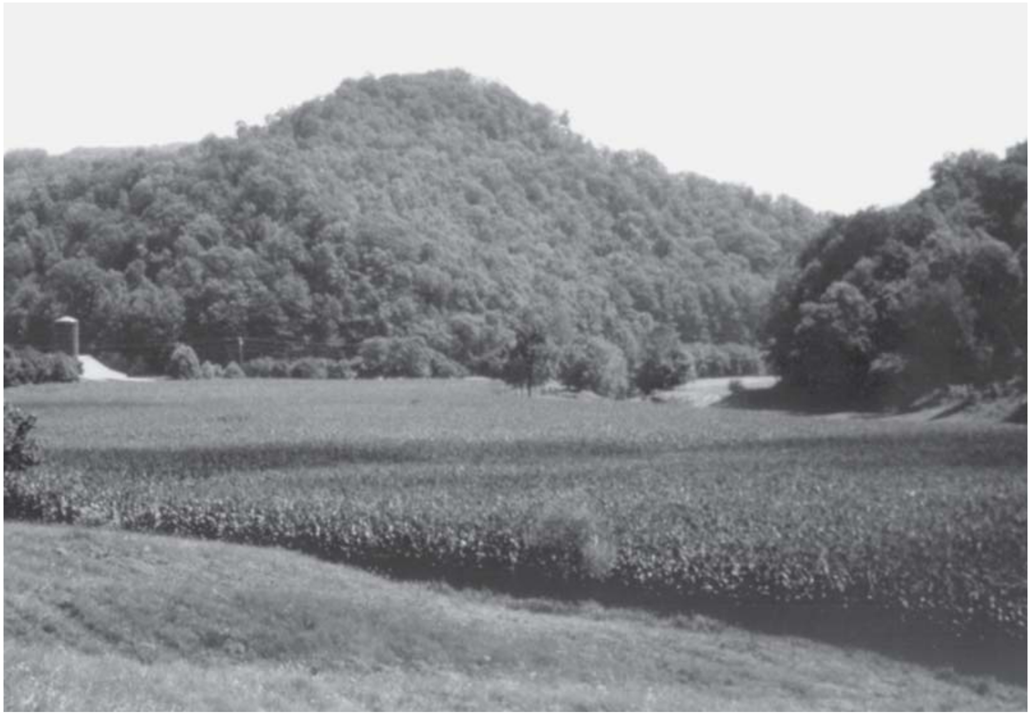

Figure 3.—An area of Chagrin loam in the foreground. This soil is typically used as cropland.

The hazard of flooding is the main management concern on sites for dwellings and septic tank absorption fields in areas of this soil. An alternative site should be selected unless the soil is protected by a properly designed flood-control structure. If vegetation is removed, establishing a plant cover in unprotected areas and providing for the proper disposal of surface water help to control erosion and sedimentation.

The capability subclass is IIw.

FpE—Fairpoint channery clay loam, steep, very stony

This well drained soil is on upland ridgetops, side slopes, and benches that have been disturbed by surface coal mine operations. Stones that are 10 to 24 inches in diameter cover 1 to 3 percent of the surface. The dominant slope ranges from 25 to 35 percent.

Typically, the surface layer of this Fairpoint soil is yellowish brown channery clay loam about 2 inches thick. The substratum is brown very channery clay loam from a depth of 2 to 12 inches, strong brown very channery clay loam from a depth of 12 to 22 inches, dark yellowish brown very channery clay loam from a depth of 22 to 33 inches, and mixed yellowish brown and dark yellowish brown extremely channery clay loam and loam from a depth of 33 to 65 inches.

Included with this soil in mapping are a few small areas of the well drained Gilpin, Itmann, Janelew, Peabody, Pineville, Upshur, and Vandalia soils. Also included are a few small areas of soils that have high acidity, areas where 50 percent of the surface is covered with stones or boulders, small areas where there are wet depressions, and areas of surface mined soils that have vertical highwalls ranging from 10 to 100 feet in height. Also included are areas of mine soils that have slopes of less than 25 percent or more than 35 percent. Inclusions make up about 30 percent of the map unit.

The available water capacity of this Fairpoint soil is low or moderate. Permeability is moderately slow. Runoff is very rapid, the potential for frost action is moderate, and natural fertility is moderate. The depth to bedrock is more than 60 inches.

Most areas of this soil have been seeded to sericea lespedeza, fescue, birdsfoot trefoil, and black locust. Most areas are reverting to woodland. Gas wells are common on the nearly level or gently sloping benches.

This very stony soil is not suited to cultivated crops or hay and is difficult to manage for pasture. The stoniness and the slope restrict the use of farm machinery. The hazard of erosion, which is very severe in unprotected areas, is a management concern. Proper stocking rates that help to maintain grasses and legumes, a rotation grazing system, application of fertilizer, and deferment of grazing in the spring until the soil is reasonably firm are major pasture management practices.

The potential productivity for trees is high on this soil. The soil is suited to both coniferous and deciduous trees. Planted tree species commonly include black locust, Virginia pine, and eastern white pine. Species that are naturally invading this map unit include yellow-poplar, cherry, birch, and sycamore. In most areas the trees are not large enough to harvest. Plant competition is a management concern. Planting an adequate number of healthy seedlings at the proper time of year is necessary for the establishment of a desirable stand. The growth of tree seedlings may be slow because of competition from grasses and legumes.

The slope, the stoniness of the surface and subsurface layers, the boulders, the hazard of soil slippage, and subsidence are the main limitations on sites for dwellings and septic tank absorption fields. Onsite investigation and testing are necessary to determine if the limitations that affect specific uses can be overcome.

The capability subclass is VIIe.

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

This map unit consists of very steep, well drained soils on hillsides and side slopes throughout the survey area. The very steep hillsides are generally 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 topsoil, and the subsoil is exposed in places. Stones cover 1 to 3 percent of the surface. The Gilpin and Peabody soils occur in long, narrow areas that include both soils in a repeating, alternating pattern. The soils were mapped together because it was not practical to separate them in mapping. The unit is about 60 percent Gilpin soil, 25 percent Peabody soil, and 15 percent other soils.

Typically, the surface layer of this Gilpin soil is very dark grayish brown silt loam about 1 inch thick. The subsoil is yellowish brown silt loam from a depth of 1 to 3 inches, yellowish brown channery silt loam from a depth of 3 to 15 inches, and yellowish brown channery silty clay loam from a depth of 15 to 22 inches. The substratum is yellowish brown very channery silty clay loam. Bedrock is at a depth of about 25 inches.

Typically, the surface layer of this Peabody soil is dark brown silt loam about 1 inch thick. The subsoil is brown silty clay loam from a depth of 1 to 6 inches, reddish brown silty clay from a depth of 6 to 14 inches, dusky red channery silty clay from a depth of 14 to 22 inches, and dusky red channery silty clay from a depth of 22 to 31 inches. The substratum is dusky red very channery silty clay. Bedrock is at a depth of about 36 inches.

Included with these soils in mapping are areas of well drained Upshur and Vandalia soils. Vandalia soils are on footslopes, at the head of drainageways, and on the

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

upslope side of benches. Also included are areas of soils that have more than 35 percent rock fragments in the subsoil, have a surface layer with redder colors than those of the Gilpin soil, or have between 3 and 15 percent of their surface covered with stones; areas of rock outcrops; areas where the soils have slope of less than 35 percent; and areas of soils that are moderately eroded. Inclusions make up about 15 percent of the map unit.

The available water capacity of this Gilpin soil is low or moderate. Permeability is moderate in the subsoil. Runoff is very rapid, the potential for frost action is moderate, and natural fertility is low or moderate. In unlimed areas reaction is strongly acid to extremely acid. The root zone of some plants is restricted by bedrock at a depth of 20 to 40 inches.

The available water capacity of this Peabody soil is moderate. Permeability is slow in the subsoil. Runoff is very rapid, the potential for frost action is moderate, and natural fertility is moderate or high. In unlimed areas reaction is very strongly acid to slightly acid. Depth to bedrock ranges from 20 to 40 inches. The shrink-swell potential is high in the subsoil. The hazard of slippage is severe.

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

The potential productivy for trees on north and south aspects is moderately high in areas of the Gilpin soil. It is moderately high on north aspects and moderate on south aspects in areas of the Peabody soil. Common tree species on this unit include red oak, white oak, chestnut oak, hickory, beech, sugar maple, and yellow-poplar. Almost pure stands of Virginia pine are in the less desirable areas of this unit, such as the drier sites and eroded, less fertile sites. Proper woodland management techniques, such as timber stand improvement, will increase the value and yields from woodland areas. The slope restricts the use of equipment. Building logging roads and trails on the contour helps to control erosion. Many of the logging roads and trails can be constructed to follow the small benches in this unit. Diverting surface water away from logging roads, establishing and maintaining a crown on the roads, and establishing and maintaining sod on bare roadbanks help to control erosion.

The very steep slopes and the depth to bedrock are the main limitations on sites for dwellings with or without basements in areas of the Gilpin and Peabody soils. The slow permeability, the high shrink-swell potential in the subsoil, and the hazard of slippage are additional limitations on sites for dwellings with or without basements in areas of the Peabody soil. An alternate site with fewer limitations should be selected for dwellings with or without basements and for septic tank absorption fields.

The capability subclass is VIIs.

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

This map unit consists of very steep, well drained soils on narrow ridgetops, side slopes, and footslopes in the Bear Fork drainageway in the southwestern part of the county. In some places the very steep side slopes are broken by a series of less steep bench areas. These soils are moderately eroded. Stones cover 1 to 3 percent of the surface. The Gilpin and Peabody soils occur as areas so intermingled that it was not practical to separate them in mapping. This unit is about 60 percent Gilpin soil, 30 percent Pineville soil, and 10 percent other soils.

Typically, the surface layer of this Gilpin soil is very dark grayish brown silt loam about 1 inch thick. The subsoil is yellowish brown silt loam from a depth of 1 to 3 inches, yellowish brown channery silt loam from a depth of 3 to 15 inches, and yellowish brown channery silty clay loam from from a depth of 15 to 22 inches. The substratum is yellowish brown very channery silty clay loam. Bedrock is at a depth of 25 inches.

Typically, the surface layer of this Pineville soil is very dark grayish brown loam about 5 inches thick. The subsoil is dark yellowish brown loam from a depth of 5 to 10 inches, yellowish brown channery loam from a depth of 10 to 18 inches, strong brown channery clay loam from a depth of 18 to 45 inches, and yellowish brown channery loam from a depth of 45 to 59 inches. The substratum is yellowish brown channery loam from a depth of 59 to 65 inches.

Included with these soils in mapping are a few small areas of the well drained Upshur soils; small areas of soils that are similar to the Gilpin soil but are sandier or have bedrock at a depth of less than 20 inches; small areas of soils that are similar to the Pineville soil but have more silt or have a weak fragipan below a depth of 40 inches; small areas of occasionally flooded soils in the drainageways that dissect this unit; some areas of rock outcrop; areas where slope is less than 35 percent; areas of soils that have more than 35 percent rock fragments throughout the profile; and areas where 3 to 15 percent of the surface is covered by stones. Inclusions make up about 10 percent of the map unit.

The available water capacity of this Gilpin soil is low or moderate. Permeability is moderate in the subsoil. Runoff is very rapid, the potential for frost action is moderate, and natural fertility is low or moderate. In unlimed areas reaction is strongly acid to extremely acid. The root zone of some plants is restricted by bedrock at a depth of 20 to 40 inches.

The available water capacity of this Pineville soil is moderate or high. Permeability is moderate in the subsoil. Runoff is very rapid, the potential for frost action is moderate, and natural fertility is low or moderate. In unlimed areas reaction is extremely acid to neutral. The depth to bedrock is more than 60 inches.

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

The potential productivity is moderately high on north and south aspects in areas of the Gilpin and Pineville soils. About 95 percent of the acreage in the county is wooded. Common tree species include red oak, white oak, chestnut oak, hickory, beech, sugar maple, and yellow-poplar. Proper woodland management techniques, such as timber stand improvement, help to increase the value and yields of woodland. The slope restricts the use of equipment. Building logging roads and trails on the contour helps to control erosion. Many of the logging roads and trails can be constructed to follow the small benches when they can be found. Diverting surface water away from the logging road, establishing and maintaining a crown in the road, and establishing and maintaining sod on bare roadbanks help to control erosion.

The slope is the main limitation on sites for dwellings with or without basements in areas of the Gilpin and Pineville soils. The depth to bedrock is an additional limitation affecting homesites in areas of the Gilpin soil. An alternative site with fewer limitations should be selected for dwellings with or without basements and for septic tank absorption fields.

The capability subclass is VIIs.

GuC3—Gilpin-Upshur complex, 8 to 15 percent slopes, severely eroded

This map unit consists of strongly sloping, well drained soils on ridgetops and benches throughout the survey area. The benches are commonly dissected by drainageways, and landslips are common in some areas. Erosion has removed most of the original topsoil, and the subsoil is exposed in places. The Gilpin and Upshur soils occur in long, narrow areas that include both soils in a repeating, alternating pattern. The soils were mapped together because it was not practical to separate them in mapping. The unit is about 50 percent Gilpin soil, 25 percent Upshur soil, and 25 percent other soils.

Typically, the surface layer of this Gilpin soil is very dark grayish brown silt loam about 1 inch thick. The subsoil is yellowish brown silt loam from a depth of 1 to 3 inches, yellowish brown channery silt loam from a depth of 3 to 15 inches, and yellowish brown channery silty clay loam from a depth of 15 to 22 inches. The substratum is yellowish brown very channery silty clay loam. Bedrock is at a depth of about 25 inches.

Typically, the surface layer of this Upshur soil is dark brown silt loam about 1 inch thick. The subsoil is brown silt loam from a depth of 1 to 6 inches, reddish brown silty clay from a depth of 6 to 17 inches, and dusky red channery clay from a depth of 17 to 37 inches. The substratum is dusky red very channery silty clay. Bedrock is at a depth of about 46 inches.

Included with these soils in mapping are a few small areas of well drained Peabody soils, areas of soils that have slopes of less than 8 percent, areas of soils that have slopes of more than 15 percent, areas of soils that have 1 to 3 percent of their surface covered with stones, and areas where erosion is moderate. Included soils make up about 25 percent of the map unit.

The available water capacity of this Gilpin soil is low or moderate. Permeability is moderate in the subsoil. Runoff is rapid, the potential for frost action is moderate, and natural fertility is low or moderate. In unlimed areas reaction is strongly acid to extremely acid. The root zone of some plants is restricted by bedrock at a depth of 20 to 40 inches.

The available water capacity of this Upshur soil is moderate or high. Permeability is slow in the subsoil. Runoff is rapid, the potential for frost action is moderate, and natural fertility is moderate or high. In unlimed areas reaction is very strongly acid to moderately alkaline. Bedrock is at a depth ranging from 40 to 60 inches. The shrink-swell potential is high in the subsoil of the Upshur soil. The hazard of slippage is severe in areas of the soil.

These soils are equally divided between areas used as woodland and areas used for meadow or pasture.

The Gilpin and Upshur soils are not suited to cultivated crops. They are better suited to hay and pasture. The hazard of erosion, which is severe in unprotected areas, is a management concern. If the soils are cultivated, applying a system of conservation tillage, growing crops in contour strips, using a rotation system that includes hay crops, maintaining shallow drainageways in sod, and returning crop residues to the soil help to control erosion and to maintain soil fertility and tilth. Proper stocking rates to maintain desirable grasses and legumes, a rotation grazing system, and deferment of grazing in the spring until the soils are reasonably firm are major pasture management needs.

The potential productivity for trees is moderate on north and south aspects in areas of the Upshur soil. It is moderately high on north and south aspects in areas of the Gilpin soil. One-third of the acreage in the map unit is wooded. Common tree species on this unit include red oak, white oak, hickory, beech, sugar maple, and yellow-poplar. Almost pure stands of Virginia pine are in the less desirable areas of the map unit, such as the drier sites and the eroded, less fertile areas. Proper woodland management techniques, such as timber stand improvement, increase the value and yield of woodland. The use of equipment is restricted in areas of the Upshur soil during wet seasons because of poor traction and low soil strength. Building logging roads and trails on the contour helps to control erosion. Diverting surface water away from the logging road, establishing and maintaining a crown on the road, and establishing and maintaining sod on bare roadbanks help to control erosion.

The slope, the slow permeability, the high potential for shrink-swell in the subsoil, and the hazard of soil slippage are the main limitations on sites for dwellings with or without basements in areas of the Upshur soil. Wide reinforced footers and foundations, reinforced upslope walls, correctly installed footer drains, and ditches to divert surface water help to overcome the limitations in areas of the Upshur soil. The slope and the depth to bedrock are the main limitations on sites for dwellings with basements in areas of the Gilpin soil. Generally, depth to bedrock is not a problem on sites for dwellings without basements. The bedrock underlying the Gilpin soil is generally rippable, but it may hinder excavation. In places it is hard sandstone. Footer drains should be installed with clean, sized gravel to within 1 foot of the surface or as close as possible to the surface. Selecting areas of the deepest and less sloping soils, installing the absorption field on the contour, and installing a larger absorption field than is typical help to overcome the limitations affecting septic tank absorption fields. Land shaping and grading so that the landscape conforms to the natural lay of the land can help to overcome the slope. Lawns can be difficult to maintain. Erosion is a hazard in areas cleared for construction, but designing dwellings so 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. Additional grading and installing a system to remove excess water help to overcome the slope and other limitations on sites for local roads and streets.

The capability subclass is IVe.

GuD3—Gilpin-Upshur complex, 15 to 25 percent slopes, severely eroded

This map unit consists of moderately steep, well drained soils on ridgetops and benches throughout the survey area. The benches are commonly dissected by drainageways, and landslips are common in some areas. Erosion has removed most of the original topsoil, and the subsoil is exposed in places. The Gilpin and Upshur soils occur in long, narrow areas that include both soils in a repeating, alternating pattern. The soils were mapped together because it was not practical to separate them in mapping. The unit is about 50 percent Gilpin soil, 30 percent Upshur soil, and 20 percent other soils.

Typically, the surface layer of this Gilpin soil is very dark grayish brown silt loam about 1 inch thick. The subsoil is yellowish brown silt loam from a depth of 1 to 3 inches, yellowish brown channery silt loam from a depth of 3 to 15 inches, and yellowish brown channery silty clay loam from a depth of15 to 22 inches. The substratum is yellowish brown very channery silty clay loam. Bedrock is at a depth of about 25 inches.

Typically, the surface layer of this Upshur soil is dark brown silt loam about 1 inch thick. The subsoil is brown silt loam from a depth of 1 to 6 inches, reddish brown silty clay from a depth of 6 to 17 inches, and dusky red channery clay from a depth of 17 to 37 inches. The substratum is dusky red very channery silty clay. Bedrock is at a depth of about 46 inches.

Included with these soils in mapping are small areas of the well drained Peabody and Vandalia soils. Also included are a few small areas of soils that have up to 3 percent of their surface covered with stones, areas of soils that have a fragipan below a depth of 36 inches, areas of soils that have slopes ranging from 8 to 15 percent, areas of soils that have slopes ranging from 25 to 35 percent, and areas of soils that are moderately eroded. Included soils make up about 20 percent of the map unit.

The available water capacity of this Gilpin soil is low or moderate. Permeability is moderate in the subsoil. Runoff is rapid, the potential for frost action is moderate, and natural fertility is low or moderate. In unlimed areas reaction is strongly acid to extremely acid. The root zone of some plants is restricted by bedrock at a depth of about 20 to 40 inches. Slippage is a severe hazard.

The available water capacity of this Upshur soil is moderate or high. Permeability is slow in the subsoil. Runoff is rapid, the potential for frost action is moderate, and natural fertility is moderate or high. In unlimed areas reaction is very strongly acid to moderately alkaline. The depth to bedrock ranges from 40 to 60 inches. Slippage is a severe hazard. The shrink-swell potential is high in the subsoil.

The acreage in this map unit is equally divided between areas used as woodland (fig. 5) and areas used for meadow or pasture.

These soils are not suited to cultivated crops. They are better suited to hay and pasture. The hazard of erosion, which is severe in unprotected areas, is a management concern. If these soils are cultivated, applying a conservation tillage system, growing crops in contour strips, using a rotation system that includes hay crops, maintaining shallow drainageways in sod, and returning crop residues to the soil help to control erosion and to maintain soil fertility and tilth. Proper stocking rates that help to maintain desirable grasses and legumes, a rotation grazing system, and deferment of grazing in the spring until the soils are reasonably firm are major pasture management needs.

The potential productivity for trees is moderately high in areas of the Gilpin soil. It is moderately high on north aspects and moderate on south aspects in areas of the Upshur soil. Common tree species on this unit include red oak, white oak, hickory,

Figure 5.—A Christmas tree farm in an area of Gilpin-Upshur complex, 15 to 25 percent slopes, severely eroded.

American beech, and yellow-poplar. Erosion control on logging roads and skid trails and plant competition are management concerns. Seedling mortality is a concern on south aspects in areas of the Gilpin soil since the sites are drier and less water is available to seedlings. The use of equipment is restricted in areas of the Upshur soil during wet seasons because the soil is soft and slippery when wet. Intensive management to keep undesirable plants from competing with native plants or planted seedlings is necessary for the establishment of a desirable stand. Locating roads and skid trails near the contour, diverting surface water from the road, establishing and maintaining a crown on the road, and establishing and maintaining sod on bare roadbanks help to control erosion.

The slope and the depth to bedrock are the main limitations on sites for dwellings and septic tank absorption fields in areas of the Gilpin soil. The bedrock underlying the Gilpin soil is generally rippable, but it may hinder excavation. In places it is hard sandstone. Building on the bedrock and landscaping with additional fill help to overcome the depth to bedrock. Selecting areas of deeper and less sloping soils, installing the septic tank absorption field on the contour, and installing a larger septic tank absorption field help to overcome the limitations on sites for septic tank systems in areas of the Gilpin soil.

The slope, the slow permeability, the high shrink-swell potential in the subsoil, and the hazard of soil slippage are the main management concerns on sites for dwellings and septic tank absorption fields in areas of the Upshur soil. Selecting areas of less sloping soils, designing dwellings so that they conform to the natural slope of the land, backfilling with porous material, and installing wide reinforced footings with an adequate drainage system help to overcome the limitations on sites for dwellings. Selecting areas of less clayey soils as sites and installing a larger septic tank absorption field than is typical help to overcome the slow permeability of the Upshur soil. Removing only the minimum amount of the vegetative cover on construction sites helps to control erosion. Establishing a plant cover in unprotected areas and providing for the proper disposal of surface water help to control erosion and sedimentation.

The capability subclass is VIe.

GuE3—Gilpin-Upshur complex, 25 to 35 percent slopes, severely eroded

This map unit consists of steep, well drained soils on hillsides, benches, and narrow ridgetops throughout the survey area. The hillsides and benches are commonly dissected by drainageways, and landslips are common in some areas. Erosion has removed most of the original topsoil, and the subsoil is exposed in places. The Gilpin and Upshur soils occur in long, narrow areas that include both soils in a repeating, alternating pattern. The soils were mapped together because it was not practical to separate them in mapping. The map unit is about 45 percent Gilpin soil, 35 percent Upshur soil, and 20 percent other soils.

Typically, the surface layer of this Gilpin soil is very dark grayish brown silt loam about 1 inch thick. The subsoil is yellowish brown silt loam from a depth of 1 to 3 inches, yellowish brown channery silt loam from a depth of 3 to 15 inches, and yellowish brown channery silty clay loam from a depth of 15 to 22 inches. The substratum is yellowish brown very channery silty clay loam. Bedrock is at a depth of 25 inches.

Typically, the surface layer of this Upshur soil is dark brown silt loam about 1 inch thick. The subsoil is brown silt loam from a depth of 1 to 6 inches, reddish brown silty clay from a depth of 6 to 17 inches, and dusky red channery clay from a depth of 17 to 37 inches. The substratum is dusky red very channery silty clay. Bedrock is at a depth of 46 inches.

Included with these soils in mapping are a few small areas of the well drained Peabody and Vandalia soils. Also included are areas of soils that have slopes ranging from 15 to 25 percent, areas of soils that have slopes of more than 35 percent, a few areas of soils that have 1 to 3 percent of their surface covered with stones, and some areas of soils that are moderately eroded. Included soils make up about 20 percent of the map unit.

The available water capacity of this Gilpin soil is low or moderate. Permeability is moderate in the subsoil. Runoff is very rapid, the potential for frost action is moderate, and natural fertility is low or moderate. In unlimed areas reaction is strongly acid to extremely acid. The root zone of some plants is restricted by bedrock at a depth of 20 to 40 inches.

The available water capacity of this Upshur soil is moderate or high. Permeability is slow in the subsoil. Runoff is very rapid, the potential for frost action is moderate, and natural fertility is moderate or high. In unlimed areas reaction is very strongly acid to moderately alkaline. The depth to bedrock ranges from 40 to 60 inches. Slippage is a severe hazard. The shrink-swell potential is high in the subsoil.

Most areas of this map unit are used as woodland (fig. 6). Some are used as pasture. These soils are not suited to cultivated crops or hay, but they are suited to pasture. A very severe hazard of erosion in unprotected areas and overgrazing are major pasture management concerns. Proper stocking rates that help to maintain desirable grasses and legumes, a rotation grazing system, and deferment of grazing in the spring until the soils are reasonably firm are major pasture management needs.

The potential productivity for trees is moderately high in areas of the Gilpin soil. It is moderately high on north aspects and moderate on south aspects in areas of the Upshur soil. Common tree species on this unit include red oak, white oak, hickory,

Figure 6.—A stand of white oak in a typical area of Gilpin-Upshur complex, 25 to 35 percent slopes, severely eroded.

American beech, and yellow-poplar. Erosion on logging roads and skid trails, an equipment limitation because of the slope, and plant competition are major management concerns. Seedling mortality is a concern on south aspects in areas of the Gilpin soil since the sites are drier and less water is available to seedlings. The use of equipment is restricted in areas of the Upshur soil during wet periods because the soil is soft and slippery when wet and is highly susceptible to slipping. Intensive management to keep undesirable plants from competing with native plants or planted seedlings is necessary for the establishment of a desirable stand. Building roads and skid trails on the contour, diverting surface water away from the road, establishing and maintaining a crown on the road, and establishing and maintaining sod on bare roadbanks help to control erosion.

The slope and the depth to bedrock are the main limitations on sites for dwellings and septic tank absorption fields in areas of the Gilpin soil. The slope, the slow permeability, the high shrink-swell potential in the subsoil, and the hazard of soil slippage are the main limitations in areas of the Upshur soil. These soils are not suited to most urban uses. If vegetation on these soils is disturbed, establishing a plant cover in unprotected areas and providing for the proper disposal of surface water help to control erosion and sedimentation. Alternate sites with fewer limitations should be selected.

The capability subclass is VIIe.

Ha—Hackers silt loam

This nearly level, very deep, well drained soil is on high flood plains and low stream terraces along the Little Kanawha River. This soil is subject to rare flooding. Slope ranges from 0 to 3 percent.

Typically, the surface layer of this Hackers soil is dark brown silt loam about 6 inches thick. The upper 6 inches of the subsoil is dark reddish brown silt loam. The lower 53 inches of the subsoil is reddish brown silty clay loam.

Included with this soil in mapping are a few small areas of the well drained Chagrin, Sensabaugh, and Vandalia soils. Also included are areas of soils that are wetter than the Hackers soil and small areas of soils that have slope of more than 3 percent. Included soils make up about 20 percent of the map unit.

The available water capacity of this Hackers soil is moderate or high. Permeability is moderate in the subsoil. Runoff is slow, the potential for frost action is moderate, and natural fertility is high. In unlimed areas reaction is strongly acid to slightly acid. The depth to bedrock is more than 60 inches.

This soil is suited to cultivated crops, hay, and pasture. Most areas are used as hayland (fig. 7). The hazard of erosion, which is moderate in unvegetated areas, is a management concern. Crops can be grown continuously, but a cover crop is needed to help control erosion. Applying a conservation tillage system, using a rotation system that includes hay, maintaining sod in shallow drainageways, returning crop residue to the soil, and growing cover crops help to control erosion and to maintain fertility and tilth. Proper stocking rates that help to maintain desirable grasses and legumes and a rotation grazing system are major pasture management needs.

The potential productivity for trees is moderately high on this soil, but only a very small acreage is wooded. Common tree species include boxelder, yellow-poplar, sycamore, and ash. Proper woodland management techniques, such as timber stand improvement, will increase yields. The use of equipment is restricted during wet seasons when traction is poor and soil strength is low.

Figure 7.—An area of Hackers silt loam used as hayland.

The rare flooding is the main management concern on sites for dwellings with or without basements in areas of this soil. The soil is moderately limited as a site for septic tank absorption fields. Alternate soils that are not subject to flooding should be selected as homesites. Dwellings without basements should only be built in the higher areas of the soil. Adequate crawl space should be provided so that when a flood does occur, water will not reach the main floor.

The flooding and low strength are limitations on sites for local roads and streets. Constructing roads and streets on raised fill material and properly installing culverts help to prevent the damage caused by flooding and low strength.

The capability class is I.

ItE—Itmann channery clay loam, steep

This somewhat excessively drained soil formed mostly in coal and high-carbon shale. It is in valley fills and on the steep side slopes close to active-mining operations in the communities of Gilmer Station and Sand Fork. Most areas of this soil have been covered with 6 to 20 inches of natural soil material during reclamation (fig. 8). Slope ranges from 25 to 35 percent.

Typically, the surface layer of this Itmann soil is brown channery clay loam about 9 inches thick. The substratum is black extremely channery loam from a depth of 9 to 23 inches and black very channery loam from a depth of 23 to 65 inches. Carbolith fragments make up more than 50 percent of the total content of rock fragments.

Included with this soil in mapping are a few small areas of the well drained Gilpin, Janelew, Peabody, Upshur, and Vandalia soils; soils that have a higher pH level in the subsoil than that of the Itmann soil; soils that have slopes of less than 25 percent or more than 35 percent; soils that are less than 20 inches deep over bedrock; and soils that have not been covered with natural soil material. Also included are areas of soils

Figure 8.—Reclamation work in an area of Itmann channery clay loam, steep.

that are wetter than the Itmann soil and soils that are susceptible to flooding. Included soils make up about 40 percent of the map unit.

The available water capacity of this Itmann soil is low or moderate. Permeability is moderate or moderately rapid. Runoff is very rapid, the potential for frost action is moderate, and natural fertility is very low. In unlimed areas reaction is extremely acid to strongly acid. The depth to bedrock is more than 60 inches.

Most areas of this soil have been seeded to sericea lespedeza, fescue, and birdsfoot trefoil.

This soil is not suited to cultivated crops or hay and is difficult to manage for pasture. The slope restricts the use of farm machinery. If the soil is pastured, the very severe hazard of erosion in unprotected areas and overgrazing are major management concerns. Proper stocking rates that help to maintain desirable grasses and legumes and a rotation grazing system are major pasture management needs.

The potential productivity for trees is low on this soil. The soil is not assigned a woodland ordination symbol. Sycamore, birch, and yellow-poplar are naturally invading some areas of the soil. There are no areas of this soil in the county that have trees large enough to harvest. Seedling mortality is a management concern. Planting healthy seedlings with a well developed root system and timing planting to take full advantage of spring rains help to reduce the seedling mortality rate. The growth of native trees and planted seedlings is slow because of the very low fertility.

The steep slopes and differential settling are the main limitations on sites for dwellings and septic tank absorption fields. Onsite investigation and testing are necessary to determine if the limitations that affect specific uses can be overcome. If the vegetative cover is removed, establishing a plant cover in unprotected areas and providing for the proper disposal of surface water help to control erosion and sedimentation.

The capability subclass is VIIs.

JnE—Janelew channery silt loam, steep

This very deep, well drained soil is on hillsides that have been surface mined for coal. It is in the northeastern part of the county, along the Lewis County line. Slopes are dominantly 25 to 35 percent but range from 0 to 80 percent. The soil formed in mixed, fine-earth material and highly weathered fragments of mudstone, sandstone, siltstone, shale, and coal. The fine-earth material is derived from fragments of calcareous mudstone that have been crushed by machinery or weathered by natural forces. Some areas have naturally revegetated, while others have been reclaimed by grading and seeding. The soil is subject to extensive slippage when it is wet and the slope is 15 or more percent.

Typically, the surface layer of this Janelew soil is dark brown channery silt loam about 2 inches thick. The substratum is brown very channery silt loam from a depth of 2 to 13 inches, olive brown extremely channery silty clay loam from a depth of 13 to 33 inches, and olive brown extremely channery silty clay loam from a depth of 33 to 65 inches.

Included with this soil in mapping are small areas of the well drained Gilpin, Itmann, Peabody, Upshur, and Vandalia soils; small areas of soils that have clay loam textures, are more acid than the Janelew soil, or have as much as 3 percent of the surface covered by stones; small, wet depressions; areas with mixed rock types; areas where the available water capacity is low; and areas of bedrock escarpments along mining highwalls. Inclusions make up about 25 percent of the map unit.

The available water capacity of this Janelew soil is moderate or high. Permeability is moderate or moderately slow in the substratum. Runoff is very rapid, the potential for frost action is moderate, and natural fertility is moderate or high. In unlimed areas reaction is neutral to mildly alkaline in the surface and neutral to moderately alkaline in the substratum. The depth to bedrock is more than 60 inches.

Most of the acreage of this soil is reclaimed grassland. The soil is not suited to cultivated crops but is suited to hay or pasture. Erosion is a severe hazard in unreclaimed areas, and slippage is a very severe hazard in areas where slope is 15 percent or more. A higher level of management is necessary on this soil than on natural soils. Management needs for hay and pasture must include available soil moisture and amounts of vegetative cover. In pastured areas a major management concern is overgrazing, which can result in severe erosion and loss of desirable grasses and legumes. Insufficient available moisture, soil compaction, and heat stress do not allow the grasses and legumes to recover as they would under normal conditions. The major pasture management needs are proper stocking rates, a rotation grazing system, application of fertilizer, and deferment of grazing in the spring until the soil is reasonably firm.

The potential productivity for trees on this soil is moderately high. The major management concerns are the erosion hazard, the hazard of soil slippage, and seedling mortality. The survival rate of seeds and seedlings is better if the competing vegetation is controlled. The slope, large slips, and bedrock escarpments along mining highwalls restrict the use of logging equipment. Constructing logging roads and skid trails along the old haul roads helps to control erosion and to avoid slip-prone areas. Some common trees to plant for commercial wood production are Virginia pine, eastern white pine, and European black alder.

Onsite investigation is needed to determine the limitation of this soil affecting urban uses. The slope is the main limitation of the included soils affecting most urban uses. Other limitations are depth to bedrock in areas of the included Gilpin soils and low soil strength, shrinking and swelling, slow permeability, and the hazard of slippage in areas of the included Upshur soils.

This soil is in capability subclass VIe.

Ka—Kanawha loam

This nearly level, very deep, well drained soil is on high flood plains and low stream terraces throughout the survey area, except for along the Little Kanawha River. The soil is subject to rare flooding. Slope ranges from 0 to 3 percent.

Typically, the surface layer of this Kanawha soil is brown loam about 7 inches thick. The subsoil is brown loam from a depth of 7 to 13 inches, brown loam from a depth of 13 to 24 inches, brown loam from a depth of 24 to 54 inches, and brown loam from a depth of 54 to 65 inches.

Included with this soil in mapping are a few small areas of the well drained Chagrin, Hackers, Pineville, Sensabaugh, and Vandalia soils. Also included are small areas of soils that have slopes of more than 3 percent and soils that are wetter than the Kanawha soil. Included soils make up about 25 percent of the map unit.

The available water capacity of this Kanawha soil is high. Permeability is moderate in the subsoil. Runoff is slow, the potential for frost action is moderate, and natural fertility is high. In unlimed areas reaction is strongly acid to neutral. The depth to bedrock is more than 60 inches.

This soil is suited to cultivated crops, hay, and pasture, but most of this unit is used as hayland (fig. 9). The hazard of erosion, which is moderate in unvegetated areas, is a management concern. Crops can be grown continuously, but a protective cover crop is needed. Applying a conservation tillage system, using a rotation system that includes hay, maintaining sod in shallow drainageways, returning crop residue to the soil, and growing cover crops help to control erosion and to maintain fertility and tilth. Proper stocking rates that help to maintain desirable grasses and legumes and a rotation grazing system are major pasture management needs.

Figure 9.—Hayland in an area of Kanawha loam.

The potential productivity for trees on this soil is moderately high, but only a very small acreage is used as woodland. Common tree species include boxelder, yellow-poplar, sycamore, and ash. Proper woodland management techniques, such as timber stand improvement, will increase yields. The use of equipment is restricted during wet seasons because of poor traction and low soil strength.

The rare hazard of flooding is the main limitation on sites for dwellings with or without basements in areas of this soil. The soil is moderately limited as a site for septic tank absorption fields. Alternate soils that are not subject to flooding should be selected as homesites. Dwellings without basements should only be built in the higher areas of the soil. Adequate crawl space should be provided so that when a flood does occur, water will not reach the main floor.

The flooding and frost action are limitations on sites for local roads and streets. Constructing roads and streets on raised fill material and properly installing culverts help to prevent the damage caused by flooding and frost action.

The capability class is I.

MoB—Monongahela silt loam, 3 to 8 percent slopes

This gently sloping, very deep, moderately well drained soil is on stream terraces along the Little Kanawha River and other major streams in the survey area.

Typically, the surface layer of this Monongahela soil is brown silt loam about 8 inches thick. The subsoil is dark yellowish brown silt loam from a depth of 8 to 11 inches, yellowish brown silt loam from a depth of 11 to 18 inches, yellowish brown silt loam from a depth of 18 to 25 inches, mixed light yellowish brown and strong brown clay loam with many light brownish gray and yellowish red redoximorphic features from a depth of 25 to 38 inches, and brown clay loam with many light brownish gray and yellowish red redoximorphic features from a depth of 38 to 65 inches.

Included with this soil in mapping are small areas of the well drained Gilpin, Hackers, Kanawha, Peabody, Sensabaugh, Upshur, and Vandalia soils; well drained soils that do not have a fragipan; soils that have slopes of less than 3 percent; and soils that have slopes of more than 8 percent. Also included are soils that are on short, steep slopes at the break between this Monongahela soil and the soils on flood plains and that were generally derived from a mixture of residuum, colluvium, and alluvium. Included soils make up about 25 percent of the map unit.

The available water capacity of this Monongahela soil is moderate. Permeability is moderately slow above the fragipan and slow in the fragipan. Runoff is medium, the potential for frost action is moderate, and natural fertility is moderate. In unlimed areas reaction is very strongly acid to moderately acid. A seasonal high water table is at a depth of about 2 to 3 feet, and a fragipan restricts the root zone of deep-rooted plants. The depth to bedrock is more than 60 inches.

This soil is suited to cultivated crops, hay, and pasture, but most areas of the soil are used as hayland. The hazard of erosion, which is moderate in unvegetated areas, is a management concern. Crops can be grown continuously, but a protective cover crop is needed. Applying a conservation tillage system, using a rotation system that includes hay, maintaining sod in shallow drainageways, returning crop residue to the soil, and growing cover crops help to control erosion and to maintain fertility and tilth. Proper stocking rates that help to maintain desirable grasses and legumes, a rotation grazing system, and deferred grazing in the spring until the soil is reasonably firm are major pasture management needs.

The seasonal high water table is an important factor during the growing season. In dry years row crops and hay do well because of the available moisture. In wet years growth can be inhibited by excess soil moisture. Proper stocking rates that help to maintain desirable grasses and legumes, a rotation grazing system, and deferment of grazing in the spring until the soil is reasonably firm are major pasture management needs.

The potential productivity for trees is moderate on this soil, but only a small acreage is wooded. Common tree species include red oak, white oak, scarlet oak, hickory, yellow-poplar, sycamore, and ash. Proper woodland management techniques, such as timber stand improvement, increase the value and yield of woodland. The use of equipment is restricted during wet periods because of poor traction and low soil strength.

The seasonal high water table, the depth to a cemented pan, and the slow permeability are the main limitations of this soil on sites for dwellings with or without basements and for septic tank absorption fields. Properly installed footer drains and ditches that divert surface water help to overcome the limitations on sites for dwellings without basements. Footer drains should be installed with clean, sized gravel to within 1 foot of the surface or as close as possible to the surface. The footers generally remain stable when they are poured directly onto the cemented pan. Installing the absorption field on the contour and as shallow as possible, installing a larger absorption field area than is typical, installing an alternate system (such as a mound system), or selecting adjacent areas of better suited soils helps to overcome the limitations affecting septic tank absorption fields. Erosion is a hazard in areas cleared for construction. Revegetating during or soon after construction helps to control erosion. Because of the wetness and frost heaving, special attention should be given to overcoming the wetness on sites for local roads and streets.

The capability subclass is IIe.

MoC—Monongahela silt loam, 8 to 15 percent slopes

This strongly sloping, very deep, moderately well drained soil is on stream terraces along the Little Kanawha River and other major streams in the survey area.

Typically, the surface layer of this Monongahela soil is dark brown silt loam about 8 inches thick. The subsoil is yellowish brown silt loam from a depth of 8 to 11 inches, yellowish brown silt loam from a depth of 11 to 18 inches, yellowish brown silt loam from a depth of 18 to 25 inches, mixed light yellowish brown and strong brown clay loam with many light brownish gray and yellowish red redoximorphic features from a depth of 25 to 38 inches, and brown clay loam with many light brownish gray and yellowish red redoximorphic features from a depth of 38 to 65 inches.

Included with this soil in mapping are small areas of the well drained Gilpin, Hackers, Kanawha, Peabody, Sensabaugh, Upshur, and Vandalia soils; well drained soils that do not have a fragipan; soils that have slopes of less than 3 percent; and soils that have slopes of more than 8 percent. Also included are soils that are on short, steep slopes on flood plains at the break between this Monongahela soil and Moshannon soils and that were generally derived from a mixture of residuum and alluvium. Included soils make up about 20 percent of the map unit.

The available water capacity of this Monongahela soil is moderate. Permeability is moderately slow above the fragipan and slow in the fragipan. Runoff is rapid, the potential for frost action is moderate, and natural fertility is moderate. In unlimed areas reaction is very strongly acid to moderately acid. A seasonal high water table is at a depth of about 2 to 3 feet, and a fragipan restricts the root zone of deep-rooted plants. The depth to bedrock is more than 60 inches.

This soil is suited to cultivated crops, hay, and pasture, but most areas of this map unit are used as hayland. The hazard of erosion, which is moderate in unvegetated areas, is a management concern. Crops can be grown continuously, but a protective cover crop is needed. Applying a conservation tillage system, using a rotation system that includes hay, maintaining sod in shallow drainageways, returning crop residue to the soil, and growing cover crops help to control erosion and to maintain fertility and tilth. In wet years growth can be inhibited by excess soil moisture. Proper stocking rates that help to maintain desirable grasses and legumes, a rotation grazing system, and deferment of grazing in the spring until the soil is reasonably firm are major pasture management needs.

The potential productivity for trees is moderate on this soil, but only a small acreage is used as woodland. Common tree species include red oak, white oak, scarlet oak, hickory, yellow-poplar, sycamore, and ash. Proper woodland management techniques, such as timber stand improvement, increase the value and yield of woodland. The use of equipment is restricted during wet periods because of poor traction and low soil strength.

The seasonal high water table and the slow permeability are the main limitations of this soil on sites for dwellings with or without basements and for septic tank absorption fields. The wetness is the main limitation affecting dwellings with basements. Properly installed footer drains and ditches that divert surface water help to overcome the limitations on sites for dwellings without basements. Footer drains should be installed with clean, sized gravel to within 1 foot of the surface or as close as possible to the surface. The footers generally remain stable when they are poured directly onto the cemented pan. Installing the absorption field on the contour and as shallow as possible, installing a larger absorption field area than is typical, installing an alternate system (such as a mound system), or selecting adjacent areas of better suited soils helps to overcome the limitations affecting septic tank absorption fields. Erosion is a hazard in areas cleared for construction. Revegetating during or soon after construction helps to control erosion. Because of the wetness and frost heaving, special attention should be given to overcoming the wetness on sites for local roads and streets.

The capability subclass is IIIe.

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

This steep, very deep, well drained soil is on colluvial footslopes and at the head of drainageways at the base of the very steep areas of Gilpin-Pineville complex, 35 to 70 percent slopes, very stony. It is in a small area in the southwestern part of county, in the Bear Fork drainageway. Stones that are 10 to 24 inches in diameter cover 1 to 3 percent of the surface.

Typically, the surface layer of this Pineville soil is very dark grayish brown loam about 5 inches thick. The subsoil is dark yellowish brown loam from a depth of 5 to 10 inches, yellowish brown channery loam from a depth of 10 to 18 inches, strong brown channery clay loam from a depth of 18 to 45 inches, and yellowish brown channery loam from a depth of 45 to 59 inches. The substratum is yellowish brown channery loam from a depth of 59 to 65 inches.

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

The available water capacity of this Pineville soil is moderate or high. Permeability is moderate in the subsoil. Runoff is very rapid, the potential for frost action is moderate, and natural fertility is low or moderate. 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. The depth to bedrock is more than 60 inches.

This soil is not suited to cultivated crops or hay, and it is difficult to manage for pasture. Most areas are used as woodland. The hazard of erosion, which is very severe in unvegetated areas, is a major management concern.

The potential productivity is moderately high for trees on this soil. About 95 percent of the acreage of the unit is used as woodland. Common tree species in this unit include red oak, white oak, hickory, beech, sugar maple, and yellow-poplar. Proper woodland management techniques, such as timber stand improvement, increase the value and yield of woodland.

Erosion on logging roads and skid trails is the major management concern. Building roads and skid trails on the contour helps to control erosion. Diverting surface water away from logging roads, establishing and maintaining a crown in the road, and establishing and maintaining sod on bare roadbanks also help to control erosion. Plant competition and seedling mortality are additional management concerns.

The steep slope is the main limitation of this soil on sites for dwellings, local roads and streets, and septic tank absorption fields.

The capability subclass is VIIs.

Sb—Sensabaugh loam

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

Typically, the surface layer of this Sensabaugh soil is brown loam about 7 inches thick. The subsoil is dark yellowish brown gravelly loam from a depth of 7 to 19 inches and brown gravelly fine sandy loam from a depth of 19 to 27 inches. The substratum is brown very gravelly loam from a depth of 27 to 65 inches.

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

The available water capacity of this Sensabaugh soil is moderate or high. Permeability is moderate or moderately rapid in the subsoil. Runoff is slow, the potential for frost action is moderate, and natural fertility is moderate. In unlimed areas reaction is moderately acid to slightly alkaline. The depth to bedrock is more than 60 inches.

This soil is suited to cultivated crops, hay, and pasture. Crops can be grown continuously on this soil, but a cover crop is needed to help control erosion. Working the residue from the cover crop into the soil helps to maintain soil fertility and tilth. In places crops are subject to damage from flooding. Proper stocking rates that help to maintain desirable grasses and legumes, a rotation grazing system, and deferment of grazing in the spring until the soil is reasonably firm are major pasture management needs.

The potential productivity is moderately high for trees on this soil. Common tree species on this unit include boxelder, sycamore, yellow-poplar, ash, and black walnut. Plant competition is a management concern. Intensive management to keep undesirable plants from competing with native plants or planted seedlings is necessary for the establishment of a desirable stand.

The hazard of flooding is the main management concern on sites for dwellings and septic tank absorption fields. This soil should not be used as a site for dwellings or septic tank absorption fields unless it is protected by a properly designed flood-control structure. A better suited soil should be selected. If vegetation is removed, establishing a plant cover in unprotected areas and properly disposing of surface water help to control erosion and sedimentation.

The flooding restricts the use of this soil as a site for local roads and streets. Constructing roads and streets on raised fill material and properly installing culverts help to prevent the damage caused by flooding.

The capability subclass is IIw.

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. These soils, commonly referred to as cut and fill, are mainly along Interstate 79 in the eastern part of Gilmer County and in smaller areas near the towns of Glenville and Sand Fork. They are subject to rare flooding if they are on flood plains.

A typical pedon description is not given because the composition of Udorthents varies greatly.

Included with these soils in mapping are small areas of the well drained Gilpin, Hackers, Peabody, Upshur, and Vandalia soils. Included soils make up about 10 percent of the map unit.

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

It is impractical to estimate the physical and chemical properties of this map unit because it is made up of disturbed soils that vary greatly. Most fill areas are more than 65 inches deep to bedrock. Runoff ranges from medium in the nearly level areas to very rapid in the very steep areas. The natural fertility is generally high.

Most areas not covered with concrete or asphalt are seeded to fescue, crownvetch, sericea lespedeza, and birdsfoot trefoil. Trees that are naturally invading this map unit include sycamore, yellow-poplar, and sumac.

A few areas have limited suitability for pasture. Most are better suited to wildlife habitat and woodland. Onsite investigation is necessary to determine if the limitations that affect most uses can be overcome.

This map unit is not assigned a capability subclass.

VaD—Vandalia silt loam, 15 to 25 percent slopes

This moderately steep, very deep, well drained soil is in areas throughout most of the county. It is on footslopes along the base of the steeper slopes and at the head of drainageways in most parts of the county. Landslips and water seeps are common in some areas. The soil is moderately eroded.

Typically, the surface layer of this Vandalia soil is dark brown silt loam about 4 inches thick. The subsoil is brown silt loam from a depth of 4 to 7 inches, reddish brown channery silty clay loam from a depth of 7 to 19 inches, reddish brown channery silty clay loam from a depth of 19 to 49 inches, and dark reddish brown channery silty clay from a depth of 49 to 65 inches.

Included with this soil in mapping are a few small areas of the well drained Chagrin, Gilpin, Peabody, Pineville, Sensabaugh, and Upshur soils. Also included are areas of soils that are similar to the Vandalia soil but have bedrock at a depth of 40 to 60 inches, soils that have slopes of less than 15 percent or more than 25 percent, soils that are wetter than the Vandalia soil, and soils that have as much as 3 percent of their surface covered with stones. Included soils make up about 25 percent of the map unit.

The available water capacity of this Vandalia soil is moderate or high. Permeability is slow in the subsoil. Runoff is rapid, the potential for frost action is moderate, and natural fertility is moderate or high. In unlimed areas reaction is moderately acid to very strongly acid. The depth to bedrock is more than 60 inches. The shrink-swell potential is high in the subsoil. The soil is subject to slippage.

This soil has limited suitability for cultivated crops. It is better suited to pasture and hay. Most of the acreage in this unit is used as pasture or hayland (fig. 10). The hazard of erosion, which is severe in unvegetated areas, is a major management

Figure 10.—An area of Vandalia silt loam, 15 to 25 percent slopes, used as hayland.

concern. Proper stocking rates that help to maintain desirable grasses and legumes, a rotation grazing system, and deferment of grazing in the spring until the soil is reasonably firm are major pasture management needs. If the soil is cultivated, applying a system of conservation tillage, contour stripcropping, applying a rotation system that includes hay, maintaining shallow drainageways in sod, and returning crop residue to the soil help to control erosion and maintain fertility and good tilth.

The potential productivity is moderately high for trees. Common tree species on this unit include yellow-poplar, black walnut, American beech, and sugar maple. The hazard of erosion and the hazard of soil slippage on logging roads and skid trails are major management concerns. Locating logging roads and skid trails on the contour helps to control erosion. Keeping roadbank cuts to a minimum height helps to control slips. The use of equipment is restricted during wet periods because of poor traction and low soil strength. Heavy equipment should be operated only during dry periods.

This soil has severe limitations affecting urban uses. It is better suited to pasture, hay, or trees. The slope, the high shrink-swell potential, the hazard of soil slippage, the slow permeability, and low soil strength are severe limitations on sites for dwellings, septic tank absorption fields, and local roads and streets. Water seeps and landslips are common, and land disturbance increases the possibility of slippage.

The capability subclass is IVe.

VsE—Vandalia silt loam, 15 to 35 percent slopes, very stony

This moderately steep and steep, well drained soil is on footslopes along the base of steeper slopes and at the head of drainageways in most parts of the county. Stones cover 1 to 3 percent of the surface. Land slips and water seeps are common in some areas. The soil is moderately eroded.

Typically, the surface layer of this Vandalia soil is dark brown silt loam about 4 inches thick. The subsoil is brown silt loam from a depth of 4 to 7 inches, reddish brown channery silty clay loam from a depth of 7 to 19 inches, reddish brown channery silty clay loam from a depth of 19 to 49 inches, and dark reddish brown channery silty clay from a depth of 49 to 65 inches.

Included with this soil in mapping are a few small areas of well drained Chagrin, Gilpin, Hackers, Kanawha, Monongahela, Peabody, Pineville, Sensabaugh, and Upshur soils. Also included are areas of soils that are similar to the Vandalia soil but have bedrock at a depth of 40 to 60 inches; soils that have 3 to 15 percent of their surface covered with stones and boulders; soils that have less than 1 percent of their surface covered with stones; soils that are wetter than the Vandalia soil; and soils that have slopes of more than 35 percent. Included soils make up about 30 percent of the map unit.

The available water capacity of this Vandalia soil is moderate or high. Permeability is slow in the subsoil. Runoff is rapid or very rapid, the potential for frost action is moderate, and natural fertility is moderate or high. In unlimed areas reaction is moderately acid to very strongly acid. The depth to bedrock is more than 60 inches. The subsoil has a high shrink-swell potential. The soil is subject to slippage.

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

Because of the surface stones, this soil is unsuited to cultivated crops and hay and has limited suitability for pasture. The hazard of erosion, which is severe in unvegetated areas, is a major management concern. Proper stocking rates that help to maintain desirable grasses and legumes, a rotation grazing system, and deferment of grazing in the spring until the soil is reasonably firm are major pasture management needs.

The potential productivity is moderately high for trees. Common tree species on this soil include yellow-poplar, black walnut, American beech, and sugar maple. The hazard of erosion and the hazard of soil slippage on logging roads and skid trails are major management concerns. Logging roads should be designed so that the larger stones and boulders are avoided. Locating roads and trails on the contour helps to control erosion. Keeping roadbank cuts to a minimum height helps to control slippage. The use of equipment is restricted during wet periods because of poor traction and low soil strength. Heavy equipment should be operated only during dry periods.

The soil is not suited to most urban uses. The slope, the high shrink-swell potential in the subsoil, the slow permeability in the subsoil, and the hazard of slippage are the main limitations on sites for dwellings and septic tank absorption fields. An alternate site with fewer limitations should be selected for dwellings and septic tank absorption fields. If vegetation is removed, establishing a plant cover in unprotected areas and providing for the proper disposal of surface water help to control erosion and sedimentation.

The capability subclass is VIIs.

W—Water

This map unit consists of areas inundated with water for most of the year and generally includes rivers, lakes, and ponds. No interpretations are given for this map unit.

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

Richard D. Heaslip, state resource conservationist, Natural Resources Conservation Service, helped to prepare this section.

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

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

Yields per Acre

Because most of the soils in the survey area have only a moderate or low supply of basic plant nutrients, the application of lime and fertilizer is necessary. The amounts to be applied depend on the type of soil, crop history, severity of erosion, the type of crop grown, the desired yield, and the tests and analyses of the soil and plants.

The organic matter content is low in most of the soils in the county, and increasing it is not feasible. In soils suited to crops, it is important to maintain the organic matter content by adding farm manure; incorporating crop residue into the soil or leaving a protective amount of crop residue on the surface; and growing sod crops, cover crops, and green-manure crops. Organic matter can be retained in pastured areas with proper pasture management, which helps to prevent overgrazing and control erosion.

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

In cultivated areas, runoff and erosion occur mainly while a crop is growing or soon after it has been harvested. All of the gently sloping and steeper soils that are cultivated in the county are subject to erosion and thus require a suitable cropping system to help control erosion. The main management measures of such a system include the proper rotation of crops, minimum tillage, mulch planting, crop residue management, cover crops, green-manure crops, and applications of lime and fertilizer. Other major erosion-control practices are contour farming, contour stripcropping, diversions, 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, a controlled grazing system, and careful selection of pasture mixtures, is needed on most soils to help provide enough ground cover to prevent erosion and maintain long-term productivity. Grazing is controlled by rotating the livestock from one pasture to another and providing recovery periods to allow regrowth of forages. Different soil types may require different pasture mixtures based on soil fertility, severity of erosion, and available moisture. Available soil moisture can be improved in many soil types by subsoiling, which improves infiltration and slows surface runoff. Properly locating watering facilities and limiting livestock access to creeks help to control erosion in pastured areas.

Cultivated crops other than those shown in table 5 are grown in home gardens throughout the survey area. Estimated yields for these garden crops are not given in table 5, but the suitability for cultivated crops is given under the heading "Detailed Soil Map Units." The local office of the Natural Resources Conservation Service or the West Virginia University Extension Service can provide additional information about the management and productivity of soils for these crops.

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

Land Capability Classification

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

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

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

Class I soils have few limitations that restrict their use.

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

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

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

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

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

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

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

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

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

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

Prime Farmland

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

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

About 12,785 acres, or nearly 6 percent of the survey area, meets the requirements for prime farmland.

A recent trend in land use in some parts of the survey area has been the loss of some prime farmland to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, and less productive and cannot be easily cultivated.

The map units in the survey area that are considered prime farmland are listed in table 7. This list does not constitute a recommendation for a particular land use. On some soils included in the list, measures that overcome a hazard or limitation, such as flooding, wetness, and droughtiness, are needed. Onsite evaluation is needed to determine whether or not the hazard or limitation has been overcome by corrective measures. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps at the back of this publication. The soil qualities that affect use and management are described under the heading "Detailed Soil Map Units."

Woodland Management and Productivity

Gary Gwinn, state staff biologist, Natural Resources Conservation Service, helped to prepare this section.

Forestland in Gilmer County amounts to nearly 173,000 acres, or 80 percent of the total area. The tracts range in size from small farm woodlots to large corporate woodland (fig. 11).

The common forest types, or natural associations of tree species, and their percentage of the wooded area are oak-hickory type, about 92 percent; loblolly-shortleaf pine type, about 3 percent; oak-pine type, about 2.5 percent; and elm-ash-maple type, about 2.5 percent.

Table 8 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

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

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

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

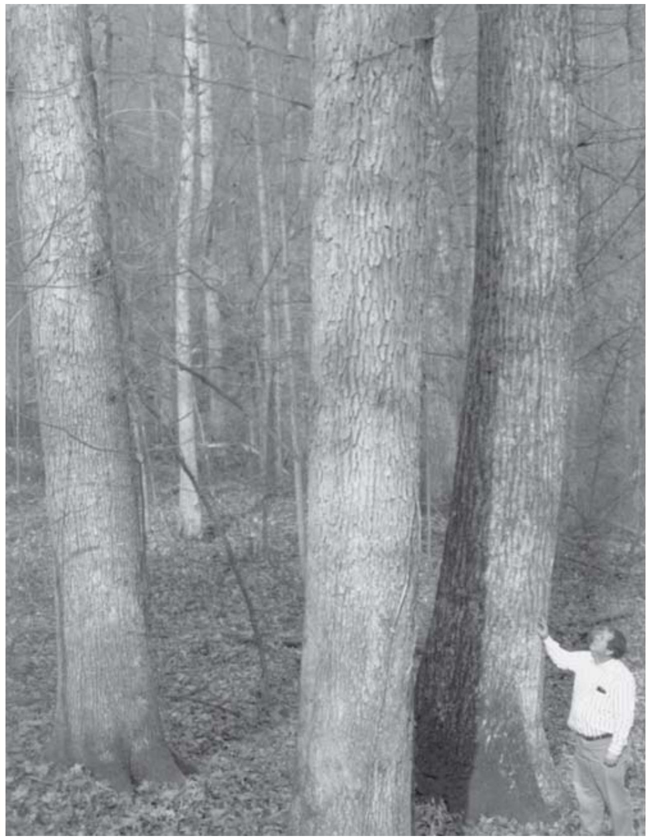

Figure 11.—Timber in an area of corporate woodland on Bear Fork in the southern part of Gilmer County.

under ordinary conditions. A rating of *moderate* indicates that erosion-control measures are needed in certain silvicultural activities. A rating of *severe* indicates that special precautions are needed to control erosion in most silvicultural activities.

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

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

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

The *potential productivity* of merchantable or *common trees* on a soil is expressed as the *site index*. The site index is the average height, in feet, that dominant and codominant trees of a given species attain in 50 years. The site index applies to fully stocked, even-aged, unmanaged stands. Common 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.

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

Recreation

Randall Jones, district conservationist, Natural Resources Conservation Service, helped to prepare this section.

Gilmer County offers a number of recreational facilities that are open to the public. Cedar Creek State Park is the main recreational attraction in Gilmer County. It offers public swimming, camping, boating, and picnicking areas. The ponds within the park offer fishing year round and are stocked with trout during the winter months. The Gilmer County Recreation Center close to Glenville also has a public swimming pool along with other recreational opportunities. Many recreational activities are available at Glenville State College. The Glenville Golf Club is open to the public most of the year. A major attraction in Gilmer County is the Folk Festival, which is held every year in June at Glenville. There is a rifle range open to the public in the county.

The soils of the survey area are rated in table 9 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreational uses by the duration and intensity of flooding and the season when flooding occurs. In planning recreational facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

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

The information in the table can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 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, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

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

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

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

Wildlife Habitat

Gary A. Gwinn, state staff biologist, Natural Resources Conservation Service, helped to prepare this section.

Wildlife habitat in Gilmer County is best suited to the needs of woodland wildlife species. With 80 percent of the survey area forested, woodland species, such as whitetail deer, wild turkey, gray and fox squirrels, and ruffed grouse, are common. The black bear population is growing in Gilmer County.

The population of openland wildlife species, such as bobwhite quail, dove, and meadowlark, is low because of the limited acreage of cultivated farmland. Cottontail rabbits are in areas 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. Fur prices have a direct effect on the local population of furbearers.

Large waterfowl species, such as Canadian geese, are becoming more common in the county, especially in Cedar Creek State Park, and smaller waterfowl, such as teal, wood duck, and mallards, are in small flocks along the larger tributaries. Water birds, such as the great blue heron, sandpipers, and kingfishers, are along streams and waterways throughout the county.

Local streams, rivers, and ponds support various species of warm-water fish. Common game species include smallmouth bass, largemouth bass, channel catfish, crappie, muskie, and assorted sunfish. Most streams also support numerous nongame species. Fish and other aquatic populations in many streams have been seriously affected by the salt water that has escaped from the numerous oil and gas wells in the area. Because of better oil and gas well containment structures and stricter enforcement of water quality regulations, water quality and fish populations have improved in recent years.

Local landowners can manipulate habitats on their properties in a manner designed to increase the carrying capacity for 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 that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

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

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

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

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

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

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

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, wildrice, saltgrass, cordgrass, rushes, sedges, and cattails.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

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

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

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

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

Engineering

Michael M. Blaine, state conservation engineer, Natural Resources Conservation Service, helped to 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 drainage systems, irrigation systems, ponds, impoundments, agricultural waste storage structures, 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, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and depth to the water table.

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

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

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, 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 the table, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

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

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

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

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

Soils rated *good* have friable, loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than

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

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at $^1/_3$-bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

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

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

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

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

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

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

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

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

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

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

Soil and Water Features

Table 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 or by runoff from adjacent slopes. Water standing for short periods after rainfall or snowmelt is not considered flooding, and water standing in swamps and marshes is considered ponding rather than flooding.

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

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

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

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

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone. An *artesian* water table is under hydrostatic head, generally below an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole.

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

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

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

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

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

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

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (Soil Survey Staff 1975, 1992). 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. An example is Upshur.

Soil Series and Their Morphology

Dr. John Sencindiver, professor of agronomy, West Virginia Agricultural and Forestry Experiment Station, helped to 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” (Soil Survey Division Staff 1993). Many of the technical terms used in the descriptions are defined in “Soil Taxonomy” (Soil Survey Staff 1975) and in “Keys to Soil Taxonomy” (Soil Survey Staff 1992). 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.”

Chagrin Series

The Chagrin series consists of very deep, well drained soils that formed in alluvial material washed from lime-influenced and acid soils on uplands. The Chagrin soils are on flood plains throughout the survey area and are subject to occasional flooding. Slope ranges from 0 to 3 percent.

Chagrin soils are on the landscape with the well drained Hackers, Kanawha, and Sensabaugh soils and the moderately well drained Monongahela soils. Hackers and Kanawha soils are rarely flooded. Sensabaugh soils have more rock fragments than Chagrin soils. Monongahela soils are not subject to flooding.

Typical pedon of Chagrin loam, in an area used as a meadow; about 2,200 feet south of the confluence of Little Bull Run and Cedar Creek; USGS Cedarville topographic quadrangle; lat. 38 degrees 52 minutes 02 seconds N. and long. 80 degrees 50 minutes 19 seconds W.

Ap—0 to 6 inches; brown (10YR 4/3) loam; moderate medium granular structure; friable; many fine and very fine roots; neutral; clear wavy boundary.

Bw1—6 to 20 inches; brown (10YR 4/3) loam; moderate medium subangular blocky structure; friable; many fine and very fine roots; moderately acid; abrupt wavy boundary.

Bw2—20 to 26 inches; dark yellowish brown (10YR 4/4) sandy loam; weak medium subangular blocky structure; very friable; common fine and very fine roots; slightly acid; abrupt wavy boundary.

BC—26 to 41 inches; brown (7.5YR 4/4) loam; moderate coarse subangular blocky structure; friable; common fine and very fine roots; slightly acid; abrupt wavy boundary.

C1—41 to 45 inches; dark yellowish brown (10YR 4/4) loamy fine sand; massive; very friable; few very fine roots; neutral; abrupt wavy boundary.

C2—45 to 59 inches; brown (7.5YR 4/4) loam; massive; friable; neutral; clear wavy boundary.

C3—59 to 65 inches; brown (10YR 4/3) loamy fine sand; common medium distinct brown (7.5YR 4/4) mottles; massive; loose; neutral.

The thickness of the solum ranges from 24 to 48 inches. The depth to bedrock is more than 60 inches. The content of rock fragments ranges from 0 to 15 percent, by volume, in the solum and is as much as 25 percent below a depth of 40 inches. In unlimed areas reaction ranges from moderately acid to neutral.

The Ap horizon has hue of 10YR, value of 4, and chroma of 2 to 4.

The Bw horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 or 4. Texture of the fine-earth fraction is sandy loam, loam, silt loam, clay loam, or silty clay loam.

The C horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 2 to 6. Texture of the fine-earth fraction is sandy loam, loam, or silt loam. In some pedons strata of loamy fine sand or gravelly loam are below a depth of 40 inches, and in other pedons mottles are below a depth of 48 inches.

Fairpoint Series

The Fairpoint series consists of deep, well drained soils that formed in moderately acid to neutral regolith from surface coal mine operations. The Fairpoint soils are on ridgetops, side slopes, and footslopes. Slope ranges from 25 to 35 percent.

Fairpoint soils are on the landscape with the well drained Gilpin, Itmann, Janelew, Peabody, Upshur, and Vandalia soils. Gilpin, Peabody, and Upshur soils formed in residuum on undisturbed uplands. Vandalia soils formed in colluvium on footslopes. Itmann soils have more carbolith rock fragments throughout the profile than Fairpoint and Janelew soils. Janelew soils are calcareous and consist dominantly of mudstone fragments.

Typical pedon of Fairpoint channery clay loam, steep, very stony, on a 35 percent slope in an area of idle land; 4,100 feet southeast of the confluence of Bear Run and the Little Kanawha River; USGS Glenville topographic quadrangle; lat. 38 degrees 55 minutes 06 seconds N. and long. 80 degrees 46 minutes 46 seconds W.

A—0 to 2 inches; yellowish brown (10Y 5/4) channery clay loam; weak fine and medium granular structure; friable; many fine and very fine roots; 20 percent channers (95 percent sandstone and 5 percent carboliths); mildly alkaline; abrupt wavy boundary.

C1—2 to 12 inches; brown (10YR 4/3) very channery clay loam; massive; firm; common very fine roots; 40 percent channers (60 percent sandstone, 35 percent siltstone, and 5 percent carboliths); slightly acid; clear wavy boundary.

C2—12 to 22 inches; strong brown (7.5YR 5/6) very channery clay loam; massive; firm; few very fine roots; 45 percent channers (60 percent sandstone, 35 percent siltstone, and 5 percent carboliths); moderately acid; clear wavy boundary.

C3—22 to 33 inches; dark yellowish brown (10YR 4/4) very channery clay loam; massive; firm; occasional very fine roots; 50 percent channers (50 percent sandstone, 45 percent siltstone, and 5 percent carboliths); moderately acid; clear wavy boundary.

C4—33 to 65 inches; mixed yellowish brown (10YR 5/6) and dark yellowish brown (10YR 4/4) extremely channery clay loam and loam; massive; firm; 75 percent channers (85 percent sandstone, 10 percent siltstone, and 5 percent carboliths); neutral.

The depth to bedrock is more than 60 inches. The content of rock fragments ranges from 15 to 60 percent, by volume, in the A horizon and from 20 to 80 percent, by volume, in the C horizon. The rock fragments are weathered siltstone, sandstone, and shale, with small amounts of coal. Most pedons have lithochromic mottles in some or all horizons. In unlimed areas reaction ranges from moderately acid to neutral.

The A or Ap horizon has hue of 2.5Y through 7.5YR, value of 4 or 5, and chroma of 2 to 6. The fine-earth material is silt loam, clay loam, or silty clay loam.

The C horizon has hue of 2.5Y through 7.5YR, value of 4 to 6, and chroma of 0 to 8. The fine-earth material is silt loam, clay loam, or silty clay loam.

Gilpin Series

The Gilpin series consists of moderately deep, well drained soils formed in residuum derived from shale, siltstone, and sandstone. The Gilpin soils are on ridgetops, benches, and hillsides throughout the survey area. Slope ranges from 8 to 70 percent.

Gilpin soils are on the landscape with the well drained Fairpoint, Itmann, Janelew, Peabody, Pineville, Upshur, and Vandalia soils and Udorthents. Fairpoint, Itmann, and Janelew soils are mine soils. Udorthents are in disturbed cut and fill areas. Gilpin soils have less clay in the subsoil than Peabody, Upshur, and Vandalia soils. Gilpin and Peabody soils are moderately deep, Upshur soils are deep, and Vandalia and Pineville soils are very deep.

Typical pedon of Gilpin silt loam, in an area of Gilpin-Peabody complex, 35 to 70 percent slopes, severely eroded, very stony, on a wooded hillside; stones cover 1 to 3 percent of the surface of this map unit; USGS Tanner topographic quadrangle; lat. 38 degrees 52 minutes 55 seconds N. and long. 80 degrees 57 minutes 34 seconds W.

Oi—1 inch to 0; hardwood leaf litter.

Ap—0 to 1 inch; very dark grayish brown (10YR 3/2) silt loam; weak fine granular structure; very friable; many very fine, fine, and medium roots; 5 percent rock fragments; extremely acid; abrupt wavy boundary.

BA—1 to 3 inches; yellowish brown (10YR 5/4) silt loam; weak fine subangular blocky structure; friable; many fine, medium, and coarse roots; 10 percent rock fragments; extremely acid; clear wavy boundary.

Bt1—3 to 15 inches; yellowish brown (10YR 5/6) channery silt loam; weak medium subangular blocky structure; firm; many fine, medium, and coarse roots; common distinct clay films on faces of peds; 15 percent rock fragments; very strongly acid; clear wavy boundary.

Bt2—15 to 22 inches; yellowish brown (10YR 5/6) channery silty clay loam; moderate medium subangular blocky structure; firm; slightly sticky and slightly plastic when wet; common fine and medium roots; common distinct clay films on faces of peds; 25 percent rock fragments; very strongly acid; clear wavy boundary.

C—22 to 25 inches; yellowish brown (10YR 5/6) very channery silty clay loam; massive; firm; slightly sticky and slightly plastic when wet; 55 percent rock fragments; very strongly acid; abrupt smooth boundary.

R—25+ inches; olive yellow siltstone.

Thickness of the solum ranges from 18 to 36 inches. The depth to bedrock ranges from 20 to 40 inches. The content of rock fragments ranges from 5 to 40 percent, by volume, in individual horizons of the solum and from 30 to 90 percent, by volume, in the C horizon. In unlimed areas reaction ranges from strongly acid to extremely acid throughout.

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

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

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

The C horizon has hue of 2.5Y, 10YR, or 7.5YR; value of 4 or 5; and chroma of 4 to 6. Texture of the fine-earth material is loam, silt loam, or silty clay loam.

Hackers Series

The Hackers series consists of very deep, well drained soils that formed in alluvial material washed from reddish soils on uplands. The Hackers soils are on high flood plains and low stream terraces along the Little Kanawha River. These soils are subject to rare flooding. Slope ranges from 0 to 3 percent.

Hackers soils are on the landscape with the well drained Chagrin and Kanawha soils and Udorthents and the moderately well drained Monongahela soils. Chagrin soils are subject to occasional flooding. Udorthents are in disturbed cut and fill areas. Monongahela soils are not subject to flooding. Chagrin and Kanawha soils have more sand in the control section than the Hackers soils.

Typical pedon of Hackers silt loam, in a meadow; about 2.5 miles east of Glenville and 700 feet southwest of the Otterbein Church; about 2,900 feet southeast of the confluence of Gluck Run and the Little Kanawha River; USGS Glenville topographic quadrangle; lat. 38 degrees 55 minutes 45 seconds N. and long. 80 degrees 47 minutes 37 seconds W.

Ap—0 to 6 inches; dark brown (7.5YR 3/4) silt loam; moderate medium granular structure; friable; common very fine and fine roots; mildly alkaline; clear wavy boundary.

BA—6 to 12 inches; dark reddish brown (5YR 3/4) silt loam; moderate medium subangular blocky structure; friable; common very fine and fine roots; slightly acid; clear wavy boundary.

Bt1—12 to 21 inches; reddish brown (5YR 4/4) silty clay loam; moderate medium subangular blocky structure; firm; few very fine roots; common distinct clay films on faces of peds; strongly acid; gradual wavy boundary.

Bt2—21 to 52 inches; reddish brown (5YR 4/4) silty clay loam; strong coarse subangular blocky structure; very firm; few very fine roots; common distinct clay films on faces of peds; strongly acid; gradual wavy boundary.

BC—52 to 65 inches; reddish brown (5YR 4/4) silty clay loam; strong coarse subangular blocky structure; firm; slightly sticky and slightly plastic when wet; common thin discontinuous clay films on faces of peds; strongly acid.

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

The Ap horizon has hue of 10YR to 5YR, value of 3 or 4, and chroma of 2 to 4. Texture is silt loam or loam.

The BA horizon has hue of 7.5YR to 5YR and value and chroma of 3 or 4. Texture 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, but some pedons have subhorizons with hue of 7.5YR. Texture of the fine-earth material is silt loam or silty clay loam with thin subhorizons of loam or clay loam.

Some pedons have a C horizon, which generally has hue of 5YR or 2.5YR and value and chroma of 3 or 4 but in some pedons hue is 7.5YR. Texture of the fine-earth material is silt loam or silty clay loam with thin stratified layers of clay loam, sandy loam, or fine sandy loam.

Itmann Series

The Itmann series consists of very deep, somewhat excessively drained soils that formed in acid regolith of waste materials from deep mined coal. The regolith is a mixture of partially weathered fine-earth material and rock fragments. The rock fragments are mainly derived from carbolithic material and a small amount of sandstone, siltstone and shale. The Itmann soils are on ridgetops, side slopes, and flood plains. In most areas they are covered with as much as 20 inches of natural soils from the surrounding area. Slope ranges from 0 to 80 percent.

Itmann soils are on the landscape with the well drained Fairpoint, Gilpin, Janelew, Peabody, Upshur, and Vandalia soils. Gilpin, Peabody, and Upshur soils formed in residuum on undisturbed uplands. Vandalia soils formed in colluvium on footslopes. Itmann soils have more carbolith rock fragments throughout the profile than Fairpoint and Janelew soils.

Typical pedon of Itmann channery clay loam, steep, on a 35 percent slope in an area of idle land; 8,700 feet southeast of the confluence of Bear Run and the Little Kanawha River; USGS Glenville topographic quadrangle; lat. 38 degrees 54 minutes 32 seconds N. and long. 80 degrees 46 minutes 05 seconds W.

A1—0 to 4 inches; brown (7.5YR 4/3) channery clay loam; weak fine granular structure; friable; many very fine and fine roots; 30 percent rock fragments (80 percent sandstone and 20 percent siltstone); neutral; clear smooth boundary.

A2—4 to 9 inches; brown (7.5YR 4/3) channery clay loam; strong coarse subangular blocky structure; firm; few very fine roots; 20 percent rock fragments (80 percent sandstone and 20 percent siltstone); moderately acid; abrupt smooth boundary.

C1—9 to 23 inches; black (10YR 2/1) extremely channery loam; massive; friable; few medium roots; 70 percent rock fragments (75 percent carboliths and 25 percent mudstone and shale); very strongly acid; gradual wavy boundary.

C2—23 to 65 inches; black (10YR 2/1) very channery loam; many medium distinct gray (10YR 5/1) lithochromic mottles; massive; friable; 55 percent rock fragments (75 percent carboliths and 25 percent mudstone and shale); very strongly acid.

The depth to bedrock is more than 60 inches. The content of rock fragments ranges from 15 to 80 percent, by volume, in individual horizons. It averages 35 or more percent, by volume, in the particle-size control section. More than 50 percent of the rock fragments are carboliths. The fine-earth fraction in the control section averages 4 to 15 percent clay. In unlimed areas reaction is extremely acid to strongly acid.

The A horizon has hue of 10YR or 7.5YR and value and chroma of 4 to 6. Texture of the fine-earth material is clay loam or silty clay loam.

The C horizon is neutral and has value of 2 or 3, or it has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The fine-earth material generally is sandy loam or loam, but it includes thin layers or pockets of clay loam or loamy sand. In some pedons the C horizon has lithochromic mottles.

Janelew Series

The Janelew series consists of very deep, well drained soils that formed in calcareous regolith from the surface mining of coal. The regolith is a mixture of partially weathered fine-earth material and bedrock fragments. The rock fragments are mainly derived from soft, blocky, calcareous mudstone and a small amount of sandstone, siltstone, shale, and coal. The Janelew soils are on hilltops, benches, and outslopes. Slopes range from 25 to 35 percent.

Janelew soils are on the landscape with Fairpoint, Gilpin, Itmann, Peabody, Upshur, and Vandalia soils. Gilpin, Peabody, and Upshur soils formed in residuum on undisturbed uplands. Vandalia soils formed in colluvium on footslopes. Itmann soils have more fragments of carbolith throughout the profile than the Fairpoint and Janelew soils. Fairpoint soils are not calcareous and are dominated by rock fragments derived from sandstone, siltstone, and shale.

Typical pedon of Janelew channery silt loam, steep, on a 28 percent slope in an idle area; 2,400 feet east southwest of the confluence of Fink Creek and Leading Creek; USGS Vadis topographic quadrangle; lat. 39 degrees 01 minute 10 seconds N. and long. 80 degrees 44 minutes 03 seconds W.

A—0 to 2 inches; dark brown (10YR 3/3) channery silt loam; weak fine subangular blocky structure; friable; many very fine and fine roots; 20 percent rock fragments

(85 percent mudstone and 15 percent shale); very slight effervescence; mildly alkaline; clear wavy boundary.

C1—2 to 13 inches; brown (10YR 4/3) very channery silt loam; massive with pockets of soil material having weak fine subangular blocky and weak fine granular structure; firm; many very fine and fine roots; 45 percent rock fragments (85 percent mudstone, 10 percent shale, and 5 percent coal and sandstone); very slight effervescence; moderately alkaline; abrupt irregular boundary.

C2—13 to 33 inches; olive brown (2.5Y 4/4) extremely channery silty clay loam; massive; firm; common very fine and fine roots; 70 percent rock fragments (65 percent mudstone, 20 percent sandstone, and 15 percent shale); very slight effervescence; moderately alkaline; gradual irregular boundary.

C3—33 to 65 inches; olive brown (2.5Y 4/4) extremely channery silty clay loam; common medium distinct yellowish brown (10YR 5/4 and 5/8) and gray (5Y 5/1) lithochromic mottles; massive; firm; few very fine and fine roots; 80 percent rock fragments (65 percent mudstone, 30 percent shale, and 5 percent sandstone); very slight effervescence; moderately alkaline.

The depth to bedrock is more than 60 inches. The content of rock fragments ranges from 20 to 80 percent, by volume, in individual horizons, but it averages from 35 to 75 percent, by volume, in the particle-size control section. The rock fragments are mudstone, sandstone, siltstone, shale, and coal. The percentage of mudstone is 65 to 100 percent of the total rock fragments in the control section. The rock fragments are mostly channers, but stones and boulders are included. The fine-earth fraction of the particle-size control section ranges from 23 to 35 percent clay. Most pedons have lithochromic mottles in some or all horizons. In unlimed areas reaction is neutral or mildly alkaline in the A horizon and neutral to moderately alkaline in the C horizon.

The A horizon has hue of 5YR to 10YR and value and chroma of 2 to 6. The fine-earth material is silt loam or silty clay loam.

The C horizon generally has hue of 2.5YR to 2.5Y, but it commonly ranges from 5YR to 10YR. Value is 3 to 5, and chroma is 1 to 8. The fine-earth material is silt loam or silty clay loam.

Kanawha Series

The Kanawha series consists of very deep, well drained, moderately permeable soils that formed in alluvium derived from interbedded shale, siltstone, and sandstone. The Kanawha soils are on high flood plains and low stream terraces throughout the survey area, except along the Little Kanawha River. These soils are subject to rare flooding. Slopes range from 0 to 3 percent.

Kanawha soils are on the landscape with the well drained Chagrin and Hackers soils and the moderately well drained Monongahela soils. Chagrin soils are subject to occasional flooding. Monongahela soils are not subject to flooding. Hackers soils are redder than the Kanawha soils and have less sand in the subsoil.

Typical pedon of Kanawha loam, in a meadow; about 800 feet north of the confluence of Leatherbark Run and Cedar Creek; USGS Cedarville topographic quadrangle; lat. 38 degrees 51 minutes 45 seconds N. and long. 80 degrees 50 minutes 26 seconds W.

Ap—0 to 7 inches; brown (7.5YR 4/3) loam; moderate fine and medium granular structure; friable; many fine and very fine roots; 5 percent rock fragments; moderately acid; clear smooth boundary.

BA—7 to 13 inches; brown (7.5YR 4/4) loam; moderate medium subangular blocky structure; friable; common fine and very fine roots; 5 percent rock fragments; moderately acid; clear wavy boundary.

Bt1—13 to 24 inches; brown (7.5YR 4/4) loam; moderate medium subangular blocky structure; firm; common very fine roots; common distinct clay films on faces of peds; moderately acid; clear wavy boundary.

Bt2—24 to 54 inches; brown (7.5YR 4/4) loam; moderate medium and coarse subangular blocky structure; firm; few very fine roots; common distinct clay films on faces of peds; moderately acid; clear wavy boundary.

BC—54 to 65 inches; brown (7.5YR 4/4) loam; weak medium subangular blocky structure; firm; few black manganese concretions; few very fine roots; moderately acid.

The thickness of the solum ranges from 40 to 72 inches. The depth to bedrock is more than 60 inches. The content of rock fragments ranges from 0 to 15 percent, by volume, in the solum and from 0 to 60 percent, by volume, in the substratum. In unlimed areas reaction ranges from strongly acid to moderately acid in the Ap and BA horizons and in the upper part of the Bt horizon and from moderately acid to neutral in the lower part of the Bt horizon and in the BC and C horizons.

The Ap horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 2 to 4. Texture is fine sandy loam, sandy loam, loam, or silt loam.

The BA, Bt and BC horizons have hue of 10YR to 5YR, value of 4 or 5, and chroma of 3 through 8. Texture is fine sandy loam, loam, silt loam, sandy clay loam, and clay loam.

Monongahela Series

The Monongahela series consists of very deep, moderately well drained soils formed in alluvium washed from acid sandstone, siltstone, and shale. The Monongahela soils are on terraces along major streams throughout the survey area, including the Little Kanawha River, Leading Creek, Cedar Creek, and Steer Creek. Slope ranges from 3 to 15 percent.

Monongahela soils are on the landscape with the well drained Chagrin, Hackers, and Kanawha soils. Chagrin soils are subject to occasional flooding. Hackers and Kanawha soils are subject to rare flooding. Monongahela soils are not subject to flooding and have a fragipan in the subsoil.

Typical pedon of Monongahela silt loam, 3 to 8 percent slopes, in a meadow; about 4,200 feet southeast of the confluence of Cedar Creek and the Little Kanawha River; USGS Tanner topographic quadrangle; lat. 38 degrees 56 minutes 11 seconds N. and long. 80 degrees 54 minutes 27 seconds W.

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

BA—8 to 11 inches; dark yellowish brown (10YR 4/4) silt loam; weak medium subangular blocky structure; friable; few very fine roots; moderately acid; clear wavy boundary.

Bt1—11 to 18 inches; yellowish brown (10YR 5/4) silt loam; moderate medium subangular blocky structure; friable; few very fine roots; common distinct clay films on faces of peds; strongly acid; clear wavy boundary.

Bt2—18 to 25 inches; yellowish brown (10YR 5/4) silt loam; moderate medium subangular blocky structure; firm; few very fine roots; common distinct clay films on faces of peds; strongly acid; clear irregular boundary.

Btx1—25 to 38 inches; mixed light yellowish brown (10YR 6/4) and strong brown (7.5YR 5/6) clay loam; many medium distinct light brownish gray (10YR 6/2) iron depletions along ped faces and yellowish red (5YR 5/6) masses that have accumulated iron in ped interiors; many black manganese concretions; weak coarse prismatic structure; very firm, brittle; common distinct clay films on faces of peds; very strongly acid; clear irregular boundary.

Btx2—38 to 65 inches; brown (7.5YR 5/4) clay loam; many medium distinct light brownish gray (10YR 6/2) iron depletions along ped faces and yellowish red (5YR 5/6) masses that have accumulated iron in ped interiors; many black manganese concretions; weak coarse prismatic structure; very firm, brittle; common distinct clay films on faces of peds; very strongly acid.

Thickness of the solum ranges from 40 to 72 inches. The depth to bedrock is more than 60 inches. Depth to the fragipan ranges from 18 to 30 inches. Rounded pebbles and cobbles range from 0 to 15 percent, by volume. 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. Texture of the fine-earth material is silt loam.

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

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

The Btx horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 2 to 8. Texture of the fine-earth material is loam, silt loam, sandy clay loam, or clay loam.

The C horizon, if it occurs, has hue of 10YR or 7.5YR, value of 4 to 7, and chroma of 2 to 8. Texture of the fine-earth material is sandy loam, loam, silt loam, clay loam, or silty clay loam.

Peabody Series

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

Peabody soils are on the landscape with the well drained Fairpoint, Gilpin, Itmann, Janelew, Pineville, Upshur, and Vandalia soils and Udorthents. Fairpoint, Itmann, and Janelew soils are mine soils. Gilpin soils have less clay and yellower colors in the subsoil than Peabody soils. Upshur soils are deep. Pineville and Vandalia soils are very deep and formed in colluvium on footslopes. Udorthents are in disturbed cut and fill areas.

Typical pedon of Peabody silt loam, in an area of Gilpin-Peabody complex, 35 to 70 percent slopes, severely eroded, very stony, on a wooded hillside; stones cover 1 to 3 percent of the surface of this map unit; 3,800 feet southeast of the confluence of Cove Creek and Big Run; USGS Auburn topographic quadrangle; lat. 39 degrees 4 minutes 7 seconds N. and long. 80 degrees 45 minutes 11 seconds W.

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

Ap—0 to 1 inch; dark brown (7.5YR 3/4) silt loam; moderate medium granular structure; friable; 5 percent rock fragments; many very fine and fine roots; neutral; abrupt wavy boundary.

Bt1—1 to 6 inches; brown (7.5YR 4/4) silty clay loam; weak medium subangular blocky structure; friable; slightly sticky and slightly plastic when wet; 5 percent rock fragments; many fine, medium, and coarse roots; common discontinuous clay films on faces of peds; strongly acid; clear wavy boundary.

Bt2—6 to 14 inches; reddish brown (5YR 4/4) silty clay; moderate medium subangular blocky structure; firm; sticky and plastic when wet; 10 percent rock fragments; common fine, medium, and coarse roots; many distinct clay films on faces of peds; strongly acid; clear wavy boundary.

Bt3—14 to 22 inches; dusky red (2.5YR 4/4) channery silty clay; strong medium and coarse subangular blocky structure; very firm; very sticky and very plastic when wet; 20 percent rock fragments; common medium roots; many distinct clay films on faces of peds; strongly acid; clear wavy boundary.

Bt4—22 to 31 inches; dusky red (2.5YR 3/4) channery silty clay; moderate medium and coarse subangular blocky structure; very firm; very sticky and very plastic when wet; 25 percent rock fragments; few fine and medium roots; many distinct clay films on faces of peds; very strongly acid; clear wavy boundary.

C—31 to 36 inches; dusky red (2.5YR 3/4) very channery silty clay; massive; very firm; very sticky and very plastic when wet; 45 percent rock fragments; strongly acid; clear wavy boundary.

Cr—36+ inches; weathered, red clay shale and siltstone.

Thickness of the solum and the depth to bedrock range from 20 to 40 inches. The content of rock fragments ranges from 0 to 15 percent, by volume, in the A, BA, and Bt1 horizons, from 0 to 25 percent, by volume, in the Bt2 and Bt3 horizons, and from 15 to 70 percent, by volume, in the C horizon, if it occurs. The rock fragments are weathered siltstone and shale. 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 a hue of 10YR, 7.5YR, or 5YR and value and chroma of 2 to 4. Texture of the fine-earth material is silt loam.

Some pedons have a BA horizon, which has hue of 7.5YR, value of 4 or 5, and chroma of 3 to 6. Texture of the fine-earth material is silt loam.

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

The C horizon has a hue of 5YR or 2.5YR, value of 3 or 4, and chroma of 3 to 6. Texture of the fine-earth material is silty clay loam or silty clay.

Pineville Series

The Pineville series consists of very deep, well drained soils with moderately rapid permeability. The Pineville soils formed in colluvium derived from sandstone, shale, and siltstone. They are on steep side slopes and footslopes and in coves and bench positions in the southwestern part of the county, in the Bear Fork drainage. Slope ranges from 25 to 70 percent.

Pineville soils are on the landscape with Gilpin, Peabody, Upshur, and Vandalia soils. Pineville and Vandalia soils are very deep, Gilpin and Peabody soils are moderately deep, and Upshur soils are deep. Pineville soils contain less clay in the subsoil than the Peabody, Upshur, and Vandalia soils.

Typical pedon of Pineville loam, in an area of Gilpin-Pineville complex, 35 to 70 percent slopes, very stony, on a wooded side slope; stones cover 1 to 3 percent of the surface of this map unit; about 6,000 feet south-southwest of the confluence of Standingstone Run and Bear Fork; USGS Millstone topographic quadrangle; lat. 38 degrees 46 minutes 20 seconds N. and long. 81 degrees 00 minutes 30 seconds W.

Oi—2 inches to 0; hardwood loose leaf litter.

A—0 to 5 inches; very dark grayish brown (10YR 3/2) loam; moderate medium granular structure; friable; many very fine, fine, and medium roots; 10 percent rock fragments; slightly acid; clear wavy boundary.

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

Bt1—10 to 18 inches; yellowish brown (10YR 5/6) channery loam; moderate medium subangular blocky structure; friable; common medium roots; few distinct clay films on faces of peds; 20 percent rock fragments; strongly acid; clear wavy boundary.

Bt2—18 to 45 inches; strong brown (7.5YR 5/6) channery clay loam; moderate medium subangular blocky structure; firm; slightly sticky and slightly plastic when wet; few fine and medium roots; common distinct clay films on faces of peds; 25 percent rock fragments; very strongly acid; gradual wavy boundary.

BC—45 to 59 inches; yellowish brown (10YR 5/6) channery loam; weak coarse subangular blocky structure; firm; 25 percent rock fragments; very strongly acid; clear wavy boundary.

C—59 to 65 inches; yellowish brown (10YR 5/6) channery loam; massive; firm; 30 percent rock fragments; very strongly acid.

Thickness of the solum ranges from 40 to 60 inches. The depth to bedrock is more than 60 inches. The content of rock fragments ranges from 10 to 60 percent, by volume, in individual horizons but averages 15 to 35 percent, by volume, in the control section. Reaction is extremely acid to neutral in the A horizons and extremely acid to strongly acid in the B and C horizons. Most pedons have a stony or very stony surface.

The A horizon has hue of 10YR to 7.5YR, value of 2 to 4, and chroma of 1 to 3. Texture of the fine-earth material is loam, silt loam, or sandy 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. Texture of the fine-earth material is loam, sandy loam, or clay loam. Structure is weak or moderate, fine, medium, or coarse subangular blocky.

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

Sensabaugh Series

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

Sensabaugh soils are on the landscape with the well drained Chagrin and Vandalia soils. Sensabaugh soils have more rock fragments in the control section than Chagrin and Vandalia soils. Sensabaugh and Chagrin soils are subject to occasional flooding. Vandalia soils are not subject to flooding. Chagrin and Sensabaugh soils formed on alluvial flood plains, and Vandalia soils formed in colluvium on footslopes.

Typical pedon of Sensabaugh loam, in an area of meadow; about 2,700 feet north of the confluence of Bull Fork and Tanner Creek; USGS Tanner topographic quadrangle; lat. 38 degrees 59 minutes 58 seconds N. and long. 80 degrees 56 minutes 38 seconds W.

Ap—0 to 7 inches; brown (10YR 4/3) loam; weak medium granular structure; friable; many fine and medium roots; 5 percent rock fragments; slightly acid; abrupt smooth boundary.

Bw1—7 to 19 inches; dark yellowish brown (10YR 4/4) gravelly loam; weak medium subangular blocky structure; friable; many fine roots; 15 percent rock fragments; slightly acid; clear wavy boundary.

Bw2—19 to 27 inches; brown (7.5YR 4/4) gravelly fine sandy loam; weak medium subangular blocky structure; friable; common fine and very fine roots; 30 percent rock fragments; moderately acid; clear wavy boundary.

C—27 to 65 inches; brown (7.5YR 4/4) very gravelly loam; massive; very friable; 50 percent rock fragments; slightly acid.

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

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

The Bw and C horizons have hue of 10YR to 5YR, value of 4 or 5, and chroma of 3 to 6. Texture of the fine-earth material is loam, fine sandy loam, clay loam, silt loam, and silty clay loam. Below a depth of 24 inches, the number of redox concentrations in shades of gray, brown, and yellow range from none to common.

Udorthents

Udorthents are very deep, well drained soils formed in a mixture of soil material and rock fragments that are the result of excavation, fill, or other earthmoving operations. These soils are in areas that have been disturbed by road construction or urban development. Bedrock is exposed in cut areas. If the Udorthents are on floodplains, they are subject to occasional or rare flooding. In many areas they have been covered with concrete or asphalt. Commonly referred to as cut and fill, Udorthents are mainly along Interstate 79 in the eastern part of Gilmer County and in smaller areas near the towns of Glenville and Sand Fork.

Udorthents are on the landscape with the well drained Gilpin, Hackers, Peabody, Upshur, and Vandalia soils. Gilpin, Peabody, Upshur, and Vandalia soils are natural soils that have been disturbed during cuts and fills of road construction. Areas of the Hackers soils along the Little Kanawha River between Glenville and Sand Fork have been raised with fill material and are used for urban construction.

The composition of Udorthents varies greatly, and a typical pedon description is not given. Bedrock is at the surface in some cut areas but extends at a depth of more than 65 inches in fill areas. The type of rock fragments varies from soft shale to hard sandstone. The soils have hue of 10R to 10YR, value of 3 to 6, and chroma of 2 to 8. Texture of the fine-earth material 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 siltstone and shale. The Upshur soils are on ridgetops, benches, and side slopes throughout the survey area. Slopes range from 8 to 35 percent.

Upshur soils are on the landscape with the well drained Fairpoint, Gilpin, Itmann, Janelew, Peabody, Pineville, and Vandalia soils and Udorthents. Gilpin and Peabody soils are moderately deep; Upshur soils are deep; and Fairpoint, Itmann, Janelew, Pineville and Vandalia soils are very deep. Fairpoint, Itmann, and Janelew soils are mine soils. Upshur soils contain more clay in the subsoil than the Gilpin and Pineville soils and more clay in the upper part of the solum than the Vandalia soils. Udorthents are in disturbed cut and fill areas.

Typical pedon of Upshur silt loam, in an area of Gilpin-Upshur complex, 25 to 35 percent slopes, severely eroded, on a wooded ridgetop; 3,700 feet south-southwest of the intersection of Highways 33 and 5 in Glenville; USGS Glenville topographic quadrangle; lat. 38 degrees 55 minutes 28 seconds N. and long. 80 degrees 50 minutes 25 seconds W.

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

A—0 to 1 inch; dark brown (7.5YR 3/4) silt loam; moderate medium granular structure; friable; many fine, medium, and coarse roots; strongly acid; clear wavy boundary.

BA—1 to 6 inches; brown (7.5YR 4/4) silt loam; moderate medium subangular blocky structure; firm; slightly sticky and slightly plastic when wet; many medium and coarse roots; 5 percent soft shale fragments; very strongly acid; clear wavy boundary.

Bt1—6 to 17 inches; reddish brown (5YR 4/4) silty clay; moderate medium and coarse subangular blocky structure; firm; very sticky and very plastic when wet; common medium and coarse roots; common distinct clay films on faces of peds; 5 percent soft shale fragments; very strongly acid; clear wavy boundary.

Bt2—17 to 37 inches; dusky red (2.5YR 3/4) clay; strong medium and coarse subangular blocky structure; very firm; very sticky and very plastic when wet; few medium and coarse roots; many distinct clay films on faces of peds; 20 percent soft shale fragments; very strongly acid; clear wavy boundary.

C—37 to 46 inches; dusky red (2.5YR 3/4) silty clay; massive; very firm; very sticky and very plastic when wet; 50 percent soft shale fragments; strongly acid; clear wavy boundary.

Cr—46+ inches; rippable, red shale.

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

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

The BA horizon has a hue of 7.5YR, value of 4 or 5, and chroma of 4 to 6. Texture of the fine-earth material 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. Texture of the fine-earth material is silty clay or clay.

Some pedons have a BC horizon, which is 5 to 7 inches thick and has hue of 5YR or 2.5YR, value of 3 or 4, and chroma of 3 to 6. Texture of the fine-earth material in this horizon is silty clay loam, silty clay, or clay.

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

Vandalia Series

The Vandalia series consists of very deep, well drained soils formed in colluvium derived from shale, siltstone, and sandstone. The Vandalia soils are on footslopes and colluvial fans. Slope ranges from 15 to 35 percent.

Vandalia soils are on the landscape with the well drained Fairpoint, Gilpin, Itmann, Janelew, Peabody, Pineville, Sensabaugh, and Upshur soils and Udorthents. Fairpoint, Itmann, and Janelew soils are mine soils. Gilpin and Peabody soils are moderately deep, Upshur soils are deep, and Pineville and Vandalia soils are very deep. Vandalia soils contain more clay in the subsoil than Gilpin and Pineville soils and less clay in the upper part of the subsoil than Upshur soils. Udorthents are in disturbed cut and fill areas.

Typical pedon of Vandalia silt loam, 15 to 35 percent slopes, very stony, in a wooded area of Cedar Creek State Park; stones cover 1 to 3 percent of the surface of the map unit; 2,000 feet east of the confluence of Upper Two Run and Cedar Creek; USGS Glenville topographic quadrangle; lat. 38 degrees 52 minutes 54 seconds N. and long. 80 degrees 51 minutes 05 seconds W.

Oi—1 inch to 0; hardwood leaf litter.

A—0 to 4 inches; dark brown (7.5YR 3/2) silt loam; weak fine subangular blocky structure parting to moderate medium granular; friable; many very fine, fine, and medium roots; 10 percent siltstone and sandstone fragments; moderately acid; abrupt smooth boundary.

BA—4 to 7 inches; brown (7.5YR 4/4) silt loam; moderate medium subangular blocky structure; friable; slightly sticky and slightly plastic when wet; many fine, medium, and coarse roots; 10 percent siltstone and sandstone fragments; moderately acid; clear wavy boundary.

Bt1—7 to 19 inches; reddish brown (5YR 4/4) channery silty clay loam; strong medium subangular blocky structure; very firm; sticky and plastic when wet; common fine, medium, and coarse roots; common discontinuous clay films on faces of peds; 15 percent siltstone and sandstone fragments; strongly acid; gradual wavy boundary.

Bt2—19 to 49 inches; reddish brown (5YR 4/4) channery silty clay loam; strong coarse subangular blocky structure; very firm; sticky and plastic when wet; few fine and medium roots; many discontinuous clay films on faces of peds; 25 percent siltstone and sandstone fragments; moderately acid; gradual wavy boundary.

Bt3—49 to 65 inches; dark reddish brown (5YR 3/4) channery silty clay; moderate medium subangular blocky structure; very firm; very sticky and very plastic when wet; few medium roots; many discontinuous clay films on faces of peds; 30 percent siltstone and sandstone fragments; moderately acid.

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

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

The BA horizon and upper part of the Bt horizon have hue of 7.5YR or 5YR, value of 4 or 5, and chroma of 3 to 6. Texture of the fine-earth material is silt loam, clay loam, or silty clay loam.

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 mottled in some pedons. Texture of the fine-earth material is silty clay loam, silty clay, or clay.

Some pedons have a C horizon, which has hue of 5YR, 2.5YR, or 10R and value and chroma of 3 to 6. Texture of the fine-earth material is silty clay loam, silty clay, or clay.

Formation of the Soils

The origin and development of the soils in Gilmer County are described in this section. The five factors of soil formation are listed, and their influence on the soils is described. Also described are the morphology of the soils, as related to horizon nomenclature, the processes involved in horizon development, and the geologic characteristics of the area.

Factors of Soil Formation

The soils in Gilmer County formed as a result of the interaction of five major factors of soil formation—parent material, time, climate, living organisms, and topography. Each factor modifies the effect of the other factors. Parent material, topography, and time have produced the major differences among the soils in Gilmer County. Climate and living organisms generally show their influence throughout broad areas, and their effects are relatively uniform throughout the area.

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. Soils in Gilmer County formed in residuum, colluvium, or alluvium.

Residuum is the oldest parent material in the county. The formation of soils in this material is greatly influenced by resistant bedrock, steepness of slope, and continual soil erosion. Gilpin, Peabody, and Upshur are the dominant soils that formed in residuum. Most of the parent material in the county is residuum derived from rocks of the Dunkard, Monongahela, and Conemaugh Groups. Examples of soils formed in residuum derived from interbedded shale, siltstone, and sandstone include Gilpin soils, which formed in siltstone and sandstone, and Peabody and Upshur soils, which formed in red clay shale.

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

The alluvium on terraces and flood plains was 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. Monongahela soils, which formed in alluvium on terraces, have a moderately well developed profile. The alluvium on flood plains is the youngest parent material in the county. Most of this material is physically well suited to the formation of topsoil, but the soil-forming processes have had little time to operate. As a result, soils on flood plains usually have only a weakly developed profile. Chagrin and Sensabaugh soils are examples of soils on flood plains. Soils on high flood plains, or second bottoms, have a moderately developed profile. Hackers and Kanawha soils are examples of soils on second bottoms.

Climate generally is relatively uniform throughout the county and is not responsible for any major differences in the soils, but it causes the development of horizons in the soil profile. A detailed description of climate is given in the section “General Nature of the County.”

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 and the color of the surface layer, and they are partly responsible for the amount of nutrients in the soil. Earthworms and burrowing animals help to keep the soil open and porous. They also mix organic matter and mineral material by moving the soil to the surface. Bacteria and fungi decompose organic matter and have some influence on the weathering and decomposition of minerals, which causes a release of nutrients for plant food.

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 move through gently sloping and strongly sloping soils. This action favors the formation of deep, moderately well developed or well developed soils. On the steep and very steep hillsides, less water moves through the soils and more water runs off the soils. As a result, the soil material is washed away almost as rapidly as it forms. In many places soils on the hillsides are shallower to bedrock than soils on the gentler slopes.

The topography of Gilmer County is favorable for the formation of soils on flood plains and terraces, and formation is progressing at a rapid rate. Soils on flood plains are weakly developed, mainly because too little time has elapsed since the parent material was deposited.

Morphology of the Soils

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

The A horizon, or surface layer, is the layer of maximum accumulation of organic matter. It is also the layer of maximum leaching, or eluviation, of clay and iron.

The B horizon underlies the A horizon or the A and the E horizons and is commonly 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 is generally 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 altered little by the soil-forming processes.

Many processes are involved in the formation of soil horizons in Gilmer County. 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 are continually taking place and have been 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 have been the main cause of these colors. The B horizon has blocky structure and translocated clay minerals.

A fragipan has formed in the B horizon of the moderately well drained Monongahela soils on terraces. This layer is dense and brittle, has redoximorphic features, and is slowly or very slowly permeable. Most fragipans are grayish in color.

Moderately well drained, somewhat poorly drained, and poorly drained soils commonly have gray colors. These colors are the result of gleying, a process of intense reduction of iron, during soil formation.

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Glossary

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

Ablation till. Loose, permeable till deposited during the final downwasting of glacial ice. Lenses of crudely sorted sand and gravel are common.

AC soil. A soil having only an A and a C horizon. Commonly, such soil formed in recent alluvium or on steep, rocky slopes.

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

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

Alkali (sodic) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Alluvial cone. The material washed down the sides of mountains and hills by ephemeral streams and deposited at the mouth of gorges in the form of a moderately steep, conical mass descending equally in all directions from the point of issue.

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

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

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

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

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

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

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

Arroyo. The flat-floored channel of an ephemeral stream, commonly with very steep to vertical banks cut in alluvium.

Aspect. The direction in which a slope faces.

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

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 2.4
Low	2.4 to 3.2
Moderate	3.2 to 5.2
High	>5.2

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

Badland. Steep or very steep, commonly nonstony, barren land dissected by many intermittent drainage channels. Badland is most common in semiarid and arid regions where streams are entrenched in soft geologic material. Local relief generally ranges from 25 to 500 feet. Runoff potential is very high, and geologic erosion is active.

Bajada. A broad alluvial slope extending from the base of a mountain range out into a basin and formed by coalescence of separate alluvial fans.

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

Basal till. Compact glacial till deposited beneath the ice.

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

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

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

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

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

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

Bisequum. Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Blowout. A shallow depression from which all or most of the soil material has been removed by the wind. A blowout has a flat or irregular floor formed by a resistant layer or by an accumulation of pebbles or cobbles. In some blowouts the water table is exposed.

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

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

Breaks. The steep and very steep broken land at the border of an upland summit that is dissected by ravines.

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

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

Butte. An isolated small mountain or hill with steep or precipitous sides and a top variously flat, rounded, or pointed that may be a residual mass isolated by erosion or an exposed volcanic neck.

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

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

Caliche. A more or less cemented deposit of calcium carbonate in soils of warm-temperate, subhumid to arid areas. Caliche occurs as soft, thin layers in the soil or as hard, thick beds directly beneath the solum, or it is exposed at the surface by erosion.

California bearing ratio (CBR). The load-supporting capacity of a soil as compared to that of standard crushed limestone, expressed as a ratio. First standardized in California. A soil having a CBR of 16 supports 16 percent of the load that would be supported by standard crushed limestone, per unit area, with the same degree of distortion.

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

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

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

Carbolith. Dark colored sedimentary rocks that make a black or very dark (Munsell value of 3 or less) streak or powder. Carbolith includes coal, bone coal, high carbon shales, and high carbon mudstones. In general this material contains at least 25 percent carbonaceous matter oxidizable at 350-400 degrees C.

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

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

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

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

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

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

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

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

Cirque. A semicircular, concave, bowllike area that has steep faces primarily resulting from glacial ice and snow abrasion.

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

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

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

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

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

Coarse textured soil. Sand or loamy sand.

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

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

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

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

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

Compressible (in tables). Excessive decrease in volume of soft soil under load.

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

Congeliturbate. Soil material disturbed by frost action.

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

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

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

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

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

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

Coppice dune. A small dune of fine grained soil material stabilized around shrubs or small trees.

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

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

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

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

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

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

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

Cuesta. A hill or ridge that has a gentle slope on one side and a steep slope on the other; specifically, an asymmetric, homoclinal ridge capped by resistant rock layers of slight or moderate dip.

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

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

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

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

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

Dense layer (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

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

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

Desert pavement. On a desert surface, a layer of gravel or larger fragments that was emplaced by upward movement of the underlying sediments or that remains after finer particles have been removed by running water or the wind.

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

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

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

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

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

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

Drumlin. A low, smooth, elongated oval hill, mound, or ridge of compact glacial till. The longer axis is parallel to the path of the glacier and commonly has a blunt nose pointing in the direction from which the ice approached.

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

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

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

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

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

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

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

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

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

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

Escarpment. A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. Synonym: scarp.

Esker. A narrow, winding ridge of stratified gravelly and sandy drift deposited by a stream flowing in a tunnel beneath a glacier.

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

Excess lime (in tables). Excess carbonates in the soil that restrict the growth of some plants.

Excess salts (in tables). Excess water-soluble salts in the soil that restrict the growth of most plants.

Excess sodium (in tables). Excess exchangeable sodium in the soil. The resulting poor physical properties restrict the growth of plants.

Excess sulfur (in tables). Excessive amount of sulfur in the soil. The sulfur causes extreme acidity if the soil is drained, and the growth of most plants is restricted.

Extrusive rock. Igneous rock derived from deep-seated molten matter (magma) emplaced on the Earth's surface.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grain is grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

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

Fast intake (in tables). The rapid movement of water into the soil.

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

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

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

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

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

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

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

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

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

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

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

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

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

Footer. The concrete foundation of a building that is poured below the soil surface.

Footer drain. The subsurface drain that is placed along the outside edge of the footer to drain away subsurface soil moisture.

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

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

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

Fragile (in tables). A soil that is easily damaged by use or disturbance.

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

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

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

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

Glacial drift. Pulverized and other rock material transported by glacial ice and then deposited. Also, the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash. Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glacial till. Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciofluvial deposits. Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are interbedded or laminated.

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

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

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

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

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

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

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

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

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

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

Head out. To form a flower head.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

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

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

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

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

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

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

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, plants invade following disturbance of the surface.

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

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are:

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Kame. An irregular, short ridge or hill of stratified glacial drift.

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

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

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

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

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

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

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

Lithochromic mottles. Mottles that have inherited their color from the parent rocks.

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

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

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

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.

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

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

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

Mesa. A broad, nearly flat topped and commonly isolated upland mass characterized by summit widths that are more than the heights of bounding erosional scarps.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

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

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

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

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

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

Mollic epipedon. A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

Moraine. An accumulation of earth, stones, and other debris deposited by a glacier. Some types are terminal, lateral, medial, and ground.

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

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

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

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

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

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

Natric horizon. A special kind of argillic horizon that contains enough exchangeable sodium to have an adverse effect on the physical condition of the subsoil.

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

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

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

Organic matter. Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Very low	less than 0.5 percent
Low	0.5 to 1.0 percent
Moderately low	1.0 to 2.0 percent
Moderate	2.0 to 4.0 percent
High	4.0 to 8.0 percent
Very high	more than 8.0 percent

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

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

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

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

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

Pedisediment. A thin layer of alluvial material that mantles an erosion surface and has been transported to its present position from higher lying areas of the erosion surface.

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

Percolation. The downward movement of water through the soil.

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

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

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

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

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

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

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

Pitting (in tables). Pits caused by melting around ice. They form on the soil after plant cover is removed.

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

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

Plateau. An extensive upland mass with relatively flat summit area that is considerably elevated (more than 100 meters) above adjacent lowlands and separated from them on one or more sides by escarpments.

Playa. The generally dry and nearly level lake plain that occupies the lowest parts of closed depressional areas, such as those on intermontane basin floors. Temporary flooding occurs primarily in response to precipitation and runoff.

Plinthite. The sesquioxide-rich, humus-poor, highly weathered mixture of clay with quartz and other diluents. It commonly appears as red mottles, usually in platy, polygonal, or reticulate patterns. Plinthite changes irreversibly to an ironstone hardpan or to irregular aggregates on repeated wetting and drying, especially if it is exposed also to heat from the sun. In a moist soil, plinthite can be cut with a spade. It is a form of laterite.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

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

Poor filter (in tables). Because of rapid or very rapid permeability, the soil may not adequately filter effluent from a waste disposal system.

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

Poor outlets (in tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.

Potential native plant community. See Climax plant community.

Potential rooting depth (effective rooting depth). Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Prescribed burning. Deliberately burning an area for specific management purposes, under the appropriate conditions of weather and soil moisture and at the proper time of day.

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

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

Proper grazing use. Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This practice increases the vigor and reproduction capacity of the key plants and promotes the accumulation of litter and mulch necessary to conserve soil and water.

Range condition. The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor on the basis of how much the present plant community has departed from the potential.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Range site. An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

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

Ultra acid	less than 3.5
Extremely acid	3.5 to 4.4
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly alkaline	7.4 to 7.8

Moderately alkaline .... 7.9 to 8.4
Strongly alkaline .... 8.5 to 9.0
Very strongly alkaline .... 9.1 and higher

Red beds. Sedimentary strata that are mainly red and are made up largely of sandstone and shale.
Redoximorphic concentrations. Nodules, concretions, soft masses, pore linings, and other features resulting from the accumulation of iron or manganese oxide. An indication of chemical reduction and oxidation resulting from saturation.
Redoximorphic depletions. Low-chroma zones from which iron and manganese oxide or a combination of iron and manganese oxide and clay has been removed. These zones are indications of the chemical reduction of iron resulting from saturation.
Redoximorphic features. Redoximorphic concentrations, redoximorphic depletions, reduced matrices, a positive reaction to alpha,alpha-dipyridyl, and other features indicating the chemical reduction and oxidation of iron and manganese compounds resulting from saturation.
Reduced matrix. A soil matrix that has low chroma in situ because of chemically reduced iron (Fe II). The chemical reduction results from nearly continuous wetness. The matrix undergoes a change in hue or chroma within 30 minutes after exposure to air as the iron is oxidized (Fe III). A type of redoximorphic feature.
Regolith. The unconsolidated mantle of weathered rock and soil material on the Earth's surface; the loose earth material above the solid rock.
Relief. The elevations or inequalities of a land surface, considered collectively.
Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.
Rill. A steep-sided channel resulting from accelerated erosion. A rill generally is a few inches deep and not wide enough to be an obstacle to farm machinery.
Road cut. A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.
Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.
Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.
Root zone. The part of the soil that can be penetrated by plant roots.
Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.
Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.
Salty water (in tables). Water that is too salty for consumption by livestock.
Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.
Sandstone. Sedimentary rock containing dominantly sand-sized particles.
Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.
Saprolite. Unconsolidated residual material underlying the soil and grading to hard bedrock below.
Saturation. Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

Scarification. The act of abrading, scratching, loosening, crushing, or modifying the surface to increase water absorption or to provide a more tillable soil.

Second bottom. The first terrace above the normal flood plain (or first bottom) of a river.

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

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

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shrink-swell (in tables). The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silica-sesquioxide ratio. The ratio of the number of molecules of silica to the number of molecules of alumina and iron oxide. The more highly weathered soils or their clay fractions in warm-temperate, humid regions, and especially those in the tropics, generally have a low ratio.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Sinkhole. A depression in the landscape where limestone has been dissolved.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slick spot. A small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil generally is silty or clayey, is slippery when wet, and is low in productivity.

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

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. In this survey, classes for simple slopes are as follows:

Nearly level	0 to 3 percent
Gently sloping	3 to 8 percent
Strongly sloping	8 to 15 percent
Moderately steep	15 to 25 percent
Steep	25 to 35 percent
Very steep	35 percent and higher

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Sloughed till. Water-saturated till that has flowed slowly downhill from its original place of deposit by glacial ice. It may rest on other till, on glacial outwash, or on a glaciolacustrine deposit.

Slow intake (in tables). The slow movement of water into the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Sodic (alkali) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Sodicity. The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium adsorption ratio (SAR) of a saturation extract, or the ratio of Na^{+} to $Ca^{++} + Mg^{++}$. The degrees of sodicity and their respective ratios are:

Slight	less than 13:1
Moderate	13-30:1
Strong	more than 30:1

Soft bedrock. Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

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

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

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

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

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

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

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.
Stripcropping. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to wind erosion and water erosion.
Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).
Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind erosion and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.
Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.
Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.
Substratum. The part of the soil below the solum.
Subsurface layer. Technically, the E horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.
Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.
Summer fallow. The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.
Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the “plow layer,” or the “Ap horizon.”
Surface soil. The A, E, AB, and EB horizons, considered collectively. It includes all subdivisions of these horizons.
Talus. Fragments of rock and other soil material accumulated by gravity at the foot of cliffs or steep slopes.
Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior. Soils are recognized as taxadjuncts only when one or more of their characteristics are slightly outside the range defined for the family of the series for which the soils are named.
Terminal moraine. A belt of thick glacial drift that generally marks the termination of important glacial advances.
Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field generally is built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.
Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.
Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying “coarse,” “fine,” or “very fine.”

Thin layer (in tables). Otherwise suitable soil material that is too thin for the specified use.
Till plain. An extensive area of nearly level to undulating soils underlain by glacial till.
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.
Too arid (in tables). The soil is dry most of the time, and vegetation is difficult to establish.
Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.
Toxicity (in tables). Excessive amount of toxic substances, such as sodium or sulfur, that severely hinder establishment of vegetation or severely restrict plant growth.
Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.
Tuff. A compacted deposit that is 50 percent or more volcanic ash and dust.
Unstable fill (in tables). Risk of caving or sloughing on banks of fill material.
Upland. Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.
Valley fill. In glaciated regions, material deposited in stream valleys by glacial meltwater. In nonglaciated regions, alluvium deposited by heavily loaded streams.
Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.
Varve. A sedimentary layer or a lamina or sequence of laminae deposited in a body of still water within a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by meltwater streams, in a glacial lake or other body of still water in front of a glacier.
Water bars. Smooth, shallow ditches or depressional areas that are excavated at an angle across a sloping road. They are used to reduce the downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.
Weathering. All physical and chemical changes produced in rocks or other deposits at or near the Earth’s surface by atmospheric agents. These changes result in disintegration and decomposition of the material.
Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.
Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.
Windthrow. The uprooting and tipping over of trees by the wind.

Tables

Table 1.--Temperature and Precipitation

(Recorded in the period 1961-90 at Glenville, WV)

Month	Temperature: Average daily maximum	Temperature: Average daily minimum	Temperature: Average daily	Temperature: 2 years in 10 will have-- Maximum temperature higher than--	Temperature: 2 years in 10 will have-- Minimum temperature lower than--	Temperature: Average number of growing degree days*	Precipitation: Average	Precipitation: 2 years in 10 will have-- Less than--	Precipitation: 2 years in 10 will have-- More than--	Precipitation: Average number of days with 0.10 inch or more	Precipitation: Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January	41.0	19.4	30.2	71	1	58	3.13	1.85	4.27	9	10.0
February	45.1	21.6	33.4	73	1	75	2.97	1.56	4.20	8	7.4
March	54.6	29.1	41.9	83	8	162	3.86	2.49	5.10	9	4.0
April	66.8	38.5	52.7	88	19	387	3.72	2.43	4.89	10	.4
May	75.9	47.3	61.6	91	28	670	4.14	2.46	5.63	9	.0
June	82.4	56.5	69.5	93	39	885	3.87	2.14	5.40	8	.0
July	85.3	61.4	73.4	95	46	1035	5.12	3.24	6.82	9	.0
August	84.2	60.2	72.2	94	45	998	4.26	2.36	5.94	8	.0
September	79.0	52.9	66.0	93	34	780	3.28	1.90	4.50	6	.0
October	68.4	40.6	54.5	85	21	456	3.22	1.32	4.82	7	.0
November	55.7	31.3	43.5	80	10	160	3.30	1.77	4.63	8	1.4
December	45.1	24.5	34.8	74	10	86	3.42	1.91	4.75	9	4.4
Yearly:											
Average	65.3	40.3	52.8	---	---	---	---	---	---	---	---
Extreme	---	---	---	97	10	---	---	---	---	---	---
Total	---	---	---	---	---	5,752	44.29	39.17	48.43	100	27.6

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

Table 2.--Freeze Dates in Spring and Fall

(Recorded in the period 1961-90 at Glenville, WV)

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. 28	May 8	May 24
2 years in 10 later than--	Apr. 22	May 4	May 18
5 years in 10 later than--	Apr. 11	Apr. 25	May 7
First freezing temperature in fall:			
1 year in 10 earlier than--	Oct. 14	Oct. 6	Sept. 26
2 years in 10 earlier than--	Oct. 20	Oct. 12	Oct. 1
5 years in 10 earlier than--	Nov. 1	Oct. 23	Oct. 10

Table 3.--Growing Season

(Recorded in the period 1961-90 at Glenville, WV)

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	178	157	134
8 years in 10	187	165	141
5 years in 10	203	180	155
2 years in 10	219	196	169
1 year in 10	228	204	177

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

Map symbol	Soil name	Acres	Percent
Cg	Chagrin loam	3,595	1.7
FpE	Fairpoint channery clay loam, steep, very stony	970	0.4
GpF3	Gilpin-Peabody complex, 35 to 70 percent slopes, severely eroded, very stony	133,330	61.3
GsF	Gilpin-Pineville complex, 35 to 70 percent slopes, very stony	6,765	3.1
GuC3	Gilpin-Upshur complex, 8 to 15 percent slopes, severely eroded	1,190	0.5
GuD3	Gilpin-Upshur complex, 15 to 25 percent slopes, severely eroded	13,420	6.2
GuE3	Gilpin-Upshur complex, 25 to 35 percent slopes, severely eroded	31,005	14.3
Ha	Hackers silt loam	1,005	0.5
ItE	Itmann channery clay loam, steep	110	0.1
JnE	Janelew channery silt loam, steep	225	0.1
Ka	Kanawha loam	1,045	0.4
MoB	Monongahela silt loam, 3 to 8 percent slopes	360	0.2
MoC	Monongahela silt loam, 8 to 15 percent slopes	415	0.2
PvE	Pineville loam, 25 to 35 percent slopes, very stony	655	0.3
Sb	Sensabaugh loam	7,140	3.3
Ud	Udorthents, smoothed	305	0.1
VaD	Vandalia silt loam, 15 to 25 percent slopes	2,820	1.3
VsE	Vandalia silt loam, 15 to 35 percent slopes, very stony	12,685	5.8
W	Water	360	0.2
	Total	217,400	100.0

Table 5.--Land Capability and Yields Per Acre of Crops and Pasture

(Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil)

Soil name and map symbol	Land capability	Corn	Oats	Wheat	Grass-legume hay	Alfalfa hay	Kentucky bluegrass
		Bu	Bu	Bu	Tons	Tons	AUM*
Cg-------------- Chagrin	IIw	125	75	45	3.5	5.0	5.5
FpE------------- Fairpoint	VIIe	---	---	---	---	---	---
GpF3------------ Gilpin-Peabody	VIIs	---	---	---	---	---	---
GsF------------- Gilpin-Pineville	VIIs	---	---	---	---	---	---
GuC3------------ Gilpin-Upshur	IVe	85	60	35	3.0	3.8	4.5
GuD3------------ Gilpin-Upshur	VIe	---	---	---	3.0	3.0	3.5
GuE3------------ Gilpin-Upshur	VIIe	---	---	---	---	---	---
Ha-------------- Hackers	I	135	80	50	3.5	5.0	5.5
ItE------------- Itmann	VIIs	---	---	---	---	---	---
JnE------------- Janelew	VIe	---	---	---	---	---	3.5
Ka-------------- Kanawha	I	135	80	50	3.5	5.0	5.5
MoB------------- Monongahela	IIe	110	65	40	3.0	3.5	4.5
MoC------------- Monongahela	IIIe	90	60	35	3.0	3.0	4.5
PvE------------- Pineville	VIIs	---	---	---	---	---	---
Sb-------------- Sensabaugh	IIw	105	65	45	3.5	3.0	4.5
VaD------------- Vandalia	IVe	90	55	30	2.5	4.0	4.0
VsE------------- 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 6.--Capability Classes and Subclasses

(Miscellaneous areas are excluded. Absence of an entry indicates no acreage)

Class	Total acreage	Major management concerns (Subclass)		
		Erosion (e)	Wetness (w)	Soil problem (s)
		Acres	Acres	Acres
I	2,050	---	---	---
II	11,095	360	10,735	---
III	415	415	---	---
IV	4,010	4,010	---	---
V	---	---	---	---
VI	13,645	13,645	---	---
VII	185,520	31,975	---	153,545
VIII	---	---	---	---

Table 7.--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
Cg	Chagrin loam
Ha	Hackers silt loam
Ka	Kanawha loam
Sb	Sensabaugh loam

Table 8.--Woodland Management and Productivity

(Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available)

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Average annual growth*		
		Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Common trees	Site index	Cubic feet/ac	Board feet/ac	Cords/ac
Cg-------------- Chagrin	5A	Slight	Slight	Slight	Severe	Northern red oak----	86	68	292	0.89
						Yellow-poplar-------	96	100	524	1.15
FpE------------- Fairpoint	4R	Moderate	Moderate	Moderate	Moderate	---	---	---	---	---
GpF3**:										
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
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
GsF**:										
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	Moderate	Moderate	Northern red oak----	86	68	292	.89
						Yellow-poplar-------	108	121	720	1.42
						Black oak-----------	85	67	285	.88
GuC3**:										
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
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
GuD3**:										
Gilpin---------	4R	Moderate	Moderate	Slight	Moderate	Northern red oak----	80	62	250	.81
						Yellow-poplar-------	95	98	510	1.14
						Virginia pine-------	66	102	---	.96

See footnotes 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
GuD3**:										
Upshur---------	4R	Moderate	Severe	Slight	Moderate	Northern red oak----	70	52	180	0.67
						Yellow-poplar-------	90	90	440	1.04
						Eastern white pine--	90	166	743	1.67
						Virginia pine-------	70	109	---	1.16
GuE3**:										
Gilpin---------	4R	Moderate	Moderate	Slight	Moderate	Northern red oak----	80	62	250	.81
						Yellow-poplar-------	95	98	510	1.14
						Virginia pine-------	66	102	---	.96
Upshur---------	4R	Severe	Severe	Slight	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
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
ItE------------- Itmann	---	Moderate	Moderate	Severe	Slight	---	---	---	---	---
							---	---	---	---
JnE------------- Janelew	4R	Moderate	Moderate	Slight	Moderate	Northern red oak----	75	57	215	.74
Ka-------------- Kanawha	4A	Slight	Slight	Slight	Severe	Northern red oak----	80	62	250	.81
						Black oak-----------	80	62	250	.81
						Yellow-poplar-------	90	90	440	1.04
						White ash-----------	80	98	---	---
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
MoC------------- Monongahela	4A	Moderate	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
PvE------------- Pineville	5R	Moderate	Moderate	Moderate	Moderate	Northern red oak----	86	68	292	.89
						Yellow-poplar-------	108	121	720	1.42
						Black oak-----------	85	67	285	.88

See footnotes at end of table.

Table 8.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Plant competition	Potential productivity: Common trees	Potential productivity: Site index	Average annual growth*: Cubic feet/ac	Average annual growth*: Board feet/ac	Average annual growth*: Cords/ac
Sb-------------- Sensabaugh	5A	Slight	Slight	Moderate	Severe	Northern red oak----	85	67	285	0.88
						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
VaD, VsE-------- 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 using the International 1/4 log rule and standard rough cords. This information should be used for planning only.

** See description of the map unit for composition and behavior characteristics of the map unit.

Table 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
Cg: Chagrin	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: flooding.
FpE: Fairpoint	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope.	Severe: small stones, slope.
GpF3*:					
Gilpin	Severe: slope, small stones.	Severe: slope, small stones.	Severe: large stones, slope, small stones.	Severe: slope.	Severe: small stones, large stones, slope.
Peabody	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
GsF*:					
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.
GuC3*:					
Gilpin	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope, thin layer.
Upshur	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
GuD3*:					
Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Upshur	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
GuE3*:					
Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Upshur	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
Ha: Hackers	Severe: flooding.	Slight	Slight	Slight	Slight.
ItE: Itmann	Variable	Variable	Variable	Variable	Variable.

See footnote at end of table.

Table 9.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
JnE: Janelew	Variable	Variable	Variable	Variable	Variable.
Ka: Kanawha	Severe: flooding.	Slight	Slight	Slight	Slight.
MoB: Monongahela	Moderate: wetness.	Moderate: wetness.	Moderate: slope, small stones.	Severe: erodes easily.	Moderate: wetness.
MoC: Monongahela	Moderate: slope, wetness.	Moderate: slope, wetness.	Severe: slope.	Severe: erodes easily.	Moderate: wetness, slope.
PvE: Pineville	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Severe: slope.	Severe: slope.
Sb: Sensabaugh	Severe: flooding.	Slight	Moderate: small stones.	Slight	Moderate: flooding.
VaD: Vandalia	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
VsE: Vandalia	Severe: slope.	Severe: slope.	Severe: large stones, slope, small stones.	Severe: slope.	Severe: slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

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
Cg: Chagrin	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
FpE: Fairpoint	Very poor.	Very poor.	Poor	Poor	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.
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.
GsF*:										
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.
GuC3*:										
Gilpin	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
Upshur	Fair	Good	Fair	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
GuD3*:										
Gilpin	Poor	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Upshur	Poor	Fair	Fair	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
GuE3*:										
Gilpin	Very poor.	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Upshur	Very poor.	Fair	Fair	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Ha: Hackers	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
ItE: Itmann	Very poor.	Very poor.	Poor	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
JnE: Janelew	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Ka: Kanawha	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.

See footnote at end of table.

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
MoC------------ Monongahela	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
PvE------------ Pineville	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Sb------------- Sensabaugh	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
VaD------------ Vandalia	Poor	Fair	Fair	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
VsE------------ Vandalia	Very poor.	Poor	Fair	Good	Good	Very poor.	Very poor.	Poor	Fair	Very poor.

* See description of the map unit for composition and behavior characteristics of the map unit.

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
Cg----------------- Chagrin	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
FpE---------------- Fairpoint	Severe: slope.	Severe: slope, unstable fill.	Severe: slope, unstable fill.	Severe: slope, unstable fill.	Severe: slope, unstable fill.	Severe: small stones, droughty, slope.
GpF3*:						
Gilpin--------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, large stones, slope.
Peabody-------------	Severe: slope.	Severe: shrink-swell, slope, slippage.	Severe: slope, shrink-swell, slippage.	Severe: shrink-swell, slope, slippage.	Severe: shrink-swell, low strength, slope.	Severe: slope.
GsF*:						
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.
GuC3*:						
Gilpin--------------	Moderate: slope, depth to rock.	Moderate: slope.	Moderate: slope, depth to rock.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope, thin layer.
Upshur--------------	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: slope, shrink-swell, slippage.	Severe: shrink-swell, low strength.	Moderate: slope.
GuD3*, GuE3*:						
Gilpin--------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

See footnote at end of table.

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
GuD3*, GuE3*:						
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.
Ha: Hackers	Slight	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: low strength, flooding, frost action.	Slight.
ItE: Itmann	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Variable.
JnE: Janelew	Variable	Variable	Variable	Variable	Variable	Variable.
Ka: Kanawha	Slight	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding, frost action.	Slight.
MoB: Monongahela	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness, slope.	Moderate: wetness, frost action.	Moderate: wetness.
MoC: Monongahela	Severe: wetness.	Moderate: wetness, slope.	Severe: wetness.	Severe: slope.	Moderate: wetness, slope, frost action.	Moderate: wetness, slope.
PvE: Pineville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Sb: Sensabaugh	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
UaD, VsE: Vandalia	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

Table 12.--Sanitary Facilities

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," 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
Cg-------------- Chagrin	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: too clayey.
FpE------------- Fairpoint	Severe: percs slowly, slope, unstable fill.	Severe: slope, unstable fill.	Severe: slope, unstable fill.	Severe: slope, unstable fill.	Severe: small stones, slope.
GpF3*:					
Gilpin---------	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, small stones, slope.
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.	Severe: depth to rock, too clayey, hard to pack.
GsF*:					
Gilpin---------	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, small stones, slope.
Pineville------	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: slope.
GuC3*:					
Gilpin---------	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Severe: area reclaim, thin layer.
Upshur---------	Severe: percs slowly.	Severe: slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock, slope.	Severe: too clayey, hard to pack.
GuD3*, GuE3*:					
Gilpin---------	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope, area reclaim, thin layer.
Upshur---------	Severe: slope, percs slowly, slippage.	Severe: slope.	Severe: depth to rock, slope, too clayey.	Severe: slope, slippage.	Severe: too clayey, hard to pack, slope.
Ha-------------- Hackers	Moderate: flooding.	Slight----------	Moderate: flooding, too clayey.	Moderate: flooding.	Moderate: too clayey.
ItE------------- Itmann	Variable---------	Variable---------	Variable---------	Variable---------	Variable.

See footnote at end of table.

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
JnE------------- Janelew	Variable---------	Variable---------	Variable---------	Variable---------	Variable.
Ka-------------- Kanawha	Moderate: flooding.	Moderate: seepage.	Moderate: flooding, too clayey.	Moderate: flooding.	Moderate: too clayey.
MoB------------- Monongahela	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
MoC------------- Monongahela	Severe: wetness, percs slowly.	Severe: slope, wetness.	Severe: wetness.	Moderate: wetness, slope.	Moderate: slope, wetness.
PvE------------- Pineville	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: slope.
Sb-------------- Sensabaugh	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage.	Moderate: small stones.
VaD, VsE-------- Vandalia	Severe: percs slowly, slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Severe: too clayey, hard to pack, slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

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
Cg----------------- Chagrin	Good----------------	Improbable: excess fines.	Improbable: excess fines.	Good.
FpE---------------- Fairpoint	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
GpF3*:				
Gilpin-------------	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Peabody------------	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
GsF*:				
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.	Severe: small stones, slope.
GuC3*:				
Gilpin-------------	Poor: thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Upshur-------------	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
GuD3*:				
Gilpin-------------	Poor: thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Upshur-------------	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
GuE3*:				
Gilpin-------------	Poor: thin layer, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Upshur-------------	Poor: shrink-swell, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
Ha----------------- Hackers	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.

See footnote at end of table.

Table 13.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
ItE--------------- Itmann	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
JnE--------------- Janelew	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
Ka---------------- Kanawha	Good----------------	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
MoB, MoC---------- Monongahela	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
PvE--------------- Pineville	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Severe: small stones, slope.
Sb---------------- Sensabaugh	Good----------------	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
VaD--------------- Vandalia	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, slope.
VsE--------------- Vandalia	Poor: shrink-swell, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

Table 14.--Water Management

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

Soil name and map symbol	Limitations for-- Pond reservoir areas	Limitations for-- Embankments, dikes, and levees	Features affecting-- Drainage	Features affecting-- Terraces and diversions	Features affecting-- Grassed waterways
Cg: Chagrin	Moderate: seepage.	Severe: piping.	Deep to water	Favorable	Favorable.
FpE: Fairpoint	Severe: slope.	Severe: piping.	Deep to water	Slope, large stones, slippage.	Large stones, slope.
GpF3*:					
Gilpin	Severe: slope.	Severe: piping.	Deep to water	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
Peabody	Severe: slope.	Severe: piping.	Deep to water	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
GsF*:					
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.
GuC3*, GuD3*, GuE3*:					
Gilpin	Severe: slope.	Severe: thin layer.	Deep to water	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
Upshur	Severe: slope, slippage.	Severe: hard to pack.	Deep to water	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
Ha: Hackers	Moderate: seepage.	Severe: piping.	Deep to water	Favorable	Favorable.
ItE: Itmann	Severe: seepage, slope.	Severe: seepage.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
JnE: Janelew	Severe: slope.	Moderate: large stones.	Deep to water	Slope, large stones.	Large stones, slope.
Ka: Kanawha	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.
MoC: Monongahela	Severe: slope.	Severe: piping.	Percs slowly, slope.	Slope, erodes easily, wetness.	Slope, erodes easily, rooting depth.

See footnote at end of table.

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
PvE: Pineville	Severe: seepage, slope.	Severe: piping.	Deep to water	Slope	Slope.
Sb: Sensabaugh	Severe: seepage.	Moderate: large stones.	Deep to water	Large stones	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.
VsE: Vandalia	Severe: slope.	Severe: hard to pack.	Deep to water	Slope, percs slowly.	Slope, percs slowly.

* See description of the map unit for composition and behavior characteristics of the map unit.

Table 15.--Engineering Index Properties

(The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated)

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
Cg---------------- Chagrin	0-6	Loam-------------	ML, CL, CL-ML	A-4	0	95-100	85-100	80-100	70-90	20-35	2-10
	6-41	Silt loam, loam, sandy loam.	ML, SM	A-4, A-2, A-6	0	90-100	75-100	55-90	30-80	20-40	NP-14
	41-65	Stratified silt loam to gravelly fine sand.	ML, SM, SP-SM	A-4, A-2	0	75-100	65-100	40-85	10-80	20-40	NP-10
FpE-------------- Fairpoint	0-2	Channery clay loam.	GC, SC, CL	A-6, A-7	5-20	65-90	55-80	45-80	35-75	35-50	12-24
	2-65	Very channery clay loam, extremely channery clay loam, extremely channery loam.	GC, SC, CL, CL-ML	A-4, A-6, A-7, A-2	15-30	55-75	25-65	20-65	15-60	25-50	4-24
GpF3*:											
Gilpin----------	0-1	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
	1-22	Channery silt loam, channery loam, 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
	22-25	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
	25	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Peabody---------	0-1	Very stony silt loam.	CL-ML, CL	A-4, A-6	3-10	95-100	90-100	80-100	65-90	25-35	5-14
	1-31	Silty clay loam, silty clay, channery silty clay.	CL, CH	A-6, A-7	0	95-100	90-100	80-100	75-95	35-55	15-30
	31-36	Extremely channery silty clay loam, very channery silty clay, channery silty clay.	GC, SC	A-6, A-7, A-2	0	50-100	20-45	15-45	15-45	30-55	11-30
	36	Weathered bedrock	---	---	---	---	---	---	---	---	---

See footnote at end of table.

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	
GsF*:											
Gilpin----------	0-1	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
	1-22	Channery silt loam, channery loam, 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
	22-25	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
	25	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Pineville-------	0-5	Very stony loam	ML, CL-ML, SM, SC-SM	A-2, A-4	3-15	55-90	50-85	45-80	30-75	25-35	4-10
	5-59	Loam, channery clay loam, channery loam.	CL, CL-ML, SC, SC-SM	A-2, A-4, A-6	0-10	55-85	50-80	45-75	30-65	25-40	6-15
	59-65	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
GuC3*, GuD3*, GuE3*:											
Gilpin---------	0-1	Silt loam--------	CL, CL-ML	A-4, A-6	0-5	80-95	75-90	70-85	65-80	20-40	4-15
	1-22	Channery silt loam, silt loam, 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
	22-25	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
	25	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

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	
GuC3*, GuD3*, GuE3*:											
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
	6-37	Silty clay, channery clay.	MH, CH, CL	A-7	0	95-100	95-100	90-100	85-100	45-70	20-40
	37-46	Silty clay loam, very channery silty clay, clay.	CL, ML, MH, CH	A-6, A-7	0	80-100	65-100	60-100	55-95	35-55	11-25
	46	Weathered bedrock	---	---	---	---	---	---	---	---	---
Ha--------------- Hackers	0-6	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	90-100	90-100	75-100	60-90	20-35	3-12
	6-65	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
ItE-------------- Itmann	0-9	Channery clay loam.	ML, CL	A-4, A-6	0-10	55-80	50-75	45-75	35-70	30-40	10-18
	9-65	Very channery sandy loam, very channery loam, extremely channery loam.	GM, GM-GC	A-1, A-2	0-15	30-55	25-50	20-45	10-35	15-25	NP-7
JnE-------------- Janelew	0-2	Channery silt loam.	ML, CL, CL-ML, GM-GC	A-4, A-6	0-5	55-80	50-75	45-70	40-65	20-35	4-11
	2-65	Extremely channery silty clay loam, very channery silt loam.	SC, GC	A-2, A-4, A-6	10-25	35-70	30-65	30-60	25-50	25-40	8-14
Ka--------------- Kanawha	0-7	Loam------------	ML, CL, CL-ML	A-4	0	80-100	75-100	65-100	50-90	20-35	2-10
	7-13	Loam, silt loam.	ML, CL, SM, SC	A-4, A-6, A-2	0	80-100	75-100	50-100	30-90	20-35	2-12
	13-65	Loam, sandy clay loam, clay loam.	SC, CL, ML, SM	A-2, A-4, A-6	0	80-100	75-100	60-100	25-80	20-40	3-15

See footnote at end of table.

Table 15.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
MoB, MoC--------- Monongahela	0-11	Silt loam--------	ML, SM, CL-ML, SC-SM	A-4	0-5	90-100	85-100	75-100	45-90	20-35	1-10
	11-25	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
	25-65	Silt loam, 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
PvE-------------- Pineville	0-5	Very stony loam	ML, CL-ML, SM, SC-SM	A-2, A-4	3-15	55-90	50-85	45-80	30-75	25-35	4-10
	5-59	Loam, channery clay loam, channery loam.	CL, CL-ML, SC, SC-SM	A-2, A-4, A-6	0-10	55-85	50-80	45-75	30-65	25-40	6-15
	59-65	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
Sb--------------- Sensabaugh	0-7	Loam------------	CL-ML, CL, ML	A-4	0-5	90-100	75-95	65-85	55-75	16-29	3-9
	7-27	Gravelly loam, gravelly fine sandy loam, gravelly silty clay loam.	CL-ML, CL, SC-SM, GC	A-4, A-6	2-18	70-95	55-90	45-75	35-65	20-35	5-14
	27-65	Very gravelly loam, 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

See footnote at end of table.

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	
VaD-------------- Vandalia	0-7	Silt loam--------	ML, CL	A-4, A-6, A-7	0-5	80-100	75-100	70-95	50-90	25-45	5-20
	7-65	Channery silty clay loam, channery silty clay, clay.	CL, CH, ML	A-6, A-7	0-5	75-100	70-95	65-90	60-85	35-55	15-30
VsE-------------- Vandalia	0-7	Very stony silt loam.	ML, CL	A-4, A-6, A-7	5-10	65-95	60-80	55-75	55-65	25-45	5-20
	7-65	Channery silty clay loam, clay loam, channery silty clay.	MH, CL, CH, ML	A-6, A-7	0-5	70-100	70-95	65-90	60-85	35-55	15-30

* See description of the map unit for composition and behavior characteristics of the map unit.

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		Organic matter
								K	T	
	In	Pct	g/cc	In/hr	In/in	pH				Pct
Cg--------------- Chagrin	0-6	10-27	1.20-1.40	0.6-2.0	0.20-0.24	5.6-7.3	Low----------	0.32	5	2-4
	6-41	18-30	1.20-1.50	0.6-2.0	0.14-0.20	5.6-7.3	Low----------	0.32		
	41-65	5-25	1.20-1.40	0.6-2.0	0.08-0.20	5.6-7.3	Low----------	0.32		
FpE-------------- Fairpoint	0-2	27-35	1.45-1.65	0.2-0.6	0.06-0.15	5.6-7.3	Moderate-----	0.28	5	<.5
	2-65	18-35	1.60-1.80	0.2-0.6	0.03-0.10	5.6-7.3	Moderate-----	0.28		
GpF3*:										
Gilpin----------	0-1	15-27	1.20-1.40	0.6-2.0	0.08-0.14	3.6-5.5	Low----------	0.24	3	.5-4
	1-22	18-35	1.20-1.50	0.6-2.0	0.12-0.16	3.6-5.5	Low----------	0.24		
	22-25	15-35	1.20-1.50	0.6-2.0	0.08-0.12	3.6-5.5	Low----------	0.24		
	25	---	---	0.2-2.0	---	---	-------------	----		
Peabody---------	0-1	15-27	1.20-1.40	0.6-2.0	0.10-0.14	4.5-6.5	Low----------	0.37	3	1-4
	1-31	35-50	1.30-1.60	0.06-0.6	0.10-0.14	4.5-6.5	High---------	0.32		
	31-36	27-50	1.30-1.60	0.06-0.6	0.10-0.14	4.5-7.3	High---------	0.32		
	36	---	---	---	---	---	-------------	----		
GsF*:										
Gilpin----------	0-1	15-27	1.20-1.40	0.6-2.0	0.08-0.14	3.6-5.5	Low----------	0.24	3	.5-4
	1-22	18-35	1.20-1.50	0.6-2.0	0.12-0.16	3.6-5.5	Low----------	0.24		
	22-25	15-35	1.20-1.50	0.6-2.0	0.08-0.12	3.6-5.5	Low----------	0.24		
	25	---	---	0.2-2.0	---	---	-------------	----		
Pineville-------	0-5	15-25	1.00-1.30	0.6-2.0	0.12-0.18	3.6-7.3	Low----------	0.20	4	.5-5
	5-59	18-30	1.30-1.60	0.6-2.0	0.08-0.14	3.6-5.5	Low----------	0.15		
	59-65	15-30	1.30-1.60	0.6-6.0	0.06-0.14	3.6-5.5	Low----------	0.15		
GuC3*, GuD3*, GuE3*:										
Gilpin---------	0-1	15-27	1.20-1.40	0.6-2.0	0.12-0.18	3.6-5.5	Low----------	0.32	3	.5-4
	1-22	18-35	1.20-1.50	0.6-2.0	0.12-0.16	3.6-5.5	Low----------	0.24		
	22-25	15-35	1.20-1.50	0.6-2.0	0.08-0.12	3.6-5.5	Low----------	0.24		
	25	---	---	0.2-2.0	---	---	-------------	----		
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
	6-37	40-55	1.30-1.60	0.06-0.2	0.10-0.14	4.5-8.4	High---------	0.32		
	37-46	27-45	1.30-1.60	0.06-0.2	0.08-0.12	5.1-8.4	Moderate-----	0.32		
	46	---	---	---	---	---	-------------	----		

See footnote at end of table.

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
Ha--------------- Hackers	0-6	15-27	1.20-1.40	0.6-2.0	0.18-0.24	5.1-6.5	Low----------	0.32	4	2-4
	6-65	18-35	1.30-1.50	0.6-2.0	0.12-0.18	5.1-6.5	Moderate-----	0.37		
ItE-------------- Itmann	0-9	27-40	1.30-1.55	0.6-6.0	0.08-0.16	5.6-7.3	Moderate-----	0.37	3	<.5
	9-65	4-15	1.00-1.30	2.0-20	0.05-0.12	3.6-5.5	Low----------	0.32		
JnE-------------- Janelew	0-2	18-30	1.65-1.95	0.2-2.0	0.13-0.16	6.1-7.8	Low----------	0.24	5	1-5
	2-65	23-35	1.65-1.95	0.2-2.0	0.09-0.13	6.6-8.4	Moderate-----	0.20		
Ka--------------- Kanawha	0-7	10-20	1.20-1.40	0.6-2.0	0.16-0.22	5.1-6.0	Low----------	0.32	4	2-4
	7-13	10-25	1.30-1.50	0.6-2.0	0.12-0.20	5.1-6.0	Low----------	0.32		
	13-65	18-35	1.30-1.50	0.6-2.0	0.14-0.18	5.1-7.3	Low----------	0.28		
MoB, MoC--------- Monongahela	0-11	10-27	1.20-1.40	0.6-2.0	0.18-0.24	4.5-7.3	Low----------	0.43	3	2-4
	11-25	18-35	1.30-1.50	0.6-2.0	0.14-0.18	4.5-7.3	Low----------	0.43		
	25-65	18-35	1.30-1.60	0.06-0.6	0.08-0.12	4.5-5.5	Low----------	0.43		
PvE-------------- Pineville	0-5	15-25	1.00-1.30	0.6-2.0	0.12-0.18	3.6-7.3	Low----------	0.20	4	.5-5
	5-59	18-30	1.30-1.60	0.6-2.0	0.08-0.14	3.6-5.5	Low----------	0.15		
	59-65	15-30	1.30-1.60	0.6-6.0	0.06-0.14	3.6-5.5	Low----------	0.15		
Sb--------------- Sensabaugh	0-7	8-25	1.25-1.40	0.6-6.0	0.12-0.18	5.6-7.8	Low----------	0.24	5	1-3
	7-27	18-35	1.30-1.50	0.6-6.0	0.10-0.16	5.6-7.8	Low----------	0.20		
	27-65	12-38	1.25-1.50	0.6-6.0	0.08-0.14	5.6-7.8	Low----------	0.17		
VaD-------------- Vandalia	0-7	20-35	1.20-1.50	0.2-2.0	0.12-0.18	4.5-6.0	Moderate-----	0.37	4	1-3
	7-65	35-50	1.30-1.60	0.06-0.6	0.12-0.15	4.5-6.0	High---------	0.32		
VsE-------------- Vandalia	0-7	20-35	1.20-1.50	0.2-2.0	0.12-0.18	4.5-6.0	Moderate-----	0.32	4	1-3
	7-65	35-50	1.30-1.60	0.06-0.6	0.12-0.15	4.5-6.0	High---------	0.32		

* See description of the map unit for composition and behavior characteristics of the map unit.

Table 17.--Soil and Water Features

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

Soil name and map symbol	Hydrologic group	Flooding	High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
			Ft			In				
Cg----------------- Chagrin	B	Occasional------	4.0-6.0	Apparent	Feb-Mar	>60	---	Moderate	Low------	Moderate.
FpE---------------- Fairpoint	C	None------------	>6.0	---	---	>60	---	Moderate	High-----	Moderate.
GpF3*:										
Gilpin-----------	C	None------------	>6.0	---	---	20-40	Soft	Moderate	Low------	High.
Peabody----------	D	None------------	>6.0	---	---	20-40	Soft	Moderate	High-----	Moderate.
GsF*:										
Gilpin-----------	C	None------------	>6.0	---	---	20-40	Soft	Moderate	Low------	High.
Pineville--------	B	None------------	>6.0	---	---	>60	---	Moderate	Low------	High.
GuC3*, GuD3*, GuE3*:										
Gilpin----------	C	None------------	>6.0	---	---	20-40	Soft	Moderate	Low------	High.
Upshur----------	D	None------------	>6.0	---	---	40-60	Soft	Moderate	High-----	Moderate.
Ha----------------- Hackers	B	Rare------------	>6.0	---	---	>60	---	Moderate	Low------	Moderate.
ItE---------------- Itmann	C	None------------	>6.0	---	---	>60	---	Moderate	High-----	High.
JnE---------------- Janelew	C	None------------	>6.0	---	---	>60	---	Moderate	High-----	Low.
Ka----------------- Kanawha	B	Rare------------	>6.0	---	---	>60	---	Moderate	Low------	Moderate.
MoB, MoC---------- Monongahela	C	None------------	1.5-3.0	Perched	Dec-Apr	>60	---	Moderate	High-----	High.
PvE---------------- Pineville	B	None------------	>6.0	---	---	>60	---	Moderate	Low------	High.

See footnote at end of table.

Table 17.--Soil and Water Features--Continued

Soil name and map symbol	Hydrologic group	Flooding	High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
			Ft			In				
Sb---------------- Sensabaugh	B	Occasional------	2.0-6.0	Apparent	Jan-Apr	>60	---	Moderate	Low------	Low.
VaD, VsE---------- Vandalia	D	None------------	4.0-6.0	Perched	Feb-Apr	>60	---	Moderate	High-----	Moderate.

* See description of the map unit for composition and behavior characteristics of the map unit.

Table 18.--Classification of the Soils

Soil name	Family or higher taxonomic class
Chagrin	Fine-loamy, mixed, mesic Dystric Fluventic Eutrochrepts
Fairpoint	Loamy-skeletal, mixed, nonacid, mesic Typic Udorthents
Gilpin	Fine-loamy, mixed, mesic Typic Hapludults
Hackers	Fine-silty, mixed, mesic Typic Hapludalfs
Itmann	Loamy-skeletal, mixed, acid, mesic Typic Udorthents
Janelew	Loamy-skeletal, mixed (calcareous), mesic Typic Udorthents
Kanawha	Fine-loamy, mixed, mesic Typic Hapludalfs
Monongahela	Fine-loamy, mixed, mesic Typic Fragiudults
Peabody	Fine, mixed, mesic Ultic Hapludalfs
Pineville	Fine-loamy, mixed, mesic Typic Hapludults
Sensabaugh	Fine-loamy, mixed, mesic Dystric Fluventic Eutrochrepts
Udorthents	Udorthents
Upshur	Fine, mixed, mesic Typic Hapludalfs
Vandalia	Fine, mixed, mesic Typic Hapludalfs

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