United States Department of Agriculture

Soil Conservation Service

In cooperation with United States Department of Agriculture, Forest Service; Kentucky Natural Resources and Environmental Protection Cabinet; and Kentucky Agricultural Experiment Station

Soil Survey of Powell and Wolfe Counties, Kentucky

How To Use This Soil Survey

General Soil Map

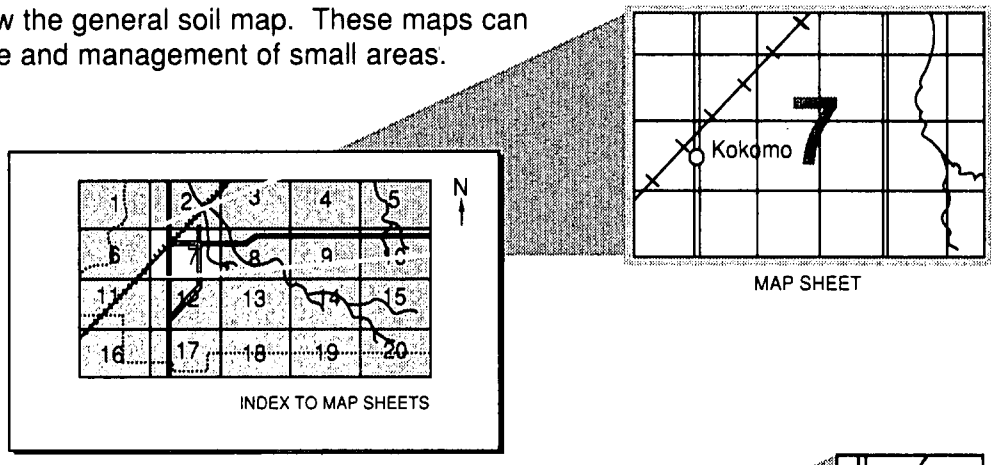
The general soil map, which is the color map preceding the detailed soil maps, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

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

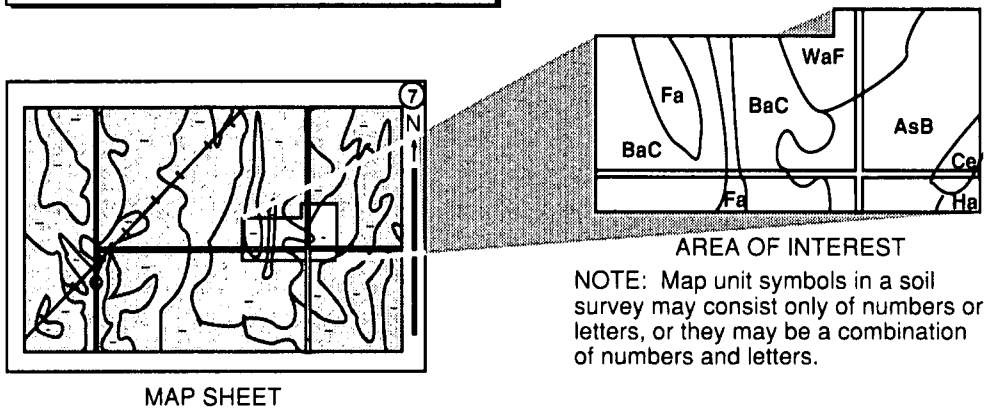
Detailed Soil Maps

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

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



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



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

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

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1988. Soil names and descriptions were approved in 1989. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1989. This soil survey was made cooperatively by the Soil Conservation Service, the Forest Service, the Kentucky Natural Resources and Environmental Protection Cabinet, and the Kentucky Agricultural Experiment Station. It is part of the technical assistance furnished to the Powell County Conservation District and the Wolfe County 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.

All programs and services of the Soil Conservation Service are offered on a nondiscriminatory basis, without regard to race, color, national origin, religion, sex, age, marital status, or handicap.

Cover: A natural rock bridge in an area of Helechawa-Rock outcrop complex, 35 to 55 percent slopes.

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Foreword

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

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

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

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

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Soil Survey of Powell and Wolfe Counties, Kentucky

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Line drawings by Phillip D. Combs, Soil Conservation Service

United States Department of Agriculture, Soil Conservation Service,
in cooperation with
Kentucky Natural Resources and Environmental Protection Cabinet, Kentucky Agricultural Experiment Station, and United States Department of Agriculture, Forest Service

POWELL AND WOLFE COUNTIES are in the east-central part of Kentucky, along the western edge of the Mountains and Eastern Coalfields physiographic region (fig. 1). The western part of Powell County is in the Knobs physiographic region. Powell County has a population of 11,101, and Wolfe County has a population of 6,698 *(27)*. Stanton, the county seat of Powell County, has a population of 2,691 and is about 40 miles southeast of Lexington, Kentucky. Campton, the county seat of Wolfe County, has a population of 486 and is about 62 miles southeast of Lexington, Kentucky. Powell County has a land area of 115,271 acres, or 180 square miles, and Wolfe County has a land area of 142,656 acres, or 223 square miles *(28)*. There are no large bodies of water in either county.

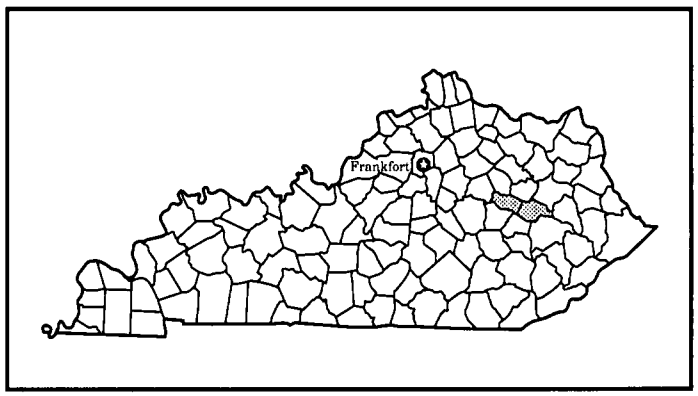

Figure 1.—Location of Powell and Wolfe Counties in Kentucky.

General Nature of the Survey Area

This section provides general information about Powell and Wolfe Counties. It describes early history, geology, topography and drainage, natural resources, and climate.

Early History

Powell County was established in 1852. It was formed from Clark, Estill, and Montgomery Counties. Lee, Menifee, and Wolfe Counties were later formed from parts of Powell County. Powell County was named for Lazarus W. Powell, a native of Henderson County who became governor of the Commonwealth in 1851 *(14)*.

Wolfe County was formed from parts of Morgan, Breathitt, Owsley, and Powell Counties in 1860. It was named for Nathaniel Wolfe, a senator from Louisville, Kentucky *(34)*.

Geology

The geology of Powell and Wolfe Counties is complex *(29, 30, 31, 32)*. The oldest bedrock strata, which crop out along the northwestern edge of Powell County, are those of the Ordovician and Silurian ages. The black shales of the Devonian age are mostly west and north of the community of Clay City. Mississippian age limestones, sandstones, and shales overlie the black shale and are commonly exposed west and north of Slade. Collectively, these Devonian and Mississippian areas are known as the Knobs. Rocks of the Pennsylvanian Geologic System are mainly in the eastern part of Powell County. They occur on ridgetops as strata of sandstone, siltstone, and shale that overlie outcrops of Mississippian limestone. The Pennsylvanian rocks extend across Wolfe County and are interspersed with outcrops of sandstone. They are characterized by coal seams that increase in thickness in the eastern part of the county.

Topography and Drainage

Powell and Wolfe Counties are drained primarily by the Red River, which flows from east to west through both counties to its confluence with the Kentucky River. The southern part of Wolfe County is drained by the North Fork of the Kentucky River and its tributaries.

Most of the land in the survey area that is suitable for cultivated crops is on the flood plains of the Red River and its tributaries. Undulating to hilly landscapes and ridgetops are used for pasture and hay and for limited cultivation. The steep hillsides in the survey area are used mostly as woodland.

Many of the tributary streams, particularly those of the Red River, have cut deep, canyonlike landscapes. Chimney rocks and arches are scattered throughout the area. Most of the canyonlike area is owned by the United States Department of Agriculture, Forest Service, and is known as the Red River Gorge scenic area. The most notable of the arch formations is in Natural Bridge State Park.

Elevations range from 1,450 feet near the Red River watershed divide in Wolfe County to 575 feet where the Red River leaves the survey area on the Powell County line.

Natural Resources

Forest products, limestone, natural gas, oil, and clay for making bricks are important natural resources in Powell County. The limestone is exposed on ridges in the northern part of the county. It is suitable for construction projects, agricultural lime, and cement. Clay from the Nancy Member of the Borden Geologic Formation is used to manufacture brick. The southwestern part of Powell County is adjacent to the Big Sinking Oil Field of Lee and Estill Counties. Oil and gas wells are scattered throughout this area. Iron ore was mined in the area from 1785 to 1874.

Forest products, natural gas, oil, and coal are important natural resources in Wolfe County. Oil and gas wells are scattered throughout the southwestern part of the county. Coalbeds are usually thin and are stripped or augered in the southeastern part of the county.

Most steep land in Powell and Wolfe Counties is forested. The Forest Service owns 14,092 acres in Powell County and 15,850 acres in Wolfe County. This acreage makes up part of the Daniel Boone National Forest. The Corps of Engineers owns 439 acres in Powell County. The Commonwealth of Kentucky owns 1,900 acres in Natural Bridge State Park, which is near Slade.

The quantity and quality of the ground water in Powell and Wolfe Counties are variable. The principal aquifers are the Corbin Sandstone Member of the Lee Geologic Formation and the Newman Limestone Geologic Formation.

Urban and industrial development in the survey area is increasing slowly. Small industries are of major importance to the economy.

Climate

Prepared by the National Climatic Data Center, Asheville, North Carolina.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Mount Sterling, Kentucky, in the period 1951 to 1983. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter, the average temperature is 36 degrees F and the average daily minimum temperature is 26 degrees. The lowest temperature on record, which occurred at Mount Sterling on January 24, 1963, is -20 degrees. In summer, the average temperature is 74 degrees and the average daily maximum temperature is 85 degrees. The highest recorded temperature, which occurred at Mount Sterling on July 14, 1954, is 106 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 about 46 degrees. Of this, about 25 inches, or 55 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 21 inches. The heaviest 1-day rainfall during the period of record was 6 inches at Mount Sterling on December 8, 1978. Thunderstorms occur on about 45 days each year.

The average seasonal snowfall is 16.6 inches. The greatest snow depth at any one time during the period of record was 22 inches. On the average, 11 days of the year have at least 1 inch of snow on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 65 percent of the time possible in summer and 45 percent in winter. The prevailing wind is from the south. Average windspeed is highest, 11 miles per hour, in spring.

How This Survey Was Made

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

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

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

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

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

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

table will always be at a specific level in the soil on a specific date.

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

The names and delineations of the soils in this survey do not fully agree with those in adjoining counties because of modifications in series concepts and differences in map unit design.

Map Unit Composition

A map unit delineation on a soil map represents an area dominated by one major kind of soil or an area dominated by two or three kinds of soil. A map unit is identified and named according to the taxonomic classification of the dominant soil or soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural objects. In common with other natural objects, they have a characteristic variability in their properties. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of soils of other taxonomic classes. Consequently, every map unit is made up of the soil for which it is named and some soils that belong to other taxonomic classes. In the detailed soil map units, these latter soils are called inclusions or included soils. In the general soil map units, they are called soils of minor extent.

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

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

General Soil Map Units

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

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

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

Soil Descriptions for Powell County

1. Jessietown-Muse-Rohan

Very deep to shallow, well drained, gently sloping to very steep soils that have a loamy or clayey subsoil; on side slopes, ridgetops, toe slopes, and benches

This map unit is in the western and northwestern parts of Powell County and is characterized by narrow, convex ridgetops; short, steep side slopes; benches; and toe slopes. It is dissected by the Red River and is drained from the north and south by tributary streams. Slopes range from 2 to 45 percent but are dominantly 20 to 45 percent.

This map unit makes up about 15 percent of Powell County. It is about 27 percent Jessietown soils, 19 percent Muse soils, 15 percent Rohan soils, and 39 percent soils of minor extent (fig. 2).

Jessietown soils are moderately deep. They are on ridgetops and side slopes. They formed in loamy material weathered from black shale. Typically, the surface layer is dark yellowish brown silt loam. The subsurface layer is yellowish brown silt loam. The subsoil is yellowish brown silty clay loam in the upper part and strong brown silty clay loam in the lower part.

Muse soils are very deep and deep. They are on toe slopes and benches. They formed in colluvium or material weathered from black shale. Typically, the surface layer is dark brown silt loam. The subsoil is yellowish brown silt loam in the upper part and strong brown silty clay loam and gravelly silty clay in the lower part. The substratum is yellowish red gravelly silty clay loam.

Rohan soils are shallow. They are on ridgetops and side slopes. They formed in loamy colluvium or material weathered from black shale. Typically, the surface layer is dark brown gravelly silt loam. The subsoil is yellowish brown very gravelly silt loam.

Of minor extent in this map unit are Westbend, Shrouts, Woolper, Allegheny, Cotaco, and Grigsby soils. Westbend soils are on the upper side slopes. Shrouts and Woolper soils are on the lower side slopes and on benches. Allegheny and Cotaco soils are on stream terraces. Grigsby soils are on narrow flood plains.

Most of the acreage in this map unit is used as woodland.

The major soils in this map unit are poorly suited to row crops, hay, and pasture. The main limitations are the slope, the hazard of erosion, and the depth to bedrock. Some of the minor soils on stream terraces, the lower side slopes, and flood plains are suited to row crops, hay, and pasture.

This map unit is suited to woodland. The erosion hazard, the equipment limitation, and plant competition are management concerns. The soils are suited to woodland wildlife habitat.

This map unit is poorly suited to most urban uses. The slope and the depth to bedrock are the main limitations.

2. Westbend

Deep, well drained, sloping to very steep soils that have a loamy subsoil; on side slopes, ridgetops, and toe slopes

This map unit is in the western part of Powell County and is characterized by low hills with narrow ridgetops;

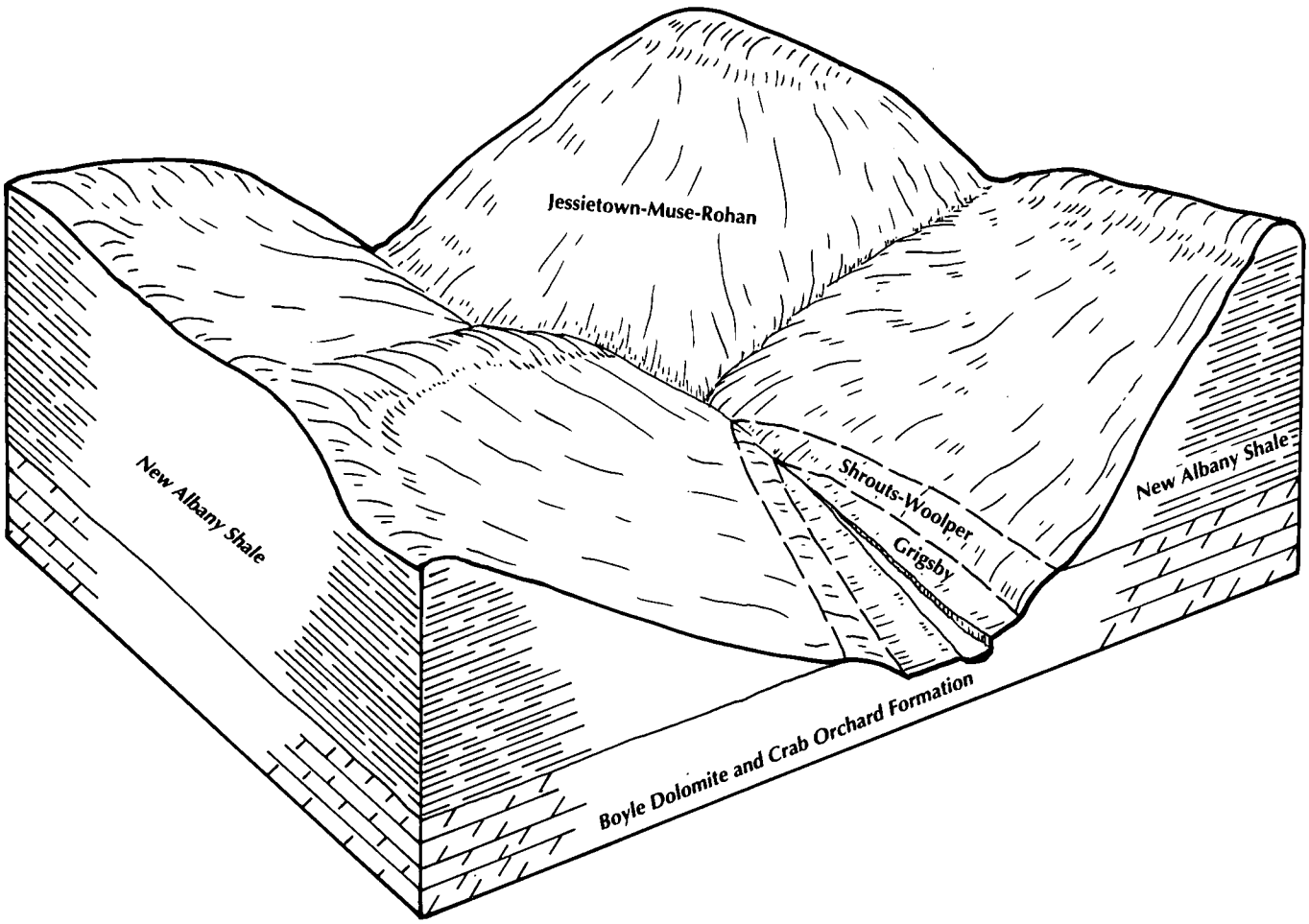

Figure 2.—Typical pattern of soils and parent material in the Jessietown-Muse-Rohan general soil map unit.

short, sloping to very steep side slopes; and toe slopes. It is dissected by tributary streams of the Red River. Slopes range from 6 to 45 percent.

This map unit makes up about 12 percent of Powell County. It is about 65 percent Westbend soils and 35 percent soils of minor extent (fig. 3).

Westbend soils formed in loamy colluvium and material weathered mainly from interbedded soft shale and siltstone. Typically, the surface layer is light yellowish brown silt loam. The upper part of the subsoil is yellowish brown silt loam and silty clay loam, the next part is yellowish brown and olive gray channery silty clay loam, and the lower part is light olive gray, mottled channery silty clay loam. The substratum is light olive gray and olive very channery silty clay loam.

Of minor extent in this map unit are Muse, Shelocta, Jessietown, Rohan, Grigsby, Newark, Allegheny, and Cotaco soils. Muse and Shelocta soils are on toe slopes, benches, and side slopes. Jessietown and Rohan soils are on side slopes. Grigsby and Newark soils are on flood plains. Allegheny and Cotaco soils are on stream terraces.

Most of the acreage in this map unit is used as woodland. Some of the less sloping areas are used as pasture or hayland.

Most of the soils in this map unit are poorly suited to row crops, hay, and pasture. The sloping and moderately steep soils are suited to pasture. The slope is a major limitation. Some of the minor soils on flood plains, stream terraces, the lower side slopes, and toe slopes are suited to row crops, hay, and pasture.

This map unit is suited to woodland. Plant competition is the main management concern.

This map unit is poorly suited to most urban uses. Slippage and the slope are the main limitations.

3. Carpenter-Bledsoe-Berks

Very deep to moderately deep, well drained, steep and very steep soils that have a loamy or clayey subsoil; on side slopes, benches, and toe slopes

This map unit is in the central part of Powell County and is characterized by steep and very steep side slopes, benches, and toe slopes. It is dissected from east to west by the Red River. Tributary streams that flow from north to south and from south to north drain the unit. Slopes range from 20 to 70 percent.

This map unit makes up about 45 percent of Powell County. It is about 21 percent Carpenter soils, 20 percent Bledsoe soils, 15 percent Berks soils, and 44 percent soils of minor extent (fig. 4).

Carpenter soils are deep and very deep. They are on side slopes and toe slopes. They formed in loamy colluvium over material weathered mainly from siltstone and shale. Typically, the surface layer is olive brown silt loam. The subsurface layer is light olive brown silt loam. The subsoil is light yellowish brown and light olive brown silty clay loam. The substratum is olive clay loam.

Bledsoe soils are very deep. They are on side slopes, benches, and toe slopes. They formed in clayey colluvium weathered chiefly from limestone, sandstone, and shale. Typically, the surface layer is dark brown silt loam. The subsoil is strong brown silt loam and silty clay loam.

Berks soils are moderately deep. They are on side slopes. They formed in loamy material weathered from siltstone or shale. Typically, the surface layer is brown channery silt loam. The subsurface layer is light yellowish brown channery silt loam. The subsoil is light

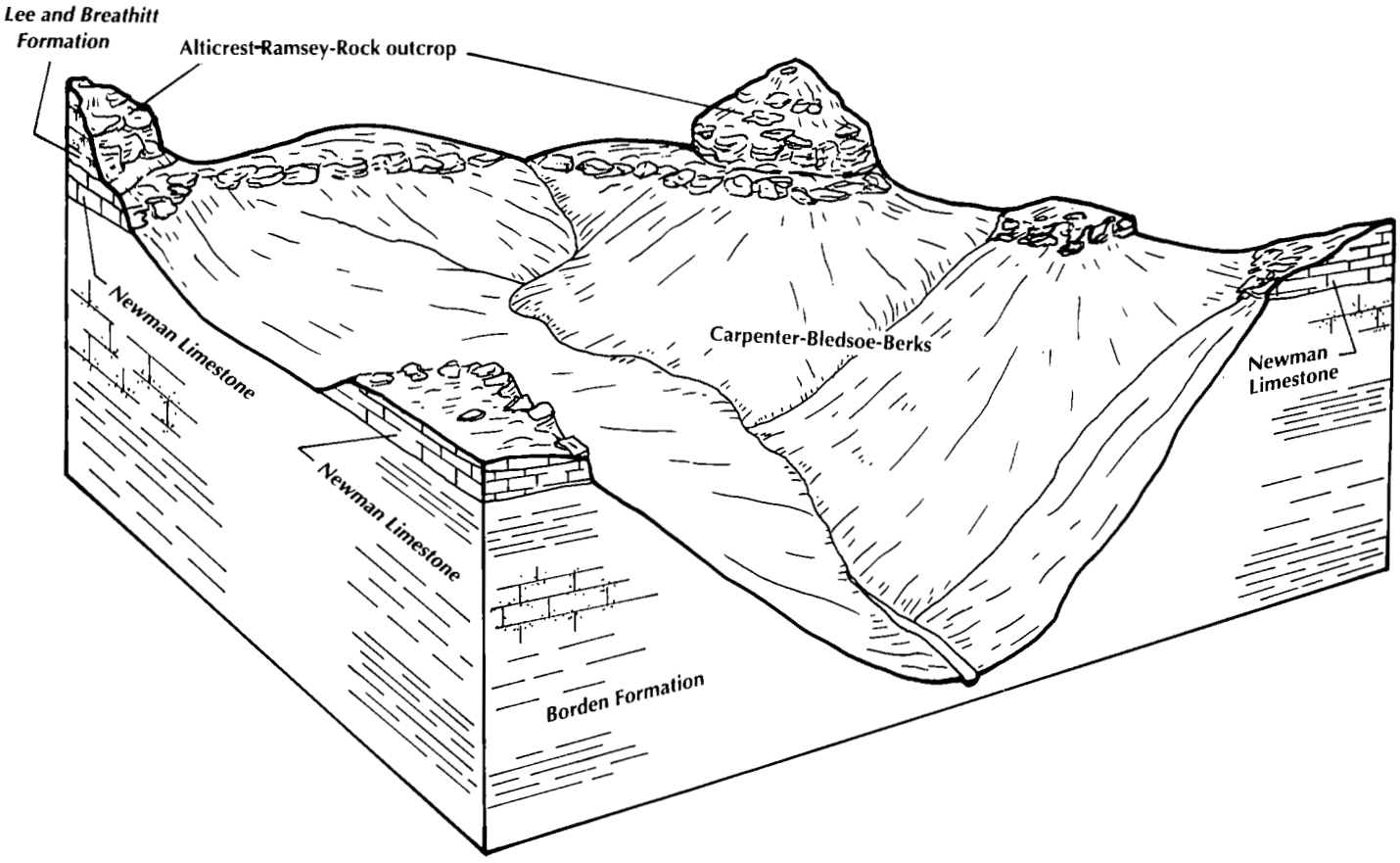

Figure 3.—Typical pattern of soils and parent material in the Westbend general soil map unit.

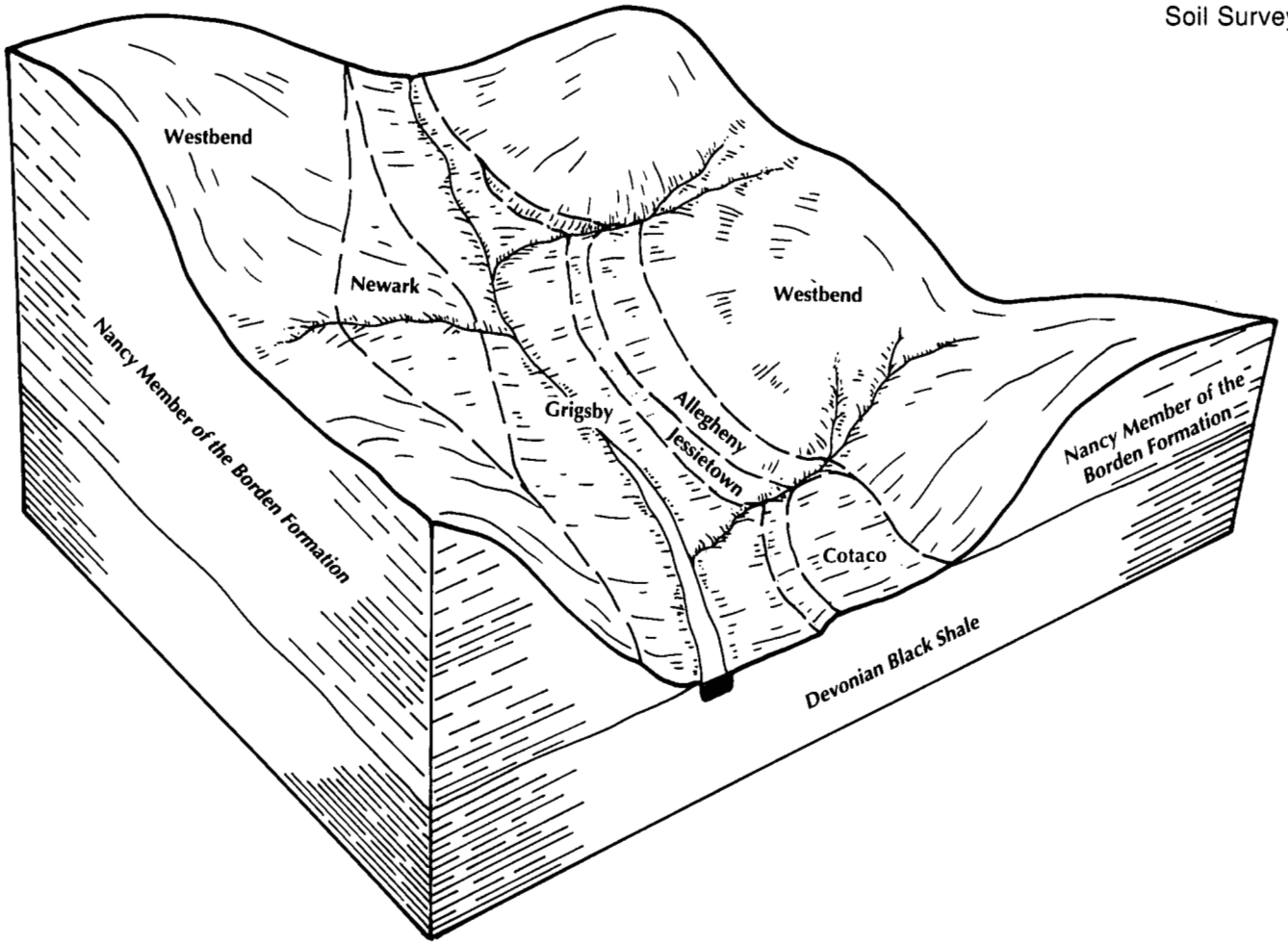

Figure 4.—Typical pattern of soils and parent material in the Carpenter-Bledsoe-Berks general soil map unit.

yellowish brown very channery silt loam. The substratum is light yellowish brown extremely channery silt loam.

Of minor extent in this map unit are Alticrest, Ramsey, Faywood, Shelocta, Grigsby, and Skidmore soils and rock outcrop. Alticrest, Ramsey, and Faywood soils are on ridgetops and side slopes. Shelocta soils are on toe slopes and side slopes. Grigsby and Skidmore soils are on flood plains. The rock outcrop is on side slopes.

Most of the acreage in this map unit is used as woodland.

This map unit is poorly suited to row crops, hay, and pasture. The main limitations are the slope, the hazard of erosion, and the depth to bedrock.

This map unit is suited to woodland. Plant competition, the equipment limitation, the erosion hazard, and seedling mortality are management concerns. The soils are suited to woodland wildlife habitat.

This map unit is poorly suited to most urban uses. The slope and the depth to bedrock are limitations.

4. Grigsby-Allegheny-Knowlton

Very deep, well drained and poorly drained, nearly level to steep soils that have a loamy subsoil; on flood plains and stream terraces

This map unit is on flood plains and stream terraces along the Red River in Powell County. Slopes range from 0 to 25 percent but are dominantly 0 to 6 percent. The communities of Clay City and Stanton are located within this map unit.

This map unit makes up about 11 percent of Powell County. It is about 35 percent Grigsby soils, 20 percent Allegheny soils, 15 percent Knowlton soils, and 30 percent soils of minor extent (fig. 5).

Grigsby soils are well drained and are on flood plains. They formed in loamy alluvium. Typically, the surface layer is brown silt loam. The subsoil is dark

yellowish brown and brownish yellow sandy loam. The substratum is yellowish brown sandy loam.

Allegheny soils are well drained and are on stream terraces. They formed in loamy alluvium. Typically, the surface layer is brown loam. The subsoil is yellowish brown and strong brown loam. The substratum is yellowish brown and pale brown loam.

Knowlton soils are poorly drained and are on stream terraces. They formed in loamy alluvium. Typically, the surface layer is grayish brown silt loam. The subsoil is light brownish gray and light gray, mottled silt loam.

Of minor extent in this map unit are Cotaco and Morehead soils on stream terraces and Newark and Skidmore soils on flood plains.

Most of the acreage in this map unit is used for row crops, hay, or pasture. Some areas of the less sloping soils on stream terraces are used as sites for residential or commercial development. Small tracts of woodland are in some of the poorly drained areas.

The nearly level and gently sloping, well drained soils in this map unit are well suited to row crops. They also are suited to specialty crops, such as vegetables and nursery plants. The sloping to moderately steep soils are better suited to hay, pasture, and woodland than to crops. The main limitations are the slope, the hazard of erosion, wetness, and the hazard of flooding in low areas.

This map unit is well suited to woodland. Plant competition is the main management concern.

Most of the soils in this map unit are suited to habitat for openland wildlife.

The very deep, well drained soils on stream terraces

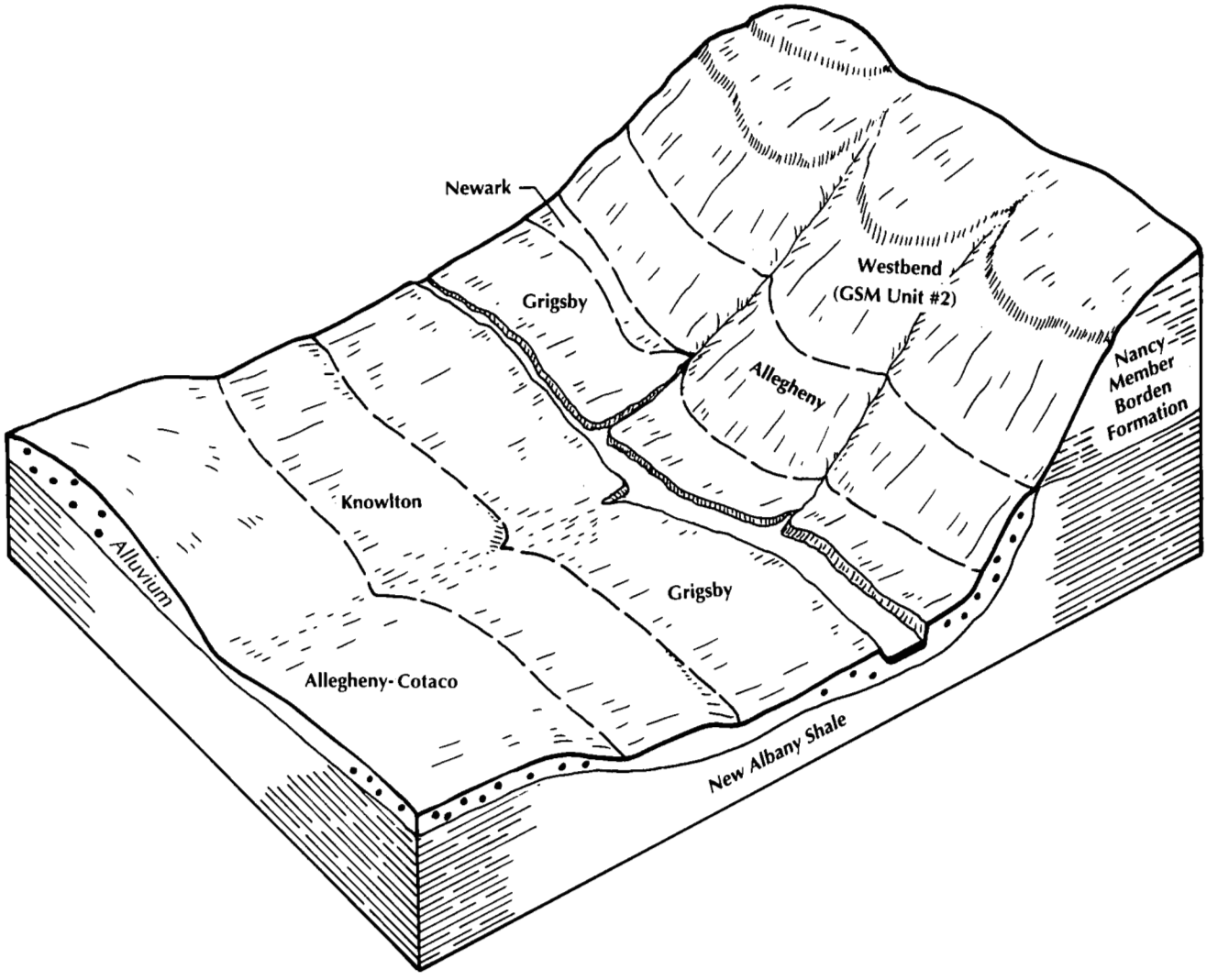

Figure 5.—Typical pattern of soils and parent material in the Grigsby-Allegheny-Knowlton general soil map unit.

in nearly level to sloping areas above the flood plains are suited to most urban uses. The slope, slow permeability, the hazard of flooding, the wetness, and seepage are limitations in some areas.

5. Helechawa-Alticrest-Gilpin-Rock outcrop

Rock outcrop and very deep to moderately deep, somewhat excessively drained and well drained, gently sloping to very steep soils that have a loamy subsoil; on side slopes and ridgetops

This map unit is in the eastern part of Powell County and is characterized by narrow ridgetops, very steep side slopes, and narrow valleys. Prominent rock outcrops, including natural arches, are throughout the map unit. The unit is highly dissected by tributary streams of the Red River and the North Fork of the Kentucky River. Slopes range from 4 to 25 percent on the ridgetops and from 20 to 65 percent on side slopes, except for the vertical outcroppings of sandstone. Large acreages of the Red River Gorge scenic area and the Natural Bridge State Park are in this map unit. A portion of the Daniel Boone National Forest also is in this map unit.

This map unit makes up about 17 percent of Powell County. It is about 27 percent Helechawa soils, 15 percent Alticrest soils, 15 percent Gilpin soils, 14 percent Rock outcrop, and 29 percent soils of minor extent.

Helechawa soils are deep and very deep and are somewhat excessively drained. They are on side slopes. They formed in loamy colluvium or material weathered from sandstone. Typically, the surface layer is dark brown loamy sand. The subsoil is dark yellowish brown, yellowish brown, and strong brown sandy loam.

Alticrest soils are moderately deep and are well drained or somewhat excessively drained. They are on ridgetops and side slopes. They formed in material weathered from sandstone. Typically, the surface layer is dark brown sandy loam. The subsurface layer is yellowish brown sandy loam. The subsoil is strong brown channery sandy loam. The substratum is yellowish brown channery sandy loam.

Gilpin soils are moderately deep and well drained. They are on ridgetops and side slopes. They formed in loamy material weathered from siltstone, sandstone, and shale. Typically, the surface layer is dark brown silt loam. The subsoil is strong brown silt loam in the upper part and yellowish brown silty clay loam in the lower part. The substratum is yellowish brown channery silt loam.

Rock outcrop consists of vertical sandstone cliffs and discontinuous ledges of sandstone outcroppings. Numerous natural arches are in the map unit.

Of minor extent in this map unit are Latham, Ramsey, Hazleton, Shelocta, and Grigsby soils. Latham and Ramsey soils are on ridgetops and side slopes. Hazleton soils are on side slopes. Shelocta soils are on toe slopes and side slopes. Grigsby soils are on narrow flood plains.

Most of the acreage in this map unit is used as woodland.

This map unit is poorly suited to agricultural and urban uses. The main limitations are the slope, the hazard of erosion, the Rock outcrop, and a lack of access roads.

This map unit is suited to woodland. The equipment limitation, the erosion hazard, and seedling mortality are the main management concerns. The soils are well suited to woodland wildlife habitat.

Soil Descriptions for Wolfe County

1. Helechawa-Alticrest-Gilpin-Rock outcrop

Rock outcrop and very deep to moderately deep, somewhat excessively drained and well drained, gently sloping to very steep soils that have a loamy subsoil; on side slopes and ridgetops

This map unit is in the western part of Wolfe County and is characterized by narrow ridgetops, very steep side slopes, and narrow valleys. Prominent rock outcrops, including natural arches, are throughout the map unit. The unit is highly dissected by tributary streams of the Red River. Slopes range from 4 to 25 percent on the ridgetops and from 20 to 65 percent on side slopes, except for the vertical outcroppings of sandstone. Large acreages of the Red River Gorge scenic area and the Natural Bridge State Park are in this map unit. A portion of the Daniel Boone National Forest also is in this map unit.

This map unit makes up about 23 percent of Wolfe County. It is about 18 percent Helechawa soils, 18 percent Alticrest soils, 15 percent Gilpin soils, 10 percent Rock outcrop, and 39 percent soils of minor extent (fig. 6).

Helechawa soils are deep and very deep and are somewhat excessively drained. They are on side slopes. They formed in loamy colluvium or material weathered from sandstone. Typically, the surface layer is dark brown loamy sand. The subsoil is dark yellowish brown, yellowish brown, and strong brown sandy loam.

Alticrest soils are moderately deep and are well drained or somewhat excessively drained. They are on ridgetops and side slopes. They formed in material weathered from sandstone. Typically, the surface layer is dark brown sandy loam. The subsurface layer is yellowish brown sandy loam. The subsoil is strong

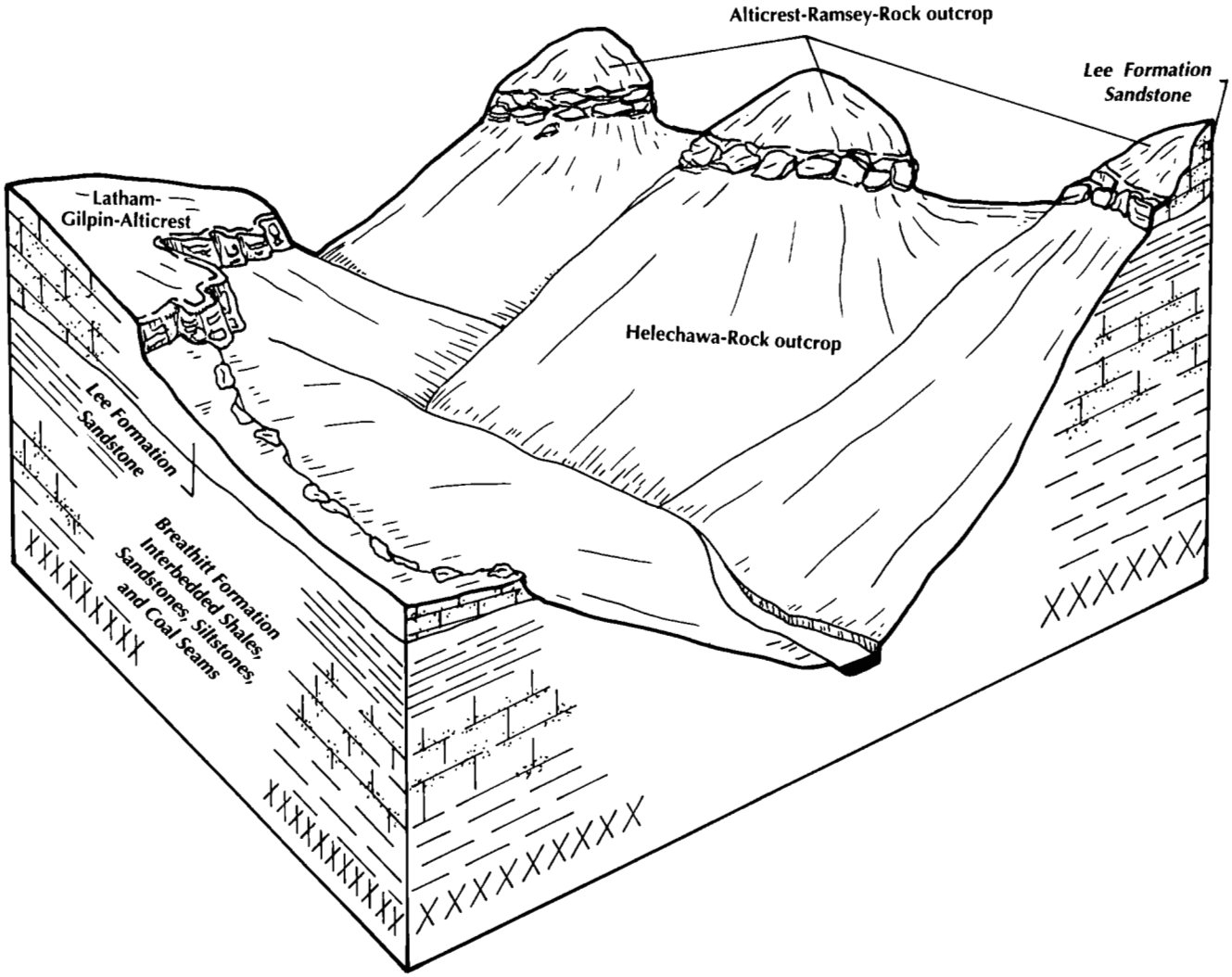

Figure 6.—Typical pattern of soils and parent material in the Helechawa-Alticrest-Gilpin-Rock outcrop general soil map unit.

brown channery sandy loam. The substratum is yellowish brown channery sandy loam.

Gilpin soils are moderately deep and well drained. They are on ridgetops and side slopes. They formed in loamy material weathered from siltstone, sandstone, and shale. Typically, the surface layer is dark brown silt loam. The subsoil is strong brown silt loam in the upper part and yellowish brown silty clay loam in the lower part. The substratum is yellowish brown channery silt loam.

Rock outcrop consists of vertical sandstone cliffs and discontinuous ledges of sandstone outcroppings. Numerous natural arches are in the map unit.

Of minor extent in this map unit are Latham, Lily, Ramsey, Rigley, Shelocta, and Grigsby soils. Latham, Lily, and Ramsey soils are on ridgetops and side slopes. Rigley and Shelocta soils are on side slopes and toe slopes and in coves. Grigsby soils are on narrow flood plains.

Most of the acreage in this map unit is used as woodland.

This map unit is poorly suited to agricultural and urban uses. The main limitations are the slope, the hazard of erosion, the Rock outcrop, and a lack of access roads.

This map unit is suited to woodland. The equipment limitation, the erosion hazard, and seedling mortality are the main management concerns. The soils are well suited to woodland wildlife habitat.

2. Bledsoe-Berks-Alticrest

Very deep and moderately deep, well drained and somewhat excessively drained, steep and very steep soils that have a loamy or clayey subsoil; on side slopes, benches, toe slopes, and ridgetops

This map unit is in the northwestern part of Wolfe County and is characterized by steep and very steep side slopes, benches, and toe slopes and by narrow, winding ridgetops. The Red River flows along the northern boundary of most of the map unit. Slopes range from 20 to 70 percent.

This unit makes up about 1 percent of Wolfe County. It is about 30 percent Bledsoe soils, 25 percent Berks soils, 15 percent Alticrest soils, and 30 percent soils of minor extent.

Bledsoe soils are very deep and well drained and are on side slopes, benches, and toe slopes. They formed in clayey colluvium weathered chiefly from limestone, sandstone, and shale. Typically, the surface layer is dark brown silt loam. The subsoil is strong brown silt loam and silty clay loam.

Berks soils are moderately deep and well drained and are on side slopes. They formed in loamy material weathered from siltstone or shale. Typically, the surface layer is brown channery silt loam. The subsurface layer is light yellowish brown channery silt loam. The subsoil is light yellowish brown very channery silt loam. The substratum is light yellowish brown extremely channery silt loam.

Alticrest soils are moderately deep and are well drained or somewhat excessively drained. They are on ridgetops and side slopes. They formed in material weathered from sandstone. Typically, the surface layer is dark brown sandy loam. The subsurface layer is yellowish brown sandy loam. The subsoil is strong brown channery sandy loam. The substratum is yellowish brown channery sandy loam.

Of minor extent in this map unit are Ramsey, Lily, Shelocta, Helechawa, and Grigsby soils and rock outcrop. Ramsey and Lily soils are on ridgetops and side slopes. Shelocta and Helechawa soils are on side slopes and toe slopes. Grigsby soils are on narrow flood plains. The rock outcrop is on side slopes.

Most of the acreage in this map unit is used as woodland.

This map unit is poorly suited to row crops, hay, and pasture. The main limitations are the slope, the hazard of erosion, and the depth to bedrock.

This map unit is suited to woodland. Plant competition, the equipment limitation, the erosion hazard, and seedling mortality are management concerns. The soils are suited to woodland wildlife habitat.

This map unit is poorly suited to most urban uses. The slope and the depth to bedrock are limitations.

3. Shelocta-Gilpin-Latham

Very deep to moderately deep, well drained and moderately well drained, gently sloping to very steep soils that have a loamy or clayey subsoil; on side slopes, foot slopes, benches, and ridgetops

This map unit extends from the northeastern part of Wolfe County to the southwestern part. It is characterized by long, narrow ridgetops, steep and very steep side slopes, and narrow, elongated valleys. Many creeks and streams, mostly intermittent, are in this map unit. The streams that flow to the north drain into the Red River, and those that flow to the south drain into the North Fork of the Kentucky River. Slopes range from 4 to 65 percent on the upper side slopes and ridgetops and from 20 to 65 percent on the middle and lower side slopes.

This map unit makes up about 72 percent of Wolfe County. It is about 35 percent Shelocta soils, 21 percent Gilpin soils, 11 percent Latham soils, and 33 percent soils of minor extent (fig. 7).

Shelocta soils are deep and very deep and are well drained. They are on side slopes, foot slopes, and benches. They formed in colluvium weathered from sandstone, siltstone, and shale. Typically, the surface layer is dark brown gravelly silt loam. The subsurface layer is dark yellowish brown gravelly silt loam. The subsoil is dark yellowish brown and yellowish brown silt loam in the upper part and yellowish brown channery silt loam in the lower part. The substratum is yellowish brown channery silty clay loam.

Gilpin soils are moderately deep and well drained and are on ridgetops and side slopes. They formed in loamy material weathered from siltstone, sandstone, and shale. Typically, the surface layer is dark brown silt loam. The subsoil is strong brown silt loam in the upper part and yellowish brown silty clay loam in the lower part. The substratum is yellowish brown channery silt loam.

Latham soils are moderately deep and moderately well drained and are on ridgetops and side slopes. They formed in clayey material weathered from shale. Typically, the surface layer is pale brown silt loam. The subsoil is reddish yellow silty clay loam. It is mottled in the lower part.

Of minor extent in this map unit are Alticrest, Lily, Ramsey, Rigley, Allegheny, Grigsby, Bethesda, and Fairpoint soils. Alticrest, Lily, and Ramsey soils are on ridgetops and the upper side slopes. Rigley soils are on benches and in coves. Allegheny soils are on stream terraces. Grigsby soils are on narrow flood plains.

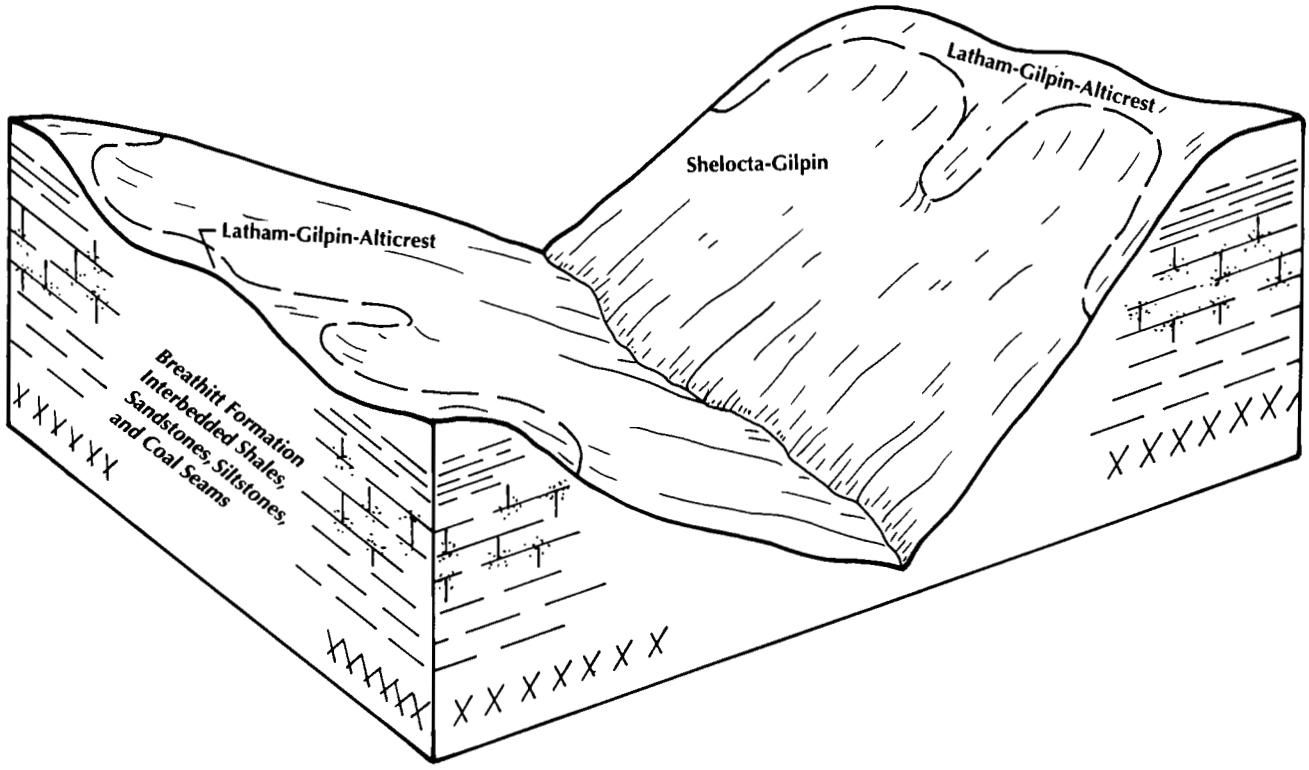

Figure 7.—Typical pattern of soils and parent material in the Shelocta-Gilpin-Latham general soil map unit.

Bethesda and Fairpoint soils are in areas that have been surface mined.

Most of the acreage in this map unit is used as woodland. Some areas of the minor soils along the narrow flood plains are used for specialty crops, such as vegetables, tobacco, and nursery plants.

Most of the soils in this map unit are poorly suited to row crops, hay, and pasture. Some of the gently sloping to moderately steep soils on ridgetops and the nearly level minor soils on flood plains, however, are suited to these uses. The main limitations are the slope and the hazard of erosion.

This map unit is suited to woodland. The hazard of erosion, the equipment limitation, and plant competition are the main management concerns. The soils are well suited to woodland wildlife habitat.

This map unit is poorly suited to urban uses. The slope is the main limitation.

4. Grigsby-Allegheny-Rowdy

Very deep, well drained, nearly level to steep soils that have a loamy subsoil; on flood plains, stream terraces, and alluvial fans

This map unit is on flood plains and stream terraces along the Red River in Wolfe County. Slopes range from 0 to 25 percent but are dominantly 0 to 4 percent. The communities of Hazel Green and Daysboro are located within this map unit.

This map unit makes up about 4 percent of Wolfe County. It is about 35 percent Grigsby soils, 20 percent Allegheny soils, 15 percent Rowdy soils, and 30 percent soils of minor extent.

Grigsby soils are on flood plains. They formed in loamy alluvium. Typically, the surface layer is brown silt loam. The subsoil is dark yellowish brown and brownish yellow sandy loam. The substratum is yellowish brown sandy loam.

Allegheny soils are on stream terraces. They formed in loamy alluvium. Typically, the surface layer is brown loam. The subsurface layer is yellowish brown loam. The subsoil is yellowish brown and strong brown loam. The substratum is yellowish brown and pale brown loam.

Rowdy soils are on low stream terraces and alluvial fans. They formed in loamy alluvium. Typically, the surface layer is brown loam. The subsoil is yellowish brown silt loam and loam. The substratum is yellowish brown sandy loam.

Of minor extent in this map unit are Cotaco and Knowlton soils on stream terraces and Orrville

and Skidmore soils on flood plains.

Most of the acreage in this map unit is used for row crops, hay, or pasture. Some of the less sloping soils on stream terraces are used as sites for residential or commercial development.

The nearly level and gently sloping, well drained soils in this map unit are well suited to row crops. They also are suited to specialty crops, such as vegetables and nursery plants. The sloping to moderately steep soils are better suited to hay, pasture, and woodland than to crops. The main limitations are the slope, the hazard of erosion, wetness, and the hazard of flooding in low areas.

This map unit is well suited to woodland. Plant competition is the main management concern.

Most of the soils in this map unit are suited to habitat for openland wildlife.

The very deep, well drained soils on stream terraces in nearly level to sloping areas above the flood plains are suited to most urban uses. The flooding, the slope, and seepage are the main limitations.

Detailed Soil Map Units

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

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

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

In the descriptions the suitability of the soils for various uses is described. *Well suited* indicates that the soils have favorable properties for the specified use and that limitations are easy to overcome. Good performance and low maintenance can be expected. *Suited* indicates that the soils have moderately favorable properties for the selected use. One or more properties make these soils less desirable than well suited soils. *Poorly suited* indicates that the soils have one or more properties unfavorable for the selected use. Overcoming the limitations requires special design, extra maintenance, or costly alteration. *Not suited* indicates that the soils do not meet the requirements for the selected use or that extreme measures are needed to overcome the limitations.

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

Soils of one series can differ in texture of the surface layer or of the substratum. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Allegheny loam, 0 to 2 percent slopes, is a phase of the Allegheny series.

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

A *soil 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 soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Jessietown-Muse-Rohan complex, 20 to 45 percent slopes, is an example.

A *soil association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated soil uses in the survey area, it was not considered practical or necessary to map the soils separately. The pattern and relative proportion of the soils are somewhat similar. Gilpin-Hazleton-Rock outcrop association, 20 to 60 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils in the mapped areas are not uniform. An area can be made up of only one of the major soils, or it can be made up of all of them. Bethesda and Fairpoint soils, 2 to 70 percent slopes, is an undifferentiated group in this survey area.

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

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

Miscellaneous areas are shown on the soil maps. Some that are too small to be shown are identified by a special symbol on the soil maps.

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

Soil Descriptions

AgA—Allegheny loam, 0 to 2 percent slopes. This very deep, well drained, nearly level soil is on stream terraces along the Red River and its tributaries. Individual areas are long and narrow or broad and range from about 10 to 100 acres in size.

Typically, the surface layer is brown loam about 6 inches thick. The subsurface layer to a depth of about 17 inches is yellowish brown loam. The subsoil extends to a depth of about 50 inches. It is yellowish brown and strong brown loam. The substratum extends to a depth of 60 inches or more. It is yellowish brown and pale brown loam.

This soil is medium in natural fertility and moderate in organic matter content. Permeability is moderate, and the available water capacity is high. Tilth is good. The soil can be worked throughout a wide range in moisture content. The root zone is very deep, and the depth to bedrock is more than 60 inches.

Included with this soil in mapping are areas of Cotaco, Rowdy, and Knowlton soils. These soils are in landscape positions similar to those of the Allegheny soil. Also included are small areas of eroded Allegheny soils, a few low areas of Allegheny soils that are occasionally flooded, and areas of soils that are similar to the Allegheny soil but are 40 to 60 inches deep over bedrock. Included areas make up about 20 percent of the map unit. They are generally less than 5 acres in size.

The Allegheny soil is used extensively for row crops, hay, or pasture. Many areas are used for urban development.

This soil is well suited to all of the commonly grown row crops and small grain. It can be cropped intensively. Conservation practices that improve tilth and fertility are needed. Applying a system of conservation tillage, properly managing crop residue, growing cover crops, adding fertilizer and lime, and including grasses and legumes in the cropping sequence help to maintain or improve soil structure, soil fertility, and organic matter content.

This soil is well suited to pasture and hay. All of the commonly grown grasses and legumes grow well. The main management needs are proper stocking rates, a well planned clipping and harvesting schedule, weed control, applications of lime and fertilizer, and rotation grazing. Pasture renovation should be frequent enough to maintain the desired plants.

This soil is well suited to woodland, but few areas are wooded. The native trees are shortleaf pine, yellow poplar, Virginia pine, and sugar maple. Species preferred for planting include eastern white pine, yellow poplar, shortleaf pine, and white oak. Table 7 provides specific information relating to potential productivity. The main management concern is plant competition. If openings are made in the canopy, invading brushy plants can delay natural regeneration.

This soil is well suited to most urban uses. Seepage is a hazard on sites for some sanitary facilities.

The capability classification is I.

AgB—Allegheny loam, 2 to 6 percent slopes. This very deep, well drained, gently sloping soil is on stream terraces along the Red River and its tributaries. Individual areas are long and narrow or broad and range from about 10 to 80 acres in size.

Typically, the surface layer is brown loam about 6 inches thick. The subsurface layer to a depth of about 17 inches is yellowish brown loam. The subsoil extends to a depth of about 50 inches. It is yellowish brown and strong brown loam. The substratum extends to a depth of 60 inches or more. It is yellowish brown and pale brown loam.

This soil is medium in natural fertility and moderate in organic matter content. Permeability is moderate, and the available water capacity is high. Tilth is good. The soil can be worked throughout a wide range in moisture content. The root zone is very deep, and the depth to bedrock is more than 60 inches.

Included with this soil in mapping are areas of Cotaco and Rowdy soils. These soils are in landscape positions similar to those of the Allegheny soil. Also included are areas of soils that are similar to the Allegheny soil but are less than 60 inches deep over bedrock; small areas of eroded Allegheny soils; a few low areas of Allegheny soils that are occasionally flooded; and small, narrow, slightly concave areas of somewhat poorly drained soils along drainageways and in depressions. Included areas make up about 10 to 20 percent of the map unit. They are generally less than 2 acres in size.

The Allegheny soil is used extensively for row crops, hay, or pasture. Many areas are used for urban development.

This soil is well suited to all of the commonly grown row crops and small grain. Conservation practices that help to control erosion and improve tilth and fertility are

needed. Applying a system of conservation tillage, properly managing crop residue, growing cover crops, including grasses and legumes in the cropping sequence, and adding lime and fertilizer help to maintain or improve soil structure, soil fertility, and organic matter content.

This soil is well suited to pasture and hay. All of the commonly grown grasses and legumes grow well. The main management needs are proper stocking rates, a well planned clipping and harvesting schedule, weed control, applications of lime and fertilizer, and rotation grazing. Pasture renovation should be frequent enough to maintain the desired plants.

This soil is well suited to woodland, but few areas are wooded. The native trees are shortleaf pine, yellow poplar, Virginia pine, and sugar maple. Species preferred for planting include eastern white pine, yellow poplar, shortleaf pine, and white oak. Table 7 provides specific information relating to potential productivity. The main management concern is plant competition. If openings are made in the canopy, invading brushy plants can delay natural regeneration.

This soil is well suited to most urban uses. Seepage and the slope are limitations affecting some sanitary facilities. Proper design, proper installation procedures, and adequate site preparation can help to overcome these limitations.

The capability classification is IIe.

AgC2—Allegheny loam, 6 to 15 percent slopes, eroded. This very deep, well drained, sloping and moderately steep soil is on stream terraces along the Red River and its tributaries. Erosion has removed about 25 to 75 percent of the original surface layer. Individual areas are commonly narrow and range from about 10 to 30 acres in size.

Typically, the surface layer is dark yellowish brown loam about 6 inches thick. The subsurface layer to a depth of about 17 inches is yellowish brown loam. The subsoil extends to a depth of about 50 inches. It is yellowish brown and strong brown loam. The substratum extends to a depth of 60 inches or more. It is yellowish brown and pale brown loam.

This soil is medium in natural fertility and low in organic matter content. Permeability is moderate, and the available water capacity is high. Tilth is good. The soil can be worked throughout a wide range in moisture content. The root zone is very deep, and the depth to bedrock is more than 60 inches.

Included with this soil in mapping are areas of Cotaco and Rowdy soils. These soils are in landscape positions similar to those of the Allegheny soil. Also included are areas of soils that are similar to the Allegheny soil but are less than 60 inches deep over bedrock and small areas of severely eroded Allegheny soils. Included areas make up about 10 to 20 percent of the map unit. They are commonly less than 5 acres in size.

The Allegheny soil is used extensively for row crops, hay, or pasture.

This soil is suited to the commonly grown row crops, small grain, and specialty crops. The hazard of erosion is severe if conventional tillage methods are used. Measures that control erosion and reduce runoff are needed. Applying a system of conservation tillage, properly managing crop residue, growing cover crops, adding fertilizer and lime, and including grasses and legumes in the cropping sequence help to maintain or improve soil structure, tilth, soil fertility, and organic matter content.

This soil is well suited to pasture and hay. All of the commonly grown grasses and legumes grow well. The main management needs are selection and maintenance of desired species, a well planned clipping and harvesting schedule, proper stocking rates, rotation grazing, and applications of lime and fertilizer. Pasture renovation should be frequent enough to maintain the desired plants.

This soil is well suited to woodland, but few areas are wooded. The native trees are shortleaf pine, yellow poplar, Virginia pine, and sugar maple. Species preferred for planting include eastern white pine, yellow poplar, shortleaf pine, and white oak. Table 7 provides specific information relating to potential productivity. The main management concern is plant competition. If openings are made in the canopy, invading brushy plants can delay natural regeneration.

This soil is suited to most urban uses. The slope is a limitation affecting most kinds of building site development and sanitary facilities. Proper design, proper installation procedures, and adequate site preparation help to overcome this limitation.

The capability classification is IIIe.

AgD3—Allegheny loam, 15 to 25 percent slopes, severely eroded. This very deep, well drained, moderately steep and steep soil is on stream terraces along the Red River and its tributaries. Erosion has removed more than 75 percent of the original surface layer. Individual areas range from about 5 to 50 acres in size. Rills or shallow gullies have formed in some areas.

Typically, the surface layer is yellowish brown loam about 6 inches thick. The subsurface layer to a depth of about 17 inches is yellowish brown loam. The subsoil extends to a depth of about 50 inches. It is yellowish brown and strong brown loam. The substratum extends

to a depth of 60 inches or more and is yellowish brown and pale brown loam.

This soil is low in natural fertility and organic matter content. Permeability is moderate, and the available water capacity is high. The root zone is very deep, and the depth to bedrock is more than 60 inches.

Included with this soil in mapping are areas of soils that are similar to the Allegheny soil but are less than 60 inches deep over bedrock and areas of soils that formed partly in colluvium and residuum. Included areas make up about 25 percent of the map unit. They are generally small.

The Allegheny soil is used mostly for pasture or hay.

This soil is poorly suited to row crops because of the slope and a very severe hazard of erosion.

This soil is suited to pasture and hay. Most of the commonly grown grasses and legumes grow well. The main management needs are applications of lime and fertilizer, proper stocking rates, rotation grazing, a well planned clipping and harvesting schedule, and control of undesirable vegetation. The use of farm equipment is somewhat restricted by the slope.

This soil is well suited to woodland. The native trees are shortleaf pine, yellow poplar, Virginia pine, and sugar maple. Species preferred for planting include eastern white pine, yellow poplar, shortleaf pine, and white oak. Table 7 provides specific information relating to potential productivity. Management concerns include plant competition, the erosion hazard, and the equipment limitation. If openings are made in the canopy, invading brushy plants can delay natural regeneration.

This soil is poorly suited to most urban uses because of the slope.

The capability classification is VIe.

AoB—Allegheny-Cotaco complex, 2 to 6 percent slopes. This map unit consists of very deep, well drained and moderately well drained or somewhat poorly drained, gently sloping soils. These soils are on stream terraces along the Red River and, to a lesser extent, along its major tributaries. The Allegheny soil is on the slightly higher, convex slopes, and the Cotaco soil is on the lower, concave slopes. Individual areas range from about 5 to 60 acres in size. They are about 45 percent Allegheny soil and 30 percent Cotaco soil.

Typically, the surface layer of the Allegheny soil is brown loam about 6 inches thick. The subsurface layer to a depth of about 17 inches is yellowish brown loam. The subsoil extends to a depth of about 50 inches. It is yellowish brown and strong brown loam. The substratum extends to a depth of 60 inches or more. It is yellowish brown and pale brown loam.

The Allegheny soil is medium in natural fertility and moderate in organic matter content. Permeability is moderate, and the available water capacity is high. Tilth is good. The soil can be worked throughout a wide range in moisture content. The root zone is very deep, and the depth to bedrock is more than 60 inches.

Typically, the surface layer of the Cotaco soil is dark grayish brown silt loam about 10 inches thick. The upper part of the subsoil is dark brown and dark grayish brown silt loam about 6 inches thick. The next part is dark brown, mottled loam about 8 inches thick. The lower part to a depth of about 46 inches is yellowish brown, mottled loam. The substratum extends to a depth of 60 inches or more. It is mottled yellowish brown, light brownish gray, and strong brown clay loam.

The Cotaco soil is medium in natural fertility and moderate in organic matter content. Permeability is moderate, and the available water capacity is high. Tilth is good. The soil can be worked throughout a wide range in moisture content. The root zone is very deep, and the depth to bedrock is more than 60 inches. A seasonal high water table is at a depth of 18 to 30 inches.

Included with these soils in mapping are soils that are similar to the Allegheny and Cotaco soils but are less than 60 inches deep over bedrock. Also included are small areas of Rowdy and Knowlton soils and a few areas of eroded Allegheny and Cotaco soils. Included areas make up about 25 percent of the map unit.

The Allegheny and Cotaco soils are used extensively for row crops, hay, or pasture. They are also used for specialty vegetable crops.

These soils are suited to most of the commonly grown row crops and small grain. The Cotaco soil is better suited to crops that can tolerate slight wetness. The root zone of the Cotaco soil is restricted by a high water table during wet periods. Erosion is a moderate hazard if conventional tillage methods are used. Conservation practices that help to control erosion, improve tilth, and maintain fertility are needed. Applying a system of conservation tillage, properly managing crop residue, growing cover crops, including grasses and legumes in the cropping sequence, and adding lime and fertilizer are suitable management practices.

These soils are suited to pasture and hay. Most of the commonly grown grasses and legumes grow well. Species that can tolerate slight wetness and provide adequate ground cover should be selected for planting. Pasture renovation, proper stocking rates, a well planned clipping and harvesting schedule, rotation grazing, and applications of lime and fertilizer are suitable management practices.

These soils are well suited to woodland, but few areas are wooded. The native trees are yellow poplar, Virginia pine, black oak, and white oak. Species

preferred for planting include eastern white pine, yellow poplar, shortleaf pine, and white oak. Table 7 provides specific information relating to potential productivity. The main management concern is plant competition. If openings are made in the canopy, invading brushy plants can delay natural regeneration.

The Allegheny soil is well suited to most urban uses. Seepage is a concern on sites for some sanitary facilities. The Cotaco soil is suited to some urban uses. The wetness is a limitation affecting most kinds of building site development and sanitary facilities. Seepage also is a limitation on sites for some sanitary facilities. Proper design, proper installation procedures, and adequate site preparation can help to overcome these limitations.

The capability classification is IIe.

ArF—Alticrest-Ramsey-Rock outcrop complex, 20 to 65 percent slopes. This map unit consists of sandstone Rock outcrop and moderately deep and shallow, well drained and somewhat excessively drained, steep and very steep soils on ridgetops and the upper side slopes in the southern part of Powell County and throughout most of Wolfe County. Slopes are complex. They range from about 20 to 40 percent in areas of the Alticrest soil and from 20 to 65 percent in areas of the Ramsey soil. Individual areas of this map unit are several hundred acres in size. They are about 35 percent Alticrest soil, 30 percent Ramsey soil, and 15 percent Rock outcrop.

Typically, the surface layer of the Alticrest soil is dark brown sandy loam about 5 inches thick. The subsurface layer to a depth of about 10 inches is yellowish brown sandy loam. The subsoil extends to a depth of about 31 inches. It is strong brown sandy loam. The substratum is yellowish brown channery sandy loam about 7 inches thick. Sandstone bedrock is at a depth of about 38 inches.

The Alticrest soil is low in natural fertility and organic matter content. Permeability is moderately rapid, and the available water capacity is moderate or high. The root zone is moderately deep and can be easily penetrated by plant roots. The depth to bedrock ranges from 20 to 40 inches.

Typically, the surface layer of the Ramsey soil is dark brown fine sandy loam about 3 inches thick. The upper part of the subsoil is yellowish brown sandy loam about 4 inches thick. The lower part is strong brown gravelly sandy loam about 11 inches thick. Hard sandstone bedrock is at a depth of about 18 inches.

The Ramsey soil is low in natural fertility and organic matter content. Permeability is rapid, and the available water capacity is low. The root zone is shallow and can be easily penetrated by plant roots. The depth to bedrock ranges from 7 to 20 inches.

The Rock outcrop consists of cliffs and ledges intermingled with the Alticrest and Ramsey soils. The height of the vertical cliffs may range to 40 feet or more.

Included in mapping are small areas of Gilpin, Lily, Helechawa, Rigley, and Shelocta soils. These soils are in landscape positions similar to those of the major soils. They make up about 20 percent of the map unit.

This map unit is used mostly as woodland.

This unit is poorly suited to row crops, hay, and pasture. The slope, the depth to bedrock, and the Rock outcrop are limitations.

This unit is suited to woodland. The native trees are black oak, chestnut oak, and Virginia pine. The understory vegetation is mainly red maple, sourwood, huckleberry, and greenbrier. Species preferred for planting include shortleaf pine, eastern white pine, and white oak. Table 7 provides specific information relating to potential productivity. The main management concerns are the erosion hazard and the equipment limitation. Careful use of wheeled and tracked equipment reduces the disturbance of the surface layer. If openings are made in the canopy, invading brushy plants can delay natural regeneration.

This unit is poorly suited to most urban uses. The slope, the depth to bedrock, and the Rock outcrop are limitations affecting most kinds of building site development and sanitary facilities. Seepage is an additional concern on sites for some sanitary facilities.

The capability classification of the Alticrest and Ramsey soils is VIIe, and that of the Rock outcrop is VIIIs.

BeF—Bethesda and Fairpoint soils, 2 to 70 percent slopes. This unit consists of very deep, well drained, gently sloping to very steep soils that formed in disturbed soil and bedrock material in areas that have been strip-mined (fig. 8). Mined areas consist of narrow benches where the side slopes have been contour mined or occur as small areas that have been disturbed in the process of gaining access to coalbeds. Most mined areas are scattered throughout the southern part of Wolfe County, where the coalbeds are thin and discontinuous. The strip-mined areas generally range from about 2 to 200 acres in size and include both reclaimed and nonreclaimed sites that commonly have a highwall about 10 to 50 feet high. Individual areas of this map unit are about 60 percent Bethesda soil and 30 percent Fairpoint soil.

Typically, the surface layer of the Bethesda soil is light yellowish brown channery loam about 8 inches thick. The substratum to a depth of 60 inches or more is

Figure 8.—A typical area of Bethesda and Fairpoint soils, 2 to 70 percent slopes. These soils have been graded and smoothed.

yellowish brown and dark gray very channery and extremely channery silty clay loam, silt loam, and loam.

The Bethesda soil is medium in natural fertility and very low in organic matter content. Permeability is moderately slow, and the available water capacity is low or moderate. The root zone is very deep, but root penetration may be restricted by compaction or rock fragments.

Typically, the surface layer of the Fairpoint soil is mixed dark yellowish brown and yellowish brown channery silt loam about 6 inches thick. The substratum to a depth of 60 inches or more is dark grayish brown very channery silt loam.

The Fairpoint soil is low in natural fertility and very low in organic matter content. Permeability is moderately slow, and the available water capacity is low or moderate. The root zone is very deep, but root penetration may be restricted by compaction or rock fragments.

Included with these soils in mapping are small areas of Alticrest, Gilpin, Latham, Ramsey, and Shelocta soils. Included areas commonly make up about 10 percent of the map unit.

Most recently disturbed areas of this unit have been reshaped and seeded to grasses and legumes. Some previously mined areas have not been graded, reshaped, or reseeded.

The soils in this map unit are poorly suited to row

crops, hay, and pasture and to most urban uses. The slope, differential settling, unstable outslopes, and stoniness are limitations.

These soils are suited to woodland. Species preferred for planting include eastern white pine, shortleaf pine, black locust, and white oak. Table 7 provides specific information relating to productivity. The main management concerns are the erosion hazard and the equipment limitation.

The capability classification is VIIe.

BsF—Bledsoe-Berks-Rock outcrop complex, 20 to 70 percent slopes. This map unit consists of Rock outcrop and very deep and moderately deep, well drained, steep and very steep soils in the southern part of Powell County. It is on the lower half of side slopes along the Red River and its tributaries. The upper boundary of this unit is the outcrop of the Newman Limestone Geologic Formation. The lower boundary extends to the flood plains. Below the limestone outcrop, the underlying bedrock is dominantly level-interbedded shale and siltstone that have thin layers of dolomite and sandstone. Individual areas of this map unit are generally several hundred acres in size. They are about 40 percent Bledsoe soil, 25 percent Berks soil, and 10 percent Rock outcrop.

The soil patterns are very complex because of the influence of soil and bedrock materials that have moved downslope from the higher positions on the side slopes and because of the shape and geometric form of the landscape. In places the soils are influenced by sandy colluvial deposits containing quartz pebbles and house-sized sandstone boulders that have moved downslope from the Lee Geologic Formation. These colluvial deposits are in coves and along drainageways. Springs and seeps are associated with the soils that are directly below the limestone outcrop. Some of these springs flow throughout the year.

The Bledsoe soil is commonly on toe slopes along narrow valleys. It is also on benches and the concave lower side slopes in areas along streams where colluvial material that is dominantly of limestone origin has accumulated (fig. 9). Typically, the surface layer is dark brown silt loam about 8 inches thick. The upper part of the subsoil is strong brown silt loam about 8 inches thick. The lower part is strong brown silty clay loam about 39 inches thick. The substratum to a depth of 60 inches or more is strong brown channery silty clay loam.

The Bledsoe soil is high in natural fertility and moderate or high in organic matter content. Permeability is moderately slow, and the available water capacity is high. The root zone is very deep, and the depth to bedrock is more than 60 inches.

The Berks soil is on convex side slopes in a horizontal band about 70 to 160 feet wide below the outcrops of limestone in the upper part of the map unit. Typically, the surface layer is brown channery silt loam about 5 inches thick. The subsurface layer to a depth of about 11 inches is light yellowish brown channery silt loam. The subsoil to a depth of about 34 inches is light yellowish brown very channery silt loam. The substratum is light yellowish brown extremely channery silt loam about 4 inches thick. Bedrock of interbedded siltstone and shale is at a depth of about 38 inches.

The Berks soil is medium in natural fertility and low or moderate in organic matter content. Permeability is moderately rapid, and the available water capacity is low or moderate. The root zone is moderately deep, and the depth to bedrock ranges from 20 to 40 inches.

The Rock outcrop typically occurs as discontinuous cliffs and ledges dominantly associated with the Newman Limestone Geologic Formation near the upper part of the map unit. This limestone formation is tilted to the south. It is exposed as outcrops about 40 to 50 feet thick on ridgetops near Stanton but disappears underground near Slade. The Rock outcrop supports little or no vegetation.

Included in mapping are small areas of Faywood, Gilpin, Helechawa, Latham, and Shelocta soils and areas of soils that are similar to the Bledsoe soil but have a thick, dark surface layer and contain more than 35 percent limestone fragments. Also included are deep, well drained, loamy soils on narrow flood plains. Included areas make up about 25 percent of the map unit.

This map unit is used as woodland.

This unit is poorly suited to cultivated crops, hay, and pasture because of the slope, the Rock outcrop, a very severe hazard of erosion, and the equipment limitation.

This unit is suited to woodland. The native trees are yellow poplar, black walnut, white ash, and Virginia pine on the Bledsoe soil and white oak, black oak, and hickory on the Berks soil. The understory vegetation is mainly red maple, sassafras, flowering dogwood, sourwood, spicebush, Christmas fern, and greenbrier. Species preferred for planting include shortleaf pine and white oak. Table 7 provides specific information relating to potential productivity. Management concerns include the hazard of erosion, the equipment limitation, seedling mortality, and plant competition. Proper harvesting techniques can minimize the disturbance of the surface layer. The slope and the Rock outcrop restrict the use of wheeled and tracked equipment. If openings are made in the canopy, invading brushy plants can delay natural regeneration.

This unit is poorly suited to urban uses. The slope and the Rock outcrop are limitations affecting most

Figure 9.—An area of Bledsoe soil in the Bledsoe-Berks-Rock outcrop complex, 20 to 70 percent slopes. This soil formed in colluvial material.

kinds of building site development and sanitary facilities.

The capability classification of the Bledsoe and Berks soils is VIIe, and that of the Rock outcrop is VIIIs.

CkF—Carpenter-Bledsoe-Berks complex, 20 to 70 percent slopes. This map unit consists of very deep, deep, and moderately deep, well drained, steep and very steep soils. It stretches from south of Stanton to near Slade in Powell County. It is on the lower two-thirds of side slopes along the Red River and its tributaries. The upper boundary of the map unit is the outcrop of the Newman Limestone Geologic Formation, and the lower boundary extends to the flood plains (fig. 10). Individual areas of this map unit are generally several hundred acres in size. They are about 35 percent Carpenter soil, 25 percent

Bledsoe soil, and 20 percent Berks soil.

The soil patterns are very complex because of the influence of soil and bedrock materials that have moved downslope from the higher positions on the side slopes and because of the shape and geometric form of the landscape. In places the soils are influenced by sandy colluvial deposits containing quartz pebbles and boulders that have moved downslope from the Lee

Figure 10.—Exposed strata of the Upper Borden Geologic Formation and the cap of the Newman Limestone Geologic Formation in an area of Carpenter-Bledsoe-Berks complex, 20 to 70 percent slopes.

Geologic Formation. Thick colluvial deposits are common in coves and in areas along drainageways.

The Carpenter soil is on the concave lower side slopes and foot slopes where colluvial material has accumulated. Typically, the surface layer is olive brown silt loam about 3 inches thick. The subsurface layer to a depth of about 13 inches is light olive brown silt loam. The subsoil extends to a depth of about 45 inches. It is light yellowish brown and light olive brown silty clay loam. The substratum to a depth of 60 inches or more is olive clay loam.

The Carpenter soil is high in natural fertility and moderate or high in organic matter content. Permeability is moderately slow, and the available water capacity is high. The root zone is deep or very deep, and the depth to bedrock ranges from 40 to more than 80 inches.

The Bledsoe soil is commonly on toe slopes in areas along narrow valleys. It is also on benches and the concave lower side slopes where colluvial material that is dominantly of limestone origin has accumulated. Typically, the surface layer is dark brown silt loam about 8 inches thick. The upper part of the subsoil is strong brown silt loam about 8 inches thick. The lower part is strong brown silty clay loam about 39 inches thick. The substratum to a depth of 60 inches or more is strong brown channery silty clay loam.

The Bledsoe soil is high in natural fertility and moderate or high in organic matter content. Permeability is moderately slow, and the available water capacity is high. The root zone is very deep, and the depth to bedrock is more than 60 inches.

The Berks soil is on convex side slopes in a horizontal band about 70 to 160 feet wide below the outcrops of limestone in the upper part of the map unit. Typically, the surface layer is brown channery silt loam about 5 inches thick. The subsurface layer to a depth of about 11 inches is light yellowish brown channery silt loam. The subsoil to a depth of about 34 inches is light yellowish brown very channery silt loam. The substratum is light yellowish brown extremely channery silt loam about 4 inches thick. Bedrock of interbedded siltstone and shale is at a depth of about 38 inches.

The Berks soil is medium in natural fertility and low in organic matter content. Permeability is moderately rapid, and the available water capacity is low or moderate. The root zone is moderately deep, and the depth to bedrock ranges from 20 to 40 inches.

Included with these soils in mapping are discontinuous cliffs and ledges of rock outcrop associated with the Newman Limestone Geologic Formation. Also included are small areas of Faywood, Gilpin, Helechawa, Latham, and Shelocta soils; areas of soils that are similar to the Bledsoe soil but have a thick, dark surface layer and contain more than 35 percent limestone fragments; and Grigsby and Skidmore soils in areas along narrow flood plains. Included areas make up about 20 percent of the map unit.

The Carpenter, Bledsoe, and Berks soils are used as woodland.

These soils are not suited to row crops, hay, and pasture because of the slope, the rock outcrop, a very severe hazard of erosion, and the equipment limitation.

These soils are suited to woodland. The native trees are white oak, black oak, and Virginia pine on the Carpenter soil; yellow poplar, black walnut, white ash, and Virginia pine on the Bledsoe soil; and white oak, black oak, and hickory on the Berks soil. The understory vegetation is mainly red maple, sassafras, flowering dogwood, sourwood, spicebush, Christmas fern, and greenbrier. Species preferred for planting include white oak and shortleaf pine. Table 7 provides specific information relating to potential productivity. Management concerns include the hazard of erosion, the equipment limitation, seedling mortality, and plant competition. Proper harvesting techniques can minimize the disturbance of the surface layer. The slope restricts the use of wheeled and tracked equipment. If openings are made in the canopy, invading brushy plants can delay natural regeneration.

These soils are poorly suited to urban uses. The slope is a limitation affecting building site development and sanitary facilities.

The capability classification is VIIe.

CoA—Cotaco silt loam, 0 to 2 percent slopes. This very deep, moderately well drained or somewhat poorly drained, nearly level soil is on stream terraces and colluvial fans. It is commonly on flood plains along the Red River but also is in scattered areas along tributary streams throughout both counties. Individual areas range from about 5 to 100 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 10 inches thick. The upper part of the subsoil is dark brown and dark grayish brown silt loam about 6 inches thick. The next part is dark brown, mottled loam about 8 inches thick. The lower part is yellowish brown, mottled loam about 22 inches thick. The substratum to a depth of 60 inches or more is mottled yellowish brown, light brownish gray, and strong brown clay loam.

This soil is medium in natural fertility and moderate in organic matter content. Permeability is moderate, and the available water capacity is high. Tilth is good. The soil can be worked throughout a wide range in moisture content. The root zone is very deep, and the depth to bedrock is more than 60 inches. A seasonal high water

table is at a depth of 18 to 30 inches.

Included with this soil in mapping are small areas of Allegheny, Rowdy, and Knowlton soils. These soils are in landscape positions similar to those of the Cotaco soil. Also included are small areas of soils that are similar to the Cotaco soil but are less than 60 inches deep over bedrock. Included areas make up about 15 percent of the map unit. They are generally less than 3 acres in size.

The Cotaco soil is used for hay, pasture, or row crops.

This soil is suited to most of the commonly grown row crops but is better suited to crops that can tolerate some wetness. Measures that improve tilth, fertility, and surface and subsurface drainage are needed. Applying a system of conservation tillage, properly managing crop residue, growing cover crops, including grasses and legumes in the cropping sequence, and adding lime and fertilizer help to maintain tilth, soil structure, and organic matter content.

This soil is suited to pasture and hay. The wetness may restrict the growth of some deep-rooted legumes, such as alfalfa. Grasses and legumes that can tolerate some wetness and that provide adequate forage and ground cover should be selected for planting. Management needs include pasture renovation, an adequate drainage system, proper stocking rates, rotation grazing, a well planned clipping and harvesting schedule, applications of lime and fertilizer, and control of undesirable vegetation.

This soil is well suited to woodland, but few areas are wooded. The native trees are black oak, yellow poplar, Virginia pine, and white oak. Species preferred for planting include eastern white pine, yellow poplar, and white oak. Table 7 provides specific information relating to potential productivity. The main management concern is plant competition. If openings are made in the canopy, invading brushy plants can delay natural regeneration.

This soil is poorly suited to most urban uses. The wetness is a limitation affecting most kinds of building site development and sanitary facilities. Seepage is an additional management concern on sites for some sanitary facilities.

The capability classification is IIw.

CoB—Cotaco silt loam, 2 to 6 percent slopes. This very deep, moderately well drained or somewhat poorly drained, gently sloping soil is on stream terraces and colluvial fans. It is commonly on flood plains along the Red River but also is in scattered areas along tributary streams throughout both counties. Individual areas range from about 5 to 100 acres in size. Slopes are smooth or slightly convex.

Typically, the surface layer is dark grayish brown silt loam about 10 inches thick. The upper part of the subsoil is dark brown and dark grayish brown silt loam about 6 inches thick. The lower part is yellowish brown, mottled loam about 30 inches thick. The substratum to a depth of 60 inches or more is mottled yellowish brown, light brownish gray, and strong brown clay loam.

This soil is medium in natural fertility and moderate in organic matter content. Permeability is moderate, and the available water capacity is high. Tilth is good. The soil can be worked throughout a wide range in moisture content. The root zone is very deep, and the depth to bedrock is more than 60 inches. A seasonal high water table is at a depth of 18 to 30 inches.

Included with this soil in mapping are small areas of Allegheny, Rowdy, and Knowlton soils. These soils are in landscape positions similar to those of the Cotaco soil. Also included are small areas of eroded Cotaco soils. Included areas make up about 15 percent of the map unit. They are generally less than 3 acres in size.

The Cotaco soil is used extensively for row crops, hay, or pasture.

This soil is suited to most of the commonly grown row crops and small grain but is better suited to crops that can tolerate some wetness. Erosion is a moderate hazard if conventional tillage methods are used. Applying a system of conservation tillage, growing cover crops, properly managing crop residue, including grasses and legumes in the cropping sequence, and adding lime and fertilizer help to maintain tilth, soil structure, and organic matter content.

This soil is well suited to pasture and hay. The wetness may restrict the growth of some deep-rooted legumes, such as alfalfa. Grasses and legumes that can tolerate some wetness and that provide adequate forage and ground cover should be selected for planting. Management concerns include pasture renovation, an adequate drainage system, proper stocking rates, rotation grazing, a well planned clipping and harvesting schedule, applications of lime and fertilizer, and control of undesirable vegetation.

This soil is well suited to woodland, but few areas are wooded. The native trees are black oak, yellow poplar, Virginia pine, and white oak. Species preferred for planting include eastern white pine, yellow poplar, and white oak. Table 7 provides specific information relating to potential productivity. The main management concern is plant competition. If openings are made in the canopy, invading brushy plants can delay natural regeneration.

This soil is poorly suited to most urban uses. The wetness is a limitation affecting most kinds of building site development and sanitary facilities. Seepage is an additional concern on sites for some sanitary facilities.

The capability classification is IIe.

FaE2—Faywood silt loam, 20 to 35 percent slopes, eroded. This moderately deep, well drained, steep and very steep soil is on ridgetops and the upper side slopes in the Knobs area of Powell County. Areas of this soil commonly include entire ridgetops and extend to the limestone outcrop on the upper side slopes. Slopes are commonly linear. Erosion has removed about 25 to 75 percent of the original surface layer. Individual areas of this soil range from about 20 to 200 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 2 inches thick. The upper part of the subsoil is yellowish brown silty clay about 4 inches thick. The next part is strong brown clay about 14 inches thick. The lower part is light olive brown and olive gray clay about 12 inches thick. The substratum is pale olive clay about 6 inches thick. Limestone bedrock is at a depth of about 38 inches.

This soil is medium in natural fertility and low in organic matter content. Permeability is moderately slow or slow, and the available water capacity is moderate or high. The root zone is moderately deep, but root penetration may be restricted by the clayey subsoil. The shrink-swell potential is moderate in the subsoil. The depth to limestone bedrock ranges from 20 to 40 inches.

Included with this soil in mapping are small areas of soils that are loamy in the surface layer and the upper part of the subsoil, soils that are similar to the Faywood soil but have a yellowish red subsoil, and soils that are similar to the Faywood soil but have channer- to boulder-sized fragments of sandstone in the surface layer. Also included are clayey soils that are more than 40 inches deep over bedrock, clayey soils that are less than 20 inches deep over bedrock, areas of severely eroded Faywood soils that have a clayey surface soil, and areas of limestone rock outcrop. Included areas make up about 25 percent of the map unit. They are generally small.

The Faywood soil is used mainly as woodland.

This soil is poorly suited to row crops because of the slope, the depth to bedrock, and a very severe hazard of erosion.

This soil is suited to pasture but is poorly suited to hay. The included areas of rock outcrop hinder mowing and pasture renovation. The main management needs are applications of lime and fertilizer, proper stocking rates, and control of undesirable vegetation.

This soil is suited to woodland. The native trees are northern red oak, black oak, and white oak. Species preferred for planting include eastern white pine, white oak, and white ash. Table 7 provides specific information relating to potential productivity. Management concerns include the erosion hazard, the equipment limitation, and plant competition. Proper use of wheeled and tracked equipment can minimize the disturbance of the surface layer. If openings are made in the canopy, invading brushy plants can delay natural regeneration.

This soil is poorly suited to urban uses. The slope and the depth to bedrock are limitations affecting most kinds of building site development and sanitary facilities. Low strength is a limitation on sites for local roads and streets. Also, it limits the use of the soil as roadfill.

The capability classification is VIe.

GnC—Gilpin silt loam, 4 to 12 percent slopes. This moderately deep, well drained, gently sloping and sloping soil is on ridgetops throughout most of the survey area. Individual areas range from about 5 to 50 acres in size.

Typically, the surface layer is dark brown silt loam about 7 inches thick. The upper part of the subsoil is strong brown silt loam about 11 inches thick. The lower part is yellowish brown silty clay loam about 12 inches thick. The substratum is yellowish brown channery silt loam about 5 inches thick. Fractured siltstone and shale bedrock is at a depth of about 35 inches.

This soil is medium in natural fertility and moderate in organic matter content. Permeability is moderate, and the available water capacity is moderate or high. Tilth is good. The soil can be worked throughout a wide range in moisture content. The root zone is moderately deep and can be easily penetrated by plant roots. The depth to bedrock ranges from 20 to 40 inches.

Included with this soil in mapping are small areas of Latham and Lily soils. These soils are in landscape positions similar to those of the Gilpin soil. Also included are areas of deep, loamy soils that are underlain by soft shale bedrock and small areas of deep, silty soils. Included areas make up about 15 percent of the map unit.

Most areas of the Gilpin soil are used as woodland. A few areas have been cleared and are used for hay, pasture, or row crops.

This soil is suited to most of the commonly grown row crops. The hazard of erosion is severe if conventional tillage methods are used. Applying a system of conservation tillage, growing cover crops, including grasses and legumes in the cropping sequence, and adding lime and fertilizer help to maintain soil tilth, organic matter content, and soil fertility.

This soil is suited to pasture and hay. Most of the commonly grown grasses and legumes grow well. The main management needs are applications of lime and

Figure 11.—An area of Gilpin silt loam, 12 to 25 percent slopes, on narrow ridgetops and short side slopes.

fertilizer, proper stocking rates, pasture renovation, rotation grazing, control of undesirable vegetation, and a well planned clipping and harvesting schedule.

This soil is well suited to woodland. The native trees are black oak, white oak, yellow poplar, and shortleaf pine. Species preferred for planting include eastern white pine, white oak, and yellow poplar. Table 7 provides specific information relating to potential productivity. The main management concern is plant competition. If openings are made in the canopy, invading brushy plants can delay natural regeneration.

This soil is suited to some urban uses. The depth to bedrock is a limitation on sites for most sanitary facilities. The slope and the depth to bedrock are limitations affecting most kinds of building site development. Proper design, proper installation procedures, and adequate site preparation can help to overcome these limitations.

The capability classification is IIIe.

GnD—Gilpin silt loam, 12 to 25 percent slopes. This moderately deep, well drained, moderately steep and steep soil is on ridgetops and side slopes throughout the survey area (fig. 11). Individual areas are long and narrow and range from about 5 to 100 acres in size.

Typically, the surface layer is dark brown silt loam about 7 inches thick. The upper part of the subsoil is strong brown silt loam about 11 inches thick. The lower part is yellowish brown silty clay loam about 12 inches thick. The substratum is yellowish brown channery silt loam about 5 inches thick. Fractured siltstone and shale bedrock is at a depth of about 35 inches.

This soil is medium in natural fertility and moderate in organic matter content. Permeability is moderate, and the available water capacity is moderate or high. Tilth is good. The soil can be worked throughout a wide range in moisture content. The root zone is moderately deep and can be easily penetrated by plant roots. The depth

to bedrock ranges from 20 to 40 inches.

Included with this soil in mapping are small areas of Lily and Shelocta soils. These soils are in landscape positions similar to those of the Gilpin soil. Also included are soils that are similar to the Gilpin soil but are more than 40 inches deep over bedrock and have a clayey subsoil, soils that are similar to the Gilpin soil but have more silt and less sand, and a few areas of eroded Gilpin soils. Included areas make up about 20 percent of the map unit.

Most areas of the Gilpin soil are used as woodland. A few areas are used for hay and pasture.

This soil is suited to occasional cultivation, but the hazard of erosion is very severe if conventional tillage methods are used. Applying a system of conservation tillage, returning crop residue to the soil, growing cover crops, and including grasses and legumes in the cropping sequence help to control erosion and maintain soil tilth.

This soil is well suited to pasture and hay. Most of the commonly grown grasses and legumes grow well. Grasses and legumes that provide adequate ground cover should be selected for planting. The main management needs are applications of lime and fertilizer, proper stocking rates, pasture renovation, rotation grazing, control of undesirable vegetation, and a well planned clipping and harvesting schedule.

This soil is well suited to woodland. The native trees are black oak, white oak, yellow poplar, and shortleaf pine. Species preferred for planting include eastern white pine, white oak, and yellow poplar. The understory vegetation is mainly flowering dogwood, sourwood, and common greenbrier. Table 7 provides specific information relating to potential productivity. Management concerns include the erosion hazard, the equipment limitation, and plant competition. Proper use of wheeled and tracked equipment can minimize the disturbance of the surface layer. If openings are made in the canopy, invading brushy plants can delay natural regeneration.

This soil is poorly suited to most urban uses. The slope and the depth to bedrock are limitations affecting most kinds of building site development and sanitary facilities. Proper design, proper installation procedures, and adequate site preparation can help to overcome these limitations.

The capability classification is IVe.

GpE—Gilpin-Shelocta complex, 25 to 35 percent slopes. This map unit consists of moderately deep, deep, and very deep, well drained, steep and very steep soils on side slopes in Wolfe County. The Gilpin soil is commonly on the upper part of very steep side slopes, and the Shelocta soil is on the lower part of steep side slopes and in coves. Individual areas range from about 20 to several hundred acres in size. They are about 50 percent Gilpin soil and 30 percent Shelocta soil.

Typically, the surface layer of the Gilpin soil is dark brown silt loam about 7 inches thick. The upper part of the subsoil is strong brown silt loam about 11 inches thick. The lower part is yellowish brown silty clay loam about 12 inches thick. The substratum is yellowish brown channery silt loam about 5 inches thick. Fractured siltstone and shale bedrock is at a depth of about 35 inches.

The Gilpin soil is medium in natural fertility and moderate in organic matter content. Permeability is moderate, and the available water capacity is moderate or high. The root zone is moderately deep and can be easily penetrated by plant roots. The depth to bedrock ranges from 20 to 40 inches.

Typically, the surface layer of the Shelocta soil is dark brown gravelly silt loam about 3 inches thick. The subsurface layer to a depth of about 6 inches is dark yellowish brown gravelly silt loam. The upper part of the subsoil is dark yellowish brown and yellowish brown silt loam about 39 inches thick. The lower part is yellowish brown channery silt loam about 15 inches thick. The substratum to a depth of 70 inches or more is yellowish brown channery silty clay loam.

The Shelocta soil is medium in natural fertility and moderate in organic matter content. Permeability is moderate, and the available water capacity is moderate or high. The root zone is deep or very deep and can be easily penetrated by plant roots. The depth to bedrock ranges from 48 to more than 120 inches.

Included with these soils in mapping are small areas of Helechawa soils in coves and below sandstone rock outcrops, Grigsby soils on narrow flood plains, and Alticrest soils on ridgetops. Included soils are commonly less than 20 acres in size. They make up about 20 percent of the map unit.

Most areas of the Gilpin and Shelocta soils are used as woodland.

These soils are poorly suited to row crops, hay, and pasture. The slope is a limitation. Grasses and legumes are difficult to establish and maintain because of the equipment limitation and a very severe hazard of erosion.

These soils are well suited to woodland. The native trees are black oak, yellow poplar, and white oak. The understory vegetation is mainly red maple, flowering dogwood, spicebush, and Christmas fern. Species preferred for planting include white oak, eastern white pine, and shortleaf pine. Table 7 provides specific information relating to potential productivity. Management concerns include the erosion hazard and

the equipment limitation. Also, plant competition is a management concern on cool aspects, and seedling mortality is a management concern on warm aspects. Proper harvesting techniques can minimize the disturbance of the surface layer. If openings are made in the canopy, invading brushy plants can delay natural regeneration.

These soils are poorly suited to urban uses. The slope is a limitation affecting building site development and sanitary facilities.

The capability classification is VIIe.

GrF—Gilpin-Hazleton-Rock outcrop association, 20 to 60 percent slopes. This map unit consists of Rock outcrop and moderately deep, deep, and very deep, well drained, steep and very steep soils. It is on the upper part of side slopes in the northern part of Powell County. The upper boundary of this unit is the ridgetop, and the lower boundary is the outcrop of the Newman Limestone Geologic Formation. Individual areas range from about 20 to several hundred acres in size. They are about 55 percent Gilpin soil, 20 percent Hazleton soil, and 15 percent Rock outcrop.

Typically, the surface layer of the Gilpin soil is dark brown silt loam about 7 inches thick. The upper part of the subsoil is strong brown silt loam about 11 inches thick. The lower part to a depth of about 30 inches is yellowish brown silty clay loam. The substratum is yellowish brown channery silt loam about 5 inches thick. Fractured siltstone and shale bedrock is at a depth of about 35 inches.

The Gilpin soil is medium in natural fertility and moderate in organic matter content. Permeability is moderate, and the available water capacity is moderate or high. The root zone is moderately deep and can be easily penetrated by plant roots. The depth to bedrock ranges from 20 to 40 percent.

Typically, the surface layer of the Hazleton soil is very dark grayish brown channery sandy loam about 2 inches thick. The upper part of the subsoil is yellowish brown and strong brown very channery sandy loam about 33 inches thick. The lower part to a depth of about 42 inches is reddish brown very channery sandy loam. The substratum is strong brown very channery loam about 14 inches thick. Weathered sandstone bedrock is at a depth of about 56 inches.

The Hazleton soil is medium in natural fertility and moderate in organic matter content. Permeability is moderately rapid or rapid. The root zone is deep or very deep, but rock fragments may restrict root penetration. The depth to bedrock ranges from 40 to more than 72 inches.

The Rock outcrop occurs as vertical sandstone bluffs and steep ledges.

Included in mapping are areas of Alticrest, Helechawa, Latham, Lily, Rigley, and Shelocta soils. These soils are in landscape positions similar to those of the major soils. They make up about 10 percent of the map unit.

Most areas of this map unit are used as woodland.

This unit is poorly suited to row crops, hay, and pasture. The slope and the Rock outcrop are limitations.

This unit is suited to woodland. The native trees are black oak and white oak. The understory vegetation is mainly red maple, sourwood, huckleberry, dogwood, and greenbrier. Species preferred for planting include white oak and shortleaf pine. Table 7 provides specific information relating to potential productivity. The main management concerns are the erosion hazard and the equipment limitation. Careful use of wheeled and tracked equipment can minimize the disturbance of the surface layer. If openings are made in the canopy, invading brushy plants can delay natural regeneration.

This unit is poorly suited to urban uses because of the slope and the Rock outcrop.

The capability classification of the Gilpin and Hazleton soils is VIIe, and that of the Rock outcrop is VIIIs.

Gs—Grigsby silt loam, frequently flooded. This very deep, well drained, nearly level soil is on flood plains throughout the survey area. Individual areas range from about 5 to 20 acres in size. Slopes range from 0 to 4 percent.

Typically, the surface layer is brown silt loam about 8 inches thick. The upper part of the subsoil is dark yellowish brown sandy loam about 8 inches thick. The lower part is brownish yellow sandy loam about 23 inches thick. The substratum to a depth of 60 inches or more is yellowish brown sandy loam.

This soil is high in natural fertility and moderate in organic matter content. Permeability is moderate or moderately rapid, and the available water capacity is moderate or high. The soil is frequently flooded during late winter and early spring, but it generally is not flooded during the growing season. Tilth is good. The soil can be worked throughout a wide range in moisture content. The root zone is very deep and can be easily penetrated by plant roots. The depth to bedrock is more than 60 inches.

Included with this soil in mapping are small areas of Newark, Orrville, and Skidmore soils. These soils are in landscape positions similar to those of the Grigsby soil. Also included are narrow areas of poorly drained, loamy soils. Included areas make up about 20 percent of the map unit. They generally are small.

Most areas of the Grigsby soil have been cleared

and are used for row crops, hay, pasture, or small grain.

This soil is well suited to most of the commonly grown row crops. Flooding in winter or early spring may damage small grain, but cultivated crops are rarely damaged. The soil can be cropped intensively if properly managed. Conservation practices that help to maintain organic matter content and soil fertility include applying a system of conservation tillage, growing cover crops, including grasses and legumes in the cropping sequence, and returning crop residue to the soil.

This soil is suited to all of the commonly grown pasture and hay crops, but some hay crops may be damaged by the flooding. The main management needs are maintenance of the desired species, weed control, proper stocking rates, rotation grazing, and applications of lime and fertilizer.

This soil is well suited to woodland. The native trees are yellow poplar, northern red oak, white oak, black walnut, American sycamore, and sweetgum. The understory vegetation is mainly red maple, flowering dogwood, and hickory. Species preferred for planting include yellow poplar, black walnut, and eastern white pine. Table 7 provides specific information relating to potential productivity.

This soil is poorly suited to most urban uses because of the flooding.

The capability classification is IIw.

Gu—Grigsby-Orrville complex, frequently flooded. This map unit consists of very deep, well drained and somewhat poorly drained, nearly level soils on long, narrow flood plains along the Red River and its major tributaries. The Grigsby soil is in areas adjacent to streams, and the Orrville soil is in areas near the base of upland side slopes. Slopes range from 0 to 4 percent. Individual areas of these soils are about 5 to 20 acres in size. They are about 50 percent Grigsby soil and 30 percent Orrville soil.

Typically, the surface layer of the Grigsby soil is brown silt loam about 8 inches thick. The subsoil is sandy loam. The upper 8 inches is dark yellowish brown, and the lower 23 inches is brownish yellow. The substratum to a depth of 60 inches or more is yellowish brown sandy loam.

The Grigsby soil is high in natural fertility and moderate in organic matter content. Permeability is moderate or moderately rapid, and the available water capacity is moderate or high. The soil is frequently flooded during late winter and early spring, but it is generally not flooded during the growing season. Tilth is good. The soil can be worked throughout a wide range in moisture content. The root zone is very deep and can be easily penetrated by roots. The depth to bedrock is more than 60 inches.

Typically, the surface layer of the Orrville soil is dark grayish brown silt loam about 9 inches thick. The upper part of the subsoil is dark yellowish brown and light brownish gray, mottled loam about 25 inches thick. The lower part is pale brown, mottled sandy loam about 8 inches thick. The substratum to a depth of 60 inches or more is loamy sand. It is mottled. The upper 8 inches is yellowish brown, and the lower 10 inches is gray.

The Orrville soil is medium in natural fertility and moderate in organic matter content. Permeability is moderate in the subsoil and moderately rapid in the substratum. The available water capacity is high. The soil is frequently flooded during late winter and early spring, but it is generally not flooded during the growing season. A seasonal high water table is at a depth of 12 to 30 inches. The root zone is very deep and can be easily penetrated by plant roots. The depth to bedrock is more than 60 inches.

Included with these soils in mapping are small areas of Allegheny and Rowdy soils in the higher positions on the landscape. Also included are areas of Skidmore soils on colluvial fans at the mouth of hollows and poorly drained, loamy soils in low areas and along drainageways. Included areas make up about 20 percent of the map unit. They are generally less than five acres in size.

The Grigsby and Orrville soils are used primarily for pasture and hay.

These soils are well suited to row crops if a drainage system is provided in areas of the Orrville soil. The soils can be cropped intensively if properly managed. Measures that maintain soil fertility, tilth, and organic matter content and that provide a surface and subsurface drainage system are needed in areas of the Orrville soil. Some plants may be damaged by flooding or wetness.

These soils are suited to most of the commonly grown pasture and hay crops. The flooding in winter and early spring may damage some hay crops. The wetness of the Orrville soil may be a problem for some deep-rooted legumes. The main management needs are maintenance of desired species, weed control, proper stocking rates, rotation grazing, and applications of lime and fertilizer.

These soils are well suited to woodland. The native trees are yellow poplar, white oak, red maple, and American sycamore. The understory vegetation is mainly red maple, flowering dogwood, and hickory. Species preferred for planting include yellow poplar, eastern white pine, and white oak. Table 7 provides specific information relating to potential productivity.

These soils are poorly suited to urban uses because of the flooding and the wetness.

The capability classification is IIw.

Gy—Grigsby-Skidmore-Morehead complex, 0 to 4 percent slopes. This map unit consists of very deep, well drained soils on flood plains; deep and very deep, well drained, gravelly soils on colluvial fans; and very deep, somewhat poorly drained or moderately well drained soils on low stream terraces. These soils are nearly level and gently sloping. This map unit is in narrow valleys along tributaries of the Red River. The Grigsby soil is on the flood plains adjacent to streams, the Skidmore soil is on colluvial fans at the mouth of hollows, and the Morehead soil is on low stream terraces. Individual areas range from about 5 to 40 acres in size. They are about 30 percent Grigsby soil, 25 percent Skidmore soil, and 20 percent Morehead soil.

Typically, the surface layer of the Grigsby soil is brown silt loam about 8 inches thick. The subsoil is sandy loam. The upper 8 inches is dark yellowish brown, and the lower 23 inches is brownish yellow. The substratum to a depth of 60 inches or more is yellowish brown sandy loam.

The Grigsby soil is high in natural fertility and moderate in organic matter content. Permeability is moderate or moderately rapid, and the available water capacity is moderate or high. Tilth is good. The soil can be worked throughout a wide range in moisture content. The root zone is very deep and can be easily penetrated by plant roots. The soil is occasionally flooded during late winter and early spring, but it is generally not flooded during the growing season. The depth to bedrock is more than 60 inches.

Typically, the surface layer of the Skidmore soil is brown gravelly silt loam about 10 inches thick. The subsurface layer to a depth of about 20 inches is dark yellowish brown very gravelly loam. The subsoil extends to a depth of about 40 inches. It is dark yellowish brown very gravelly clay loam. The substratum to a depth of 60 inches or more also is dark yellowish brown very gravelly clay loam.

The Skidmore soil is medium in natural fertility and moderate in organic matter content. Permeability is moderately rapid, and the available water capacity is moderate or low. The soil is occasionally flooded during late winter and early spring, but it is generally not flooded during the growing season. The gravelly surface layer may interfere with tillage. Otherwise, tilth is good. The soil can be worked throughout a wide range in moisture content. The root zone is deep or very deep. In places it may be restricted by gravelly layers. The depth to bedrock ranges from 40 to more than 100 inches.

Typically, the surface layer of the Morehead soil is brown silt loam about 2 inches thick. The subsurface layer is grayish brown silt loam about 3 inches thick. The upper part of the subsoil is light olive brown silty clay loam about 8 inches thick. The lower part is light olive brown, mottled silty clay loam and silt loam about 29 inches thick. The substratum to a depth of 60 inches or more is light brownish gray, mottled very gravelly loam.

The Morehead soil is medium in natural fertility and moderate in organic matter content. Permeability is moderate, and the available water capacity is high. The soil is subject to rare flooding. A seasonal high water table is at a depth of 6 to 30 inches. Tilth is good. The soil can be worked throughout a wide range in moisture content. The depth to bedrock ranges from 5 to more than 10 feet.

Included with these soils in mapping are small areas of Allegheny, Cotaco, Newark, Knowlton, Rowdy, and Westbend soils. These soils are in landscape positions similar to those of the major soils. Also included are scattered wet spots that are the result of seepage from the higher areas. Included areas make up about 25 percent of the map unit. They are generally less than 5 acres in size.

The Grigsby, Skidmore, and Morehead soils are used for row crops, hay, or pasture. A few areas are used for homesite development.

These soils are well suited to most of the commonly grown row crops and specialty crops. Measures that maintain soil fertility, tilth, and organic matter content and, in places, that provide a surface and subsurface drainage system are needed.

These soils are suited to most of the commonly grown pasture and hay crops. Flooding in late winter or early spring may damage some hay crops. The wetness of the Morehead soil may be a problem for some deep-rooted legumes. The main management needs are maintenance of desired species, weed control, proper stocking rates, rotation grazing, and applications of lime and fertilizer.

These soils are well suited to woodland. The native trees are yellow poplar, white oak, sweetgum, and American sycamore. Species preferred for planting include yellow poplar, eastern white pine, shortleaf pine, and white ash. Table 7 provides specific information relating to potential productivity. The main management concern is plant competition. If openings are made in the canopy, invading brushy plants can delay natural regeneration.

These soils are poorly suited to most urban uses because of the flooding or the wetness. The elongated,

narrow valleys are dissected by tributary streams entering the valley at right angles to the principal stream. Consequently, few areas are large enough for urban development. Suitable sites for dwellings without basements are at the mouth of draws on colluvial fans and on some of the higher stream terraces and foot slopes.

The capability classification is IIw.

HaF—Helechawa-Faywood complex, 20 to 45 percent slopes. This map unit consists of very deep, deep, and moderately deep, somewhat excessively drained and well drained, steep and very steep soils on the middle part of side slopes in the southern part of Powell County. It lies between the limestone cliff at midslope and the ridgetop of the lower ridges. The Helechawa soil formed in colluvium derived from the sandstone bedrock that caps the ridgetops. This colluvium is variable in thickness, and in places it extends downslope and covers the limestone residual material. The Faywood soil is mainly in convex areas on benches above the limestone outcrop. Individual areas are about 30 percent Helechawa soil and 20 percent Faywood soil.

Typically, the surface layer of the Helechawa soil is dark brown loamy sand about 3 inches thick. The upper part of the subsoil is dark yellowish brown and yellowish brown sandy loam about 42 inches thick. The lower part to a depth of 64 inches or more is strong brown sandy loam.

The Helechawa soil is low in natural fertility and medium or high in organic matter content. Permeability is moderately rapid, and the available water capacity is moderate. The root zone is deep or very deep and can be easily penetrated by plant roots. The depth to bedrock ranges from 40 to more than 60 inches.

Typically, the surface layer of the Faywood soil is dark grayish brown silt loam about 2 inches thick. The upper part of the subsoil is yellowish brown silty clay about 4 inches thick. The next part is strong brown clay about 14 inches thick. The lower part is light olive brown and olive gray clay about 12 inches thick. The substratum is pale olive, mottled clay about 6 inches thick. Limestone bedrock is at a depth of about 38 inches.

The Faywood soil is medium in natural fertility and low in organic matter content. Permeability is moderately slow or slow, and the available water capacity is moderate or high. The root zone is moderately deep. The shrink-swell potential is moderate in the clayey subsoil. The depth to bedrock ranges from 20 to 40 inches.

Included with these soils in mapping are small areas of Alticrest, Gilpin, Lily, Rigley, and Shelocta soils. These included soils are in landscape positions similar to those of the Helechawa and Faywood soils. Also included are soils that are similar to the Faywood soil but are loamy in the surface layer and the upper part of the subsoil, scattered areas of limestone rock outcrop in areas of the Faywood soil, and areas of soils that have sandstone rock fragments on the surface. Included areas make up about 50 percent of the map unit. They generally are small.

Most areas of the Helechawa and Faywood soils are used as woodland.

Most areas of these soils are poorly suited to cultivated crops, hay, and pasture because of the slope and the rock outcrop.

These soils are well suited to woodland. The native trees are chestnut oak and white oak on the Helechawa soil and northern red oak, scarlet oak, white oak, hickory, and white ash on the Faywood soil. The understory vegetation includes red maple, flowering dogwood, sourwood, sassafras, spicebush, Christmas fern, and greenbrier. Species preferred for planting include white oak and shortleaf pine. Table 7 provides specific information relating to potential productivity. The main management concerns are the erosion hazard and the equipment limitation. Proper harvesting techniques can minimize the disturbance of the surface layer. The slope and the rock outcrop restrict the use of wheeled and tracked vehicles. If openings are made in the canopy, invading brushy plants can delay natural regeneration.

These soils are poorly suited to urban uses because of the slope and the depth to bedrock.

The capability classification is VIIe.

HeF—Helechawa-Rock outcrop complex, 35 to 55 percent slopes. This map unit consists of Rock outcrop and a very deep and deep, somewhat excessively drained, very steep soil in the Red River Gorge area in the southern part of Powell County and the northern part of Wolfe County. The Helechawa soil is on the lower and middle side slopes. The Rock outcrop is on the upper side slopes above the Helechawa soil. The upper boundary of this map unit is associated with the discontinuous outcroppings of the Corbin Sandstone Member of the Lee Geologic Formation, and the lower boundary is the flood plains. Individual areas of the unit range from about 50 to several hundred acres in size. They are about 40 percent Helechawa soil and 20 percent Rock outcrop.

Typically, the surface layer of the Helechawa soil is dark brown loamy sand about 3 inches thick. The subsoil is sandy loam. The upper 42 inches is dark yellowish brown and yellowish brown, and the lower 19 inches is strong brown.

The Helechawa soil is low in natural fertility and moderate or high in organic matter content. Permeability is moderately rapid, and the available water capacity is moderate. The root zone is deep or very deep and can be easily penetrated by plant roots. The depth to bedrock ranges from 40 to more than 60 inches.

The Rock outcrop occurs as vertical sandstone cliffs and as ledges on side slopes.

Included in mapping are Alticrest, Gilpin, Latham, Lily, Shelocta, and Rigley soils. These soils are in landscape positions similar to those of the Helechawa soil. Also included, on the lower side slopes, are areas of Helechawa soils that have large boulders on the surface. Included areas make up about 40 percent of the map unit.

This map unit is used for recreation, woodland, or wildlife habitat.

This map unit is poorly suited to row crops, hay, and pasture because of the slope and the Rock outcrop.

The Helechawa soil is suited to woodland. The native trees are white oak, chestnut oak, and Virginia pine. The understory is mainly red maple, sassafras, flowering dogwood, sourwood, spicebush, Christmas fern, and greenbrier. Species preferred for planting include white oak and shortleaf pine. Table 7 provides specific information relating to potential productivity. Management concerns include the erosion hazard, the equipment limitation, seedling mortality, and plant competition. Proper harvesting techniques can minimize the disturbance of the surface layer. The slope and the Rock outcrop can restrict the use of wheeled and tracked vehicles. If openings are made in the canopy, invading brushy plants can delay natural regeneration.

This map unit is poorly suited to urban uses because of the slope and the Rock outcrop.

The capability classification of the Helechawa soil is VIIe, and that of the Rock outcrop is VIIIs.

JaB—Jessietown silt loam, 2 to 6 percent slopes. This moderately deep, well drained, gently sloping soil is on ridgetops in the Knobs section of Powell County. Individual areas are generally long and narrow and range from about 5 to 50 acres in size.

Typically, the surface layer is dark yellowish brown silt loam about 2 inches thick. The subsurface layer to a depth of about 11 inches is yellowish brown silt loam. The subsoil is silty clay loam. The upper 8 inches is yellowish brown, and the lower 15 inches is strong brown. Soft, weathered shale is at a depth of about 34 inches. Hard, black shale bedrock is at a depth of about 38 inches.

This soil is low in natural fertility and organic matter content. Permeability is moderate, and the available water capacity is moderate or high. The root zone is moderately deep. The depth to bedrock ranges from 20 to 40 inches.

Included with this soil in mapping are small areas of Muse and Rohan soils. These soils are in landscape positions similar to those of the Jessietown soil. Also included are soils that have been influenced by loamy river-deposited material. Included soils make up about 15 percent of the map unit.

The Jessietown soil is used mostly for row crops, hay, or pasture.

This soil is well suited to row crops, but erosion is a moderate hazard if conventional tillage methods are used. Contour farming, stripcropping, conservation tillage, and cover crops help to control runoff and erosion. Properly managing crop residue and including grasses and legumes in the cropping sequence help to maintain tilth and the content of organic matter.

This soil is well suited to pasture and hay. Most of the commonly grown grasses and legumes grow well. Species that produce high-quality forage and provide satisfactory ground cover should be selected for planting. The main management needs are applications of lime and fertilizer, pasture renovation, proper stocking rates, rotation grazing, proper seeding rates and mixtures, and weed control.

This soil is well suited to woodland. The native trees are Virginia pine, white oak, and hickory. The understory vegetation is mainly flowering dogwood, sourwood, and hickory. Species preferred for planting include white oak and shortleaf pine. Table 7 provides specific information relating to potential productivity. Management concerns include plant competition and the equipment limitation.

This soil is suited to some urban uses. The depth to bedrock is a limitation affecting most kinds of building site development and sanitary facilities. Low strength is a limitation on sites for local roads and streets. Also, it limits the use of the soil as roadfill. Proper design, proper installation procedures, and adequate site preparation can help to overcome these limitations.

The capability classification is IIe.

JeD3—Jessietown silty clay loam, 12 to 30 percent slopes, severely eroded. This moderately deep, well drained, moderately steep and steep soil is on ridgetops and side slopes in the Knobs section of Powell County. Erosion has removed more than 75 percent of the original surface layer. Individual areas are generally long and narrow and range from about 5 to 50 acres in size.

Typically, the surface layer is yellowish brown silty clay loam about 5 inches thick. The subsurface layer to a depth of about 11 inches is yellowish brown silt loam.

The subsoil is silty clay loam. The upper 8 inches is yellowish brown, and the lower 9 inches is strong brown. Soft, weathered shale is at a depth of about 28 inches. Hard, fissile, black shale bedrock is at a depth of about 32 inches.

This soil is low in natural fertility and organic matter content. Permeability is moderate, and the available water capacity is moderate or high. The root zone is moderately deep.

Included with this soil in mapping are small areas of Muse and Rohan soils. These soils are in landscape positions similar to those of the Jessietown soil. Also included are areas of soils that have been influenced by loamy river-deposited material. Included areas make up about 30 percent of the map unit.

The Jessietown soil is used for hay, pasture, or woodland.

This soil is poorly suited to row crops because of a very severe hazard of erosion, the effects of past erosion, and the moderate depth to bedrock.

This soil is suited to pasture and hay. The use of equipment is somewhat restricted by the slope. The main management needs are applications of lime and fertilizer, proper stocking rates, rotation grazing, a well planned clipping and harvesting schedule, and control of undesirable vegetation.

This soil is well suited to woodland. The native trees are Virginia pine, white oak, and hickory. Species preferred for planting include Virginia pine and shortleaf pine. The understory vegetation is mainly flowering dogwood, sourwood, and hickory. Table 7 provides specific information relating to potential productivity. The main management concern is plant competition. Careful use of wheeled and tracked equipment can minimize the disturbance of the surface layer. If openings are made in the canopy, invading brushy plants can delay natural regeneration.

This soil is poorly suited to most urban uses. The slope and the depth to bedrock are limitations. Proper design, proper installation procedures, and adequate site preparation can help to overcome these limitations.

The capability classification is VIe.

JoF—Jessietown-Muse-Rohan complex, 20 to 45 percent slopes. This map unit consists of well drained, shallow to very deep, steep and very steep soils on side slopes, toe slopes, benches, and narrow ridgetops in the western and northwestern parts of Powell County. These soils formed in material weathered from black shale. The soil patterns are very complex because of the influence of soil and bedrock materials that have moved downslope from higher positions on the side slopes and because of the shape and geometric form of the landscapes. Individual areas are commonly several hundred acres in size. They are about 35 percent Jessietown soil, 30 percent Muse soil, and 25 percent Rohan soil.

The Jessietown soil is moderately deep. It formed in colluvium on concave side slopes. Typically, the surface layer is dark yellowish brown silt loam about 2 inches thick. The subsurface layer to a depth of about 11 inches is yellowish brown silt loam. The subsoil is silty clay loam. The upper 8 inches is yellowish brown, and the lower 15 inches is strong brown. Soft, weathered shale is at a depth of about 34 inches. Hard, black shale bedrock is at a depth of about 38 inches.

The Jessietown soil is low in natural fertility and organic matter content. Permeability is moderate, and the available water capacity is moderate or high. The root zone is moderately deep. The depth to bedrock ranges from 20 to 40 inches.

The Muse soil is deep and very deep. It formed in thick colluvial material at the base of slopes and in draws. Typically, the surface layer is dark brown silt loam about 7 inches thick. The upper part of the subsoil is yellowish brown silt loam about 17 inches thick. The lower part is strong brown silty clay loam and gravelly silty clay about 26 inches thick. The substratum is yellowish red gravelly silty clay loam about 15 inches thick. Hard, black shale is at a depth of about 65 inches.

The Muse soil is medium in natural fertility and moderate in organic matter content. Permeability is slow, and the available water capacity is high.

The Rohan soil is shallow. It has many shale fragments in the subsoil. It is commonly on very steep, convex side slopes and ridgetops. Typically, the surface layer is dark brown gravelly silt loam about 4 inches thick. The subsoil is yellowish brown very gravelly silt loam about 11 inches thick. Soft, weathered, strong brown shale is at a depth of about 15 inches. Hard, black shale bedrock is at a depth of about 19 inches.

The Rohan soil is low in natural fertility and organic matter content. Permeability is moderate or moderately slow, and the available water capacity is very low.

Included with these soils in mapping are soils that are similar to the Jessietown soil but have a clayey subsoil and soils that are similar to the Rohan soil but have a clayey subsoil. These included soils are in landscape positions similar to those of the major soils. Also included are moderately deep and deep, loamy soils on high ridgetops. Included soils make up about 10 percent of the map unit.

Most areas of the Jessietown, Muse, and Rohan soils are used as woodland.

These soils are poorly suited to row crops, hay, and pasture because of the slope, a very severe hazard of

Figure 12.—A typical area of Knowlton silt loam, 0 to 2 percent slopes.

erosion, a low production potential, and the equipment limitation.

These soils are suited to woodland. The native trees are Virginia pine, white oak, hickory, black oak, chestnut oak, and red maple. The understory vegetation includes white oak, flowering dogwood, red maple, grapevine, blackberry, and smilax. Species preferred for planting include Virginia pine, shortleaf pine, and white oak. Table 7 provides specific information relating to potential productivity. Management concerns include the erosion hazard, the equipment limitation, and plant competition. Careful use of wheeled and tracked equipment can minimize the disturbance of the surface layer. If openings are made in the canopy, invading brushy plants can delay natural regeneration.

These soils are poorly suited to urban uses because of the slope and the depth to bedrock.

The capability classification is VIIe.

KnA—Knowlton silt loam, 0 to 2 percent slopes. This very deep, poorly drained, nearly level soil is on low stream terraces along the Red River and its tributaries (fig. 12). Slopes are smooth and slightly concave. Individual areas range from about 10 to 200 acres in size.

Typically, the surface layer is grayish brown silt loam about 6 inches thick. The subsoil is silt loam. It is mottled. The upper part is light brownish gray, and the lower part to a depth of 66 inches or more is light gray.

This soil is low in natural fertility and organic matter

content. Permeability is slow, and the available water capacity is high. A seasonal high water table is within a depth of 12 inches. Tilth is good. The soil can be worked throughout a wide range in moisture content. The root zone is very deep.

Included with this soil in mapping are small areas of Allegheny and Cotaco soils in slightly convex areas. Also included are soils that are similar to the Knowlton soil but have more sand in the subsoil or have more sand and less clay in the subsoil and a few areas of Knowlton soils that are subject to rare flooding. Included soils make up about 15 percent of the map unit.

The Knowlton soil is used extensively for hay and pasture. Some areas are used for row crops, and small, scattered areas are used as woodland.

This soil is suited to cultivated crops if adequately drained. The wetness limits the selection of suitable plants. Crops respond well to applications of lime and fertilizer. Properly managing crop residue, growing cover crops, and including grasses and legumes in the cropping sequence help to maintain soil structure and organic matter content.

This soil is suited to hay and pasture plants that are tolerant of wetness. Frequent pasture renovation helps to maintain the desired species. Management concerns include applications of lime and fertilizer, proper stocking rates, and weed control.

This soil is well suited to woodland. The native trees are pin oak, white oak, black oak, and sweetgum. Species preferred for planting include sweetgum, pin oak, green ash, and American sycamore. Table 7 provides specific information relating to potential productivity. The main management concern is plant competition.

This soil is poorly suited to urban uses. The seasonal wetness is a limitation. Low strength is a limitation on sites for local roads and streets. Also, it limits the use of the soil as roadfill.

The capability classification is IIIw.

LaD—Latham silt loam, 8 to 25 percent slopes. This moderately deep, moderately well drained, sloping to steep soil is on convex ridgetops and complex side slopes in Wolfe County. Individual areas range from about 20 to 100 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 2 inches thick. The subsurface layer is pale brown silt loam about 7 inches thick. The upper part of the subsoil is reddish yellow silt loam about 8 inches thick. The lower part is brownish yellow, mottled silty clay loam about 17 inches thick. Soft shale bedrock is at a depth of about 34 inches.

This soil is low in natural fertility and organic matter content. Permeability is slow, and the available water capacity is moderate or high. A seasonal high water table is at a depth of 18 to 36 inches. The root zone is moderately deep. The shrink-swell potential is moderate. The depth to soft shale bedrock ranges from 20 to 40 inches.

Included with this soil in mapping are small areas of Gilpin, Lily, and Ramsey soils. These soils are in landscape positions similar to those of the Latham soil. Also included are soils that are similar to the Latham soil but are well drained or are more than 40 inches deep over bedrock. Included areas make up about 30 percent of the map unit. They are generally small.

Most areas of the Latham soil are used as woodland. Some areas are used for hay and pasture, and a few areas are used for row crops.

This soil is poorly suited to row crops because of the slope.

This soil is suited to pasture and hay. Moderate yields can be obtained if the soil is properly managed. The main management needs are applications of lime and fertilizer, proper stocking rates, rotation grazing, a well planned clipping and harvesting schedule, and control of undesirable vegetation.

This soil is suited to woodland. The native trees are black oak, Virginia pine, white oak, and shortleaf pine. Species preferred for planting include white oak and shortleaf pine. The understory vegetation is mainly dogwood, sourwood, and red maple. Table 7 provides specific information relating to potential productivity. The main management concern is the hazard of erosion. Careful use of wheeled and tracked equipment can minimize the disturbance of the surface layer.

This soil is poorly suited to most urban uses because of the slow permeability, the depth to bedrock, the slope, the wetness, and the hazard of slippage. Low strength is a limitation on sites for local roads and streets. Also, it limits the use of the soil as roadfill.

The capability classification is VIe.

LeF—Latham-Gilpin-Alticrest complex, 20 to 65 percent slopes. This map unit consists of moderately deep, moderately well drained, well drained, and somewhat excessively drained, steep and very steep soils on long and narrow, convex ridgetops and complex side slopes throughout the survey area. Individual areas range from about 20 to more than 300 acres in size. They are about 40 percent Latham soil, 30 percent Gilpin soil, and 20 percent Alticrest soil.

The Latham soil is moderately well drained. Typically, the surface layer is very dark grayish brown silt loam about 2 inches thick. The subsurface layer is pale brown silt loam about 7 inches thick. The upper part of the subsoil is reddish yellow silt loam about 8 inches thick. The lower part is brownish yellow silty clay loam

about 17 inches thick. It is mottled below a depth of 26 inches. Soft shale bedrock is at a depth of about 34 inches.

The Latham soil is low in natural fertility and organic matter content. Permeability is slow, and the available water capacity is moderate or high. The shrink-swell potential is moderate. The root zone is moderately deep. The depth to bedrock ranges from 20 to 40 inches.

The Gilpin soil is well drained. Typically, the surface layer is dark brown silt loam about 7 inches thick. The upper part of the subsoil is strong brown silt loam about 11 inches thick. The lower part is yellowish brown silty clay loam about 12 inches thick. The substratum is yellowish brown channery silt loam about 5 inches thick. Fractured siltstone and shale bedrock is at a depth of about 35 inches.

The Gilpin soil is medium in natural fertility and moderate in organic matter content. Permeability is moderate, and the available water capacity is moderate or high. The root zone is moderately deep. Bedrock is at a depth of 20 to 40 inches.

The Alticrest soil is well drained and somewhat excessively drained. Typically, the surface layer is brown sandy loam about 5 inches thick. The subsurface layer is yellowish brown sandy loam about 5 inches thick. The subsoil extends to a depth of about 31 inches. It is strong brown sandy loam. The substratum is yellowish brown channery sandy loam about 7 inches thick. Sandstone bedrock is at a depth of about 38 inches.

The Alticrest soil is low in natural fertility and organic matter content. Permeability is moderately rapid, and the available water capacity is moderate or high. The root zone is moderately deep. The depth to sandstone bedrock ranges from 20 to 40 inches.

Included with these soils in mapping are areas of Helechawa, Shelocta, and Lily soils. These included soils are in landscape positions similar to those of the Latham, Gilpin, and Alticrest soils. Also included are areas of rock outcrop. Included areas make up about 10 percent of the map unit.

Most areas of the Latham, Gilpin, and Alticrest soils are used as woodland. Small areas have been cleared for pasture.

These soils are poorly suited to row crops, pasture, and hay because of the slope, a very severe hazard of erosion, and the depth to bedrock.

These soils are suited to woodland. The native trees are black oak, white oak, chestnut oak, and shortleaf pine. The understory vegetation is mainly flowering dogwood, red maple, sourwood, and greenbrier. Species preferred for planting include white oak and shortleaf pine. Table 7 provides specific information relating to potential productivity. The main management concerns are the erosion hazard and the equipment limitation. The slope restricts the use of wheeled and tracked equipment. Careful use of this equipment can minimize the disturbance of the surface layer.

These soils are poorly suited to most urban uses because of the slope and the depth to bedrock. Wetness and the hazard of slippage also are concerns in areas of the Latham soil.

The capability classification is VIIe.

LgE—Latham-Gilpin complex, 15 to 35 percent slopes. This map unit consists of moderately deep, moderately well drained and well drained, moderately steep to very steep soils on the upper side slopes in Wolfe County. The Gilpin soil is on the convex upper side slopes, and the Latham soil is on benches and concave side slopes. Individual areas are commonly long and narrow and range from about 20 to more than 200 acres in size. They are about 45 percent Latham soil and 20 percent Gilpin soil.

The Latham soil is moderately well drained. Typically, the surface layer is very dark grayish brown silt loam about 2 inches thick. The subsurface layer is pale brown silt loam about 7 inches thick. The upper part of the subsoil is reddish yellow silt loam about 8 inches thick. The lower part is brownish yellow silty clay loam about 17 inches thick. It is mottled below a depth of 16 inches. Soft shale bedrock is at a depth of about 34 inches.

The Latham soil is low in natural fertility and organic matter content. Permeability is slow, and the available water capacity is moderate or high. The root zone is moderately deep. The depth to bedrock ranges from 20 to 40 inches.

The Gilpin soil is well drained. Typically, the surface layer is dark brown silt loam about 7 inches thick. The upper part of the subsoil is strong brown silt loam about 11 inches thick. The lower part is dark yellowish brown silty clay loam about 12 inches thick. The substratum is yellowish brown channery silt loam about 5 inches thick. Fractured siltstone and shale bedrock is at a depth of about 35 inches.

The Gilpin soil is medium in natural fertility and moderate in organic matter content. Permeability is moderate, and the available water capacity is moderate or high. The root zone is moderately deep. Bedrock is at a depth of 20 to 40 inches.

Included with these soils in mapping are areas of Alticrest, Westbend, Ramsey, and Rigley soils. These included soils are in landscape positions similar to those of the Latham and Gilpin soils. Also included are soils that are similar to the Latham soil but do not have gray mottles in the subsoil, soils that are similar to the

Gilpin soil but have more than 40 percent rock fragments in the subsoil, and a few areas of eroded Latham and Gilpin soils. Included soils make up about 35 percent of the map unit.

Most areas of the Latham and Gilpin soils are used as woodland.

These soils are poorly suited to row crops, pasture, and hay because of a very severe hazard of erosion, the slope, and the depth to bedrock. Grasses and legumes are difficult to establish and maintain because of the equipment limitation and the erosion hazard.

These soils are suited to woodland. The native trees are shortleaf pine, white oak, black oak, and scarlet oak. The understory vegetation is mainly flowering dogwood, sourwood, and red maple. Species preferred for planting include white oak and shortleaf pine. Table 7 provides specific information relating to potential productivity. The main management concern is the erosion hazard. Careful use of wheeled and tracked equipment can minimize the disturbance of the surface layer. If openings are made in the canopy, invading brushy plants can delay natural regeneration. Limbs, tops, and other slash should be kept out of stream channels.

These soils are poorly suited to urban uses. The slope, wetness, and the hazard of slippage are management concerns on the Latham soil. The slope is a limitation on the Gilpin soil.

The capability classification is VIe.

LoD—Lily sandy loam, 12 to 25 percent slopes. This moderately deep, well drained, moderately steep and steep soil is on convex ridgetops above side slopes along the Red River and its major tributaries in Wolfe County. Individual areas range from 10 to 50 acres in size.

Typically, the surface layer is dark grayish brown sandy loam about 2 inches thick. The subsurface layer to a depth of about 5 inches is dark brown sandy loam. The upper part of the subsoil is yellowish brown sandy clay loam about 19 inches thick. The lower part is strong brown channery sandy clay loam about 8 inches thick. Sandstone bedrock is at a depth of about 32 inches.

This soil is low in natural fertility and moderate in organic matter content. Permeability is moderately rapid, and the available water capacity is moderate or high. The root zone is moderately deep and can be easily penetrated by plant roots. Tilth is good. The soil can be worked throughout a wide range in moisture content. Sandstone bedrock is at a depth of 20 to 40 inches.

Included with this soil in mapping are areas of Alticrest, Gilpin, Latham, and Rigley soils. These soils are in landscape positions similar to those of the Lily soil. Also included are small areas of eroded Lily soils. Included areas make up about 20 percent of the map unit.

Most areas of the Lily soil are used as woodland. Some areas have been cleared and are used for pasture or wildlife habitat.

Most areas of this soil are poorly suited to row crops because of a very severe hazard of erosion and the slope.

This soil is suited to pasture and to limited use as hayland. The main management needs are applications of lime and fertilizer, proper stocking rates, rotation grazing, a well planned clipping and harvesting schedule, and control of undesirable vegetation.

This soil is suited to woodland. The native trees are Virginia pine, shortleaf pine, black oak, white oak, and scarlet oak. The understory vegetation is mainly red maple, sassafras, flowering dogwood, and common greenbrier. Species preferred for planting include shortleaf pine, eastern white pine, white oak, and northern red oak. Table 7 provides specific information relating to potential productivity. Management concerns include the erosion hazard, the equipment limitation, and plant competition. Careful use of wheeled and tracked equipment can minimize the disturbance of the surface layer. If openings are made in the canopy, invading brushy plants can delay natural regeneration.

This soil is poorly suited to most urban uses. The slope and the depth to bedrock are limitations affecting most kinds of building site development and sanitary facilities. Seepage also is a limitation on sites for some sanitary facilities.

The capability classification is IVe.

LyE—Lily-Gilpin-Rigley complex, 15 to 35 percent slopes. This map unit consists of moderately deep and very deep, well drained, moderately steep to very steep soils on ridgetops, side slopes, and benches and in coves in southern and northeastern Powell County and northwestern Wolfe County. The Lily and Gilpin soils are dominantly on the more stable, convex upper side slopes, and the Rigley soil is on slightly concave benches and in coves. Individual areas range from about 10 to 100 acres in size. They are about 35 percent Lily soil, 25 percent Gilpin soil, and 20 percent Rigley soil.

Typically, the surface layer of the Lily soil is dark grayish brown sandy loam about 2 inches thick. The subsurface layer to a depth of about 5 inches is dark brown sandy loam. The upper part of the subsoil is yellowish brown sandy clay loam about 19 inches thick. The lower part is strong brown channery sandy clay

loam about 8 inches thick. Sandstone bedrock is at a depth of about 32 inches.

The Lily soil is low in natural fertility and moderate in organic matter content. Permeability is moderately rapid, and the available water capacity is moderate or high. The root zone is moderately deep. Sandstone bedrock is at a depth of 20 to 40 inches.

Typically, the surface layer of the Gilpin soil is dark brown silt loam about 7 inches thick. The upper part of the subsoil is strong brown silt loam about 11 inches thick. The lower part is dark yellowish brown silty clay loam about 12 inches thick. The substratum is yellowish brown channery silt loam about 5 inches thick. Fractured siltstone and shale bedrock is at a depth of about 35 inches.

The Gilpin soil is medium in natural fertility and moderate in organic matter content. Permeability is moderate, and the available water capacity is moderate or high. The root zone is moderately deep. Bedrock is at a depth of 20 to 40 inches.

Typically, the surface layer of the Rigley soil is dark grayish brown sandy loam about 2 inches thick. The subsurface layer to a depth of about 7 inches is yellowish brown sandy loam. The subsoil extends to a depth of about 53 inches. It is yellowish brown sandy loam. The substratum is strong brown channery sandy loam about 9 inches thick. Sandstone bedrock is at a depth of about 62 inches.

The Rigley soil is low in natural fertility and moderate in organic matter content. Permeability is moderately rapid, and the available water capacity is moderate or high. The root zone is deep and can be easily penetrated by plant roots.

Included with these soils in mapping are small areas of Alticrest, Latham, Ramsey, and Shelocta soils. These included soils are in landscape positions similar to those of the Lily, Gilpin, and Rigley soils. Also included are areas of Grigsby and Orrville soils on narrow flood plains. Included areas make up about 20 percent of the map unit.

The Lily, Gilpin, and Rigley soils are used mostly as woodland. A few areas are used for pasture.

These soils are poorly suited to row crops because of the slope, a very severe hazard of erosion, and the depth to bedrock.

These soils are suited to pasture, but the slope restricts the use of machinery. The main management needs are applications of lime and fertilizer, proper stocking rates, rotation grazing, and control of undesirable vegetation.

These soils are suited to woodland. The native trees are shortleaf pine, black oak, white oak, and chestnut oak. The understory vegetation is mainly red maple, flowering dogwood, and sourwood. Species preferred for planting include shortleaf pine and white oak. Table 7 provides specific information relating to potential productivity. Management concerns include the erosion hazard, the equipment limitation, seedling mortality, and plant competition. The slope can restrict the use of both wheeled and tracked equipment. Careful use of this equipment can minimize the disturbance of the surface layer. If openings are made in the canopy, invading brushy plants can delay natural regeneration.

These soils are poorly suited to most urban uses. The depth to bedrock and the slope are limitations affecting most kinds of building site development and sanitary facilities.

The capability classification is VIe.

Ne—Newark silt loam, frequently flooded. This very deep, somewhat poorly drained, nearly level soil is on flood plains along the Red River and some of its larger tributaries. Individual areas are throughout the survey area and are about 10 to 50 acres in size. Slopes range from 0 to 2 percent.

Typically, the surface layer is brown silt loam about 8 inches thick. The subsoil is silt loam. It is mottled. The upper 20 inches is brown, and the lower 22 inches is brownish gray. The substratum to a depth of 60 inches or more is light brownish gray, mottled silt loam.

This soil is high in natural fertility and moderate in organic matter content. Permeability is moderate, and the available water capacity is high. A seasonal high water table is at a depth of 6 to 18 inches. The soil is frequently flooded in late winter and early spring, but the flooding seldom damages crops. Tilth is good. The soil can be worked throughout a wide range in moisture content. The root zone is very deep, and the depth to bedrock is more than 60 inches.

Included with this soil in mapping are small areas of Grigsby and Orrville soils and poorly drained, loamy soils. These soils are in landscape positions similar to those of the Newark soil. Also included are a few areas of Knowlton soils on low stream terraces. Included areas make up about 20 percent of the map unit.

Most areas of the Newark soil have been cleared and are used for row crops, hay, or pasture.

This soil is well suited to row crops if adequately drained. It can be cropped intensively if properly managed. Management needs include crop residue management, applications of fertilizer, maintenance of soil tilth and organic matter content, and a subsurface and surface drainage system. The flooding in late winter and early spring may damage small grain crops and some hay crops. Species that are tolerant of wetness should be selected for planting. Pasture renovation, proper stocking rates, and control of undesirable vegetation are suitable management practices.

This soil is well suited to woodland. The native trees are pin oak, sweetgum, and green ash. The understory vegetation is mainly red maple, willow, and black alder. Species preferred for planting include sweetgum, American sycamore, and green ash. Table 7 provides specific information relating to potential productivity. The main management concern is plant competition.

This soil is poorly suited to most urban uses. The flooding and the wetness are the major limitations affecting most kinds of building site development and sanitary facilities. Low strength is a limitation on sites for local roads and streets. Also, it limits the use of the soil as roadfill. Proper design, proper installation procedures, and adequate site preparation can help to overcome these limitations.

The capability classification is IIw.

Or—Orrville silt loam, occasionally flooded. This very deep, somewhat poorly drained, nearly level soil is on flood plains along the Red River and its tributaries. Individual areas are long and narrow and are commonly adjacent to the uplands. They range from about 20 to more than 100 acres in size. Slopes range from 0 to 2 percent.

Typically, the surface layer is dark grayish brown silt loam about 9 inches thick. The upper part of the subsoil is dark yellowish brown, mottled loam about 9 inches thick. The next part is light brownish gray, mottled loam about 16 inches thick. The lower part is pale brown, mottled sandy loam about 8 inches thick. The upper part of the substratum is yellowish brown, mottled loamy sand about 8 inches thick. The lower part to a depth of 60 inches or more is gray, mottled loamy sand.

This soil is high in natural fertility and moderate in organic matter content. Permeability is moderate in the upper part of the subsoil and moderately rapid in the lower part. The available water capacity is high. A seasonal high water table is at a depth of 12 to 30 inches. The soil is occasionally flooded in late winter and early spring. The root zone is very deep, and the depth to bedrock is more than 60 inches.

Included with this soil in mapping are small areas of Grigsby and Rowdy soils and poorly drained, loamy soils. These soils are in landscape positions similar to those of the Orrville soil. Also included are a few areas of Knowlton soils on low stream terraces. Included areas make up about 15 percent of the map unit.

The Orrville soil is used extensively for pasture. Some areas are used for row crops or hay.

This soil is suited to row crops if adequately drained. It can be cropped intensively if properly managed. Management needs include crop residue management, applications of fertilizer, maintenance of soil tilth and organic matter content, and a subsurface and surface drainage system. The flooding in late winter and early spring may damage small grain crops.

This soil is suited to pasture and hay. Some hay crops may be damaged by flooding in late winter and early spring. Species that are tolerant of wetness should be selected for planting. Management needs include pasture renovation, proper stocking rates, and control of undesirable vegetation.

This soil is well suited to woodland. The native trees are yellow poplar, American sycamore, black willow, sugar maple, red maple, and white oak. Species preferred for planting include eastern white pine, yellow poplar, green ash, and white oak. Table 7 provides specific information relating to potential productivity. The main management concern is plant competition.

This soil is poorly suited to most urban uses. The flooding and wetness are the major limitations affecting most kinds of building site development and sanitary facilities. Proper design, proper installation procedures, and adequate site preparation can help to overcome these limitations.

The capability classification is IIw.

Pt—Pits, quarries. This map unit consists of open excavations from which the soil, limestone, or clayey shale has been removed. It includes the associated spoil areas and stockpiled materials.

The pits vary in size, shape, and position on the landscape. Limestone quarries include open areas where the ridgetops have been removed to expose the underlying limestone bedrock, excavations in bedrock that are as much as 100 feet deep and have vertical walls, and spoil areas associated with underground quarries in the lower areas on the landscape. Clayey shale material is mined for brick.

This map unit supports little or no vegetation. If reclaimed, some areas may be suited to limited use as woodland or pasture.

The capability classification is VIIIs.

RdB—Rowdy loam, 2 to 6 percent slopes. This very deep, well drained, gently sloping soil is on low stream terraces and alluvial fans along the Red River and its tributaries. Individual areas range from about 10 to 100 acres in size.

Typically, the surface layer is brown loam about 10 inches thick. The upper part of the subsoil is yellowish brown silt loam about 35 inches thick. The lower part is yellowish brown loam about 13 inches thick. The substratum to a depth of about 65 inches is yellowish brown sandy loam.

This soil is medium in natural fertility and moderate in organic matter content. Permeability is moderate, and the available water capacity is moderate or high. Tilth is

good. The soil can be worked throughout a wide range in moisture content. The root zone is very deep, and the depth to bedrock is more than 60 inches.

Included with this soil in mapping are areas of Allegheny and Cotaco soils. These soils are in landscape positions similar to those of the Rowdy soil. Also included are a few areas of Grigsby and Orrville soils on flood plains, small areas of Rowdy soils that have slopes of 0 to 2 percent, and some low areas of Rowdy soils that are subject to occasional or rare flooding. Included areas make up about 20 percent of the map unit.

Most areas of the Rowdy soil are used for row crops, hay, or pasture.

This soil is well suited to all of the commonly grown row crops and small grain. If properly managed, it can be cropped intensively and high yields can be obtained. Erosion is a moderate hazard if conventional tillage methods are used. Conservation practices that improve tilth and fertility and help to control erosion are needed. Applying a system of conservation tillage, properly managing crop residue, growing cover crops, adding fertilizer and lime, and including grasses and legumes in the cropping sequence help to maintain soil structure and organic matter content.

This soil is well suited to pasture and hay. All of the commonly grown grasses and legumes grow well. The main management needs are proper stocking rates, a well planned clipping and harvesting schedule, weed control, applications of lime and fertilizer, pasture renovation, and rotation grazing.

This soil is well suited to woodland, but few areas are wooded. The native trees are yellow poplar, American sycamore, river birch, sweetgum, and white oak. Species preferred for planting include yellow poplar, black walnut, eastern white pine, and white oak. Table 7 provides specific information relating to potential productivity. The main management concern is plant competition. If openings are made in the canopy, invading brushy plants can delay natural regeneration.

This soil is well suited to most urban uses. Seepage is a concern on sites for some sanitary facilities. The slope is a limitation affecting some kinds of building site development. Proper design, proper installation procedures, and adequate site preparation can help to overcome these limitations.

The capability classification is IIe.

RgA—Rowdy-Grigsby complex, 0 to 4 percent slopes, occasionally flooded. This map unit consists of very deep, well drained, nearly level and gently sloping soils in long and narrow areas along tributaries of the Red River in Wolfe County. The Rowdy soil is on low stream terraces and is at slightly higher elevations than the Grigsby soil. Individual areas of these soils range from about 5 to 60 acres in size. They are about 45 percent Rowdy soil and 40 percent Grigsby soil.

Typically, the surface layer of the Rowdy soil is brown loam about 10 inches thick. The upper part of the subsoil is yellowish brown silt loam about 35 inches thick. The lower part is yellowish brown loam about 13 inches thick. The substratum to a depth of 65 inches or more is yellowish brown sandy loam.

The Rowdy soil is medium in natural fertility and moderate in organic matter content. Permeability is moderate, and the available water capacity is moderate or high. Tilth is good. The soil can be worked throughout a wide range in moisture content. The root zone is very deep, and the depth to bedrock is more than 60 inches. The soil is occasionally flooded in late winter and early spring.

Typically, the surface layer of the Grigsby soil is brown silt loam about 8 inches thick. The subsoil is sandy loam. The upper 8 inches is dark yellowish brown, and the lower 23 inches is brownish yellow. The substratum to a depth of 60 inches or more is yellowish brown sandy loam.

The Grigsby soil is high in natural fertility and moderate in organic matter content. Permeability is moderate or moderately rapid, and the available water capacity is moderate or high. The soil is occasionally flooded in late winter and early spring. A seasonal high water table is at a depth of 42 to 72 inches. Tilth is good. The soil can be worked throughout a wide range in moisture content. The root zone is very deep, and bedrock is at a depth of more than 60 inches.

Included with these soils in mapping are small areas of Cotaco, Newark, Orrville, and Rowdy soils. These included soils are in landscape positions similar to those of the Rowdy and Grigsby soils. Also included are wet spots resulting from seepage and sandy and gravelly areas near the confluence of streams. Included areas make up about 15 percent of the map unit. They are generally small.

Most areas of the Rowdy and Grigsby soils are used for row crops, hay, or pasture (fig. 13).

These soils are well suited to most of the commonly grown row crops. They can be cropped intensively if properly managed. Management needs include properly managing crop residue, growing cover crops, adding lime and fertilizer, and including grasses and legumes in the cropping sequence.

These soils are well suited to pasture and hay, but the flooding may damage some hay crops. Management needs include proper stocking rates, weed control, rotation grazing, pasture renovation, a well planned clipping and harvesting schedule, and applications of lime and fertilizer.

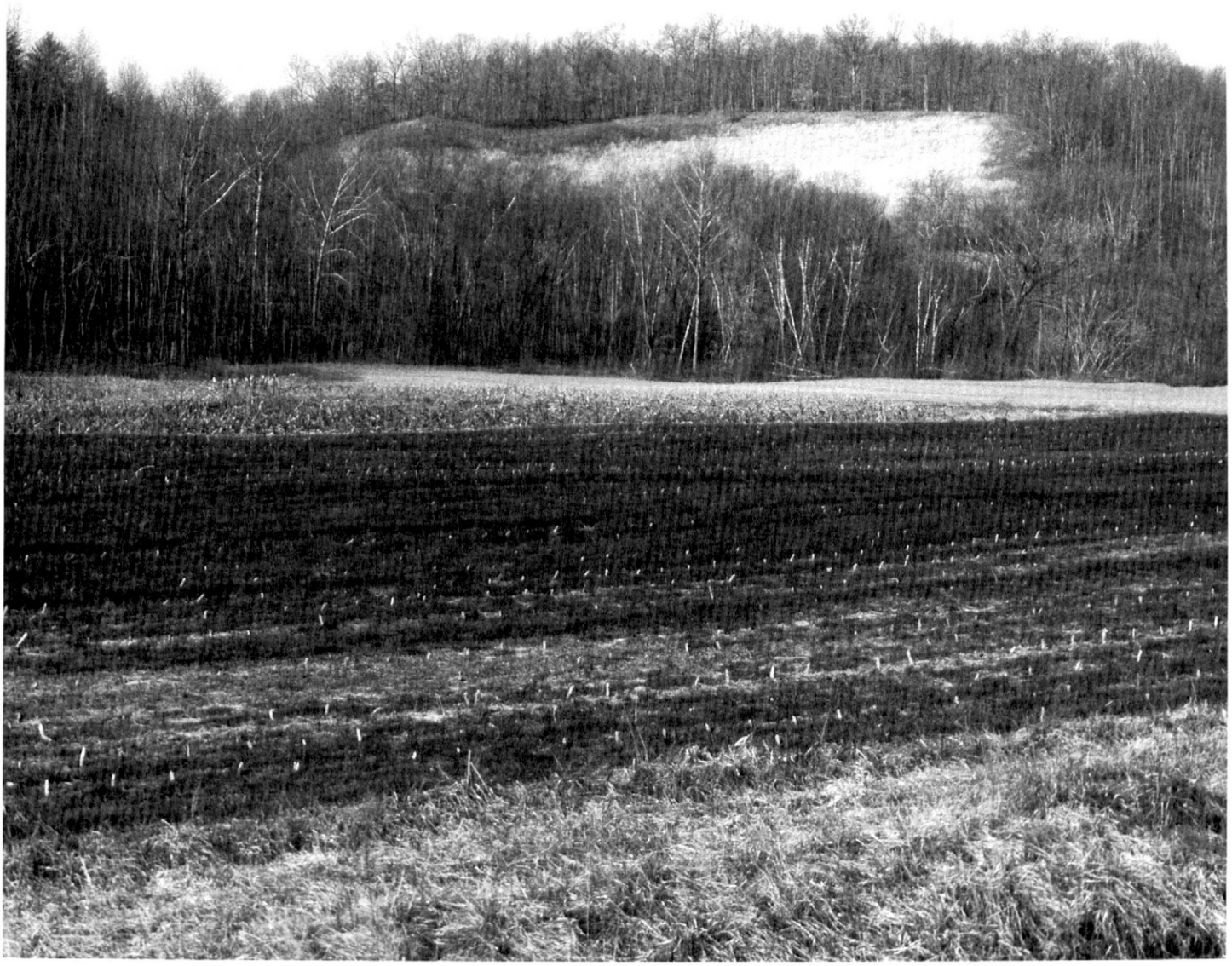

Figure 13.—An area of Rowdy-Grigsby complex, 0 to 4 percent slopes, occasionally flooded. These soils are used mainly for row crops, hay, or pasture.

These soils are well suited to woodland. The native trees are yellow poplar, American sycamore, sweetgum, and white oak. The understory vegetation is mainly red maple, flowering dogwood, and hickory. Species preferred for planting include yellow poplar, black walnut, eastern white pine, and white oak. Table 7 provides specific information relating to potential productivity. The main management concern is plant competition.

These soils are poorly suited to most urban uses. The flooding is a limitation affecting most kinds of building site development and sanitary facilities. Seepage also is a concern on sites for some sanitary facilities.

The capability classification is IIw.

SaF—Shelocta-Gilpin complex, 20 to 65 percent slopes. This map unit consists of very deep, deep, and moderately deep, well drained, steep and very steep soils on side slopes, mainly in Wolfe County. The soil

patterns are very complex because of the influence of soil and bedrock materials that have moved downslope from higher positions on the landscape and also because of the intricate shape and geometric form of the landscape. The Shelocta soil is on the lower two-thirds of linear, convex side slopes, and the Gilpin soil is on the upper part of short, convex slopes. Individual areas range from about 20 to several hundred acres in size. They are about 60 percent Shelocta soil and 20 percent Gilpin soil.

Typically, the surface layer of the Shelocta soil is dark brown gravelly silt loam about 3 inches thick. The subsurface layer to a depth of about 6 inches is dark yellowish brown gravelly silt loam. The upper part of the subsoil is dark yellowish brown and yellowish brown silt loam about 39 inches thick. The lower part is yellowish brown channery silt loam about 18 inches thick. The substratum to a depth of 70 inches or more is yellowish brown channery silty clay loam.

The Shelocta soil is medium in natural fertility and moderate in organic matter content. Permeability is moderate, and the available water capacity is moderate or high. The root zone is deep or very deep and can be easily penetrated by plant roots. The depth to bedrock ranges from 48 to more than 120 inches.

Typically, the surface layer of the Gilpin soil is dark brown silt loam about 7 inches thick. The upper part of the subsoil is strong brown silt loam about 11 inches thick. The lower part is yellowish brown silty clay loam about 12 inches thick. The substratum is yellowish brown channery silt loam about 5 inches thick. Fractured sandstone and shale bedrock is at a depth of about 35 inches.

The Gilpin soil is medium in natural fertility and moderate in organic matter content. Permeability is moderate, and the available water capacity is moderate or high. The root zone is moderately deep and can be easily penetrated by plant roots. The depth to bedrock ranges from 20 to 40 inches.

Included with these soils in mapping are areas of Alticrest, Helechawa, Latham, Lily, and Rigley soils. Helechawa and Rigley soils are in landscape positions similar to those of the Shelocta and Gilpin soils. Alticrest, Latham, and Lily soils are on narrow points and on ridgetops. Also included are small areas of Grigsby soils on narrow flood plains. Included soils make up about 20 percent of the map unit. They are generally less than 20 acres in size.

Most areas of the Shelocta and Gilpin soils are used as woodland.

These soils are poorly suited to row crops, hay, and pasture because of the slope and a very severe hazard of erosion. Grasses and legumes are difficult to establish and maintain because of the equipment limitation.

These soils are suited to woodland. The native trees are yellow poplar, white oak, and black oak. The understory vegetation is mainly flowering dogwood, sourwood, and red maple. Species preferred for planting include white oak, eastern white pine, and shortleaf pine. Table 7 provides specific information relating to potential productivity. Management concerns include the erosion hazard, the equipment limitation, and plant competition. Careful use of wheeled and tracked equipment can minimize the disturbance of the surface layer. If openings are made in the canopy, invading brushy plants can delay natural regeneration.

These soils are poorly suited to urban uses because of the slope.

The capability classification is VIIe.

SeE—Shrouts-Woolper complex, 15 to 35 percent slopes. This map unit consists of moderately deep and very deep, well drained, moderately steep to very steep soils on side slopes above drainageways in the northeastern part of Powell County. The upper boundary of the map unit is the Boyle Dolomite Geologic Formation, and the lower boundary extends to the flood plains. The Shrouts soil is mainly on convex side slopes both above and below the Woolper soil. The Woolper soil is on side slopes and benches. Individual areas of these soils range from about 50 to more than 200 acres in size. They are about 40 percent Shrouts soil and 25 percent Woolper soil.

Typically, the surface layer of the Shrouts soil is dark brown silt loam about 9 inches thick. The subsoil is olive gray and greenish gray silty clay about 16 inches thick. Soft, olive gray and greenish gray, clay shale bedrock is at a depth of about 25 inches.

The Shrouts soil is low or medium in natural fertility and is moderate or low in organic matter content. Permeability is slow, and the available water capacity is moderate. The root zone is moderately deep. The shrink-swell potential is moderate. Soft shale bedrock is at a depth of 20 to 40 inches.

Typically, the surface layer of the Woolper soil is dark brown silty clay loam about 14 inches thick. The upper part of the subsoil is dark brown silty clay loam about 18 inches thick. The lower part is strong and yellowish brown silty clay about 14 inches thick. The substratum to a depth of 65 inches or more is yellowish brown silty clay.

The Woolper soil is high in natural fertility and organic matter content. Permeability is moderately slow, and the available water capacity is high. The shrink-swell potential is moderate. The root zone is very deep,

and the depth to bedrock is more than 60 inches.

Included with these soils in mapping are shallow and moderately deep, loamy soils that have a thick, dark surface layer. These included soils are in landscape positions similar to those of the Shrouts and Woolper soils. Also included are small areas of Faywood soils in the lower elevations and areas of severely eroded Shrouts and Woolper soils. Included soils make up about 35 percent of the map unit.

Most areas of the Shrouts and Woolper soils were formerly used for farming but have reverted to woodland and support mainly hardwoods and redcedar.

Most areas of these soils are poorly suited to row crops because of the slope and a very severe hazard of erosion.

These soils are suited to pasture. The slope limits their use as hayland. Grasses and legumes that produce adequate forage and provide a good ground cover are needed. The use of equipment is limited by the slope. The main management needs are applications of fertilizer, proper stocking rates, pasture renovation, and control of undesirable vegetation.

These soils are suited to woodland. The native trees are black oak and white oak. Species preferred for planting include yellow poplar, white oak, and eastern white pine. Table 7 provides specific information relating to potential productivity. The main management concern is plant competition.

These soils are poorly suited to most urban uses. The slope and the depth to bedrock are limitations affecting most kinds of building site development and sanitary facilities. Low strength is a limitation on sites for local roads and streets. Also, it limits the use of the soils as roadfill.

The capability classification is VIe.

WbD2—Westbend silt loam, 6 to 25 percent slopes, eroded. This deep, well drained, sloping to steep soil is on the lower side slopes and toe slopes in the Knobs section of Powell County. Erosion has removed about 25 to 75 percent of the original surface layer. Individual areas range from about 10 to 100 acres in size.

Typically, the surface layer is light yellowish brown silt loam about 2 inches thick. The subsurface layer is yellowish brown silt loam about 5 inches thick. The upper part of the subsoil is yellowish brown silty clay loam about 19 inches thick. The next part is yellowish brown and olive gray channery silty clay loam about 7 inches thick. The lower part is light olive gray, mottled channery silty clay loam about 4 inches thick. The substratum is light olive gray and olive very channery silty clay loam about 8 inches thick. Soft, olive shale bedrock is at a depth of about 45 inches.

This soil is low in natural fertility and organic matter content. Permeability is moderately slow, and the available water capacity is high. The root zone is deep and can be easily penetrated by roots. The depth to bedrock ranges from 40 to 60 inches.

Included with this soil in mapping are small areas of soils that are similar to the Westbend soil but are less than 40 inches deep over bedrock or are more than 60 inches deep over bedrock. Also included are small areas of severely eroded Westbend soils. Included soils make up about 20 percent of the map unit.

Most areas of the Westbend soil are used for hay, pasture, or woodland. A few areas are used for row crops.

Most areas of this soil are poorly suited to most row crops because of the slope.

This soil is suited to pasture and hay. Most of the commonly grown grasses and legumes grow well. Grasses and legumes that provide adequate ground cover should be selected for planting. The main management needs are pasture renovation, proper stocking and seeding rates, rotation grazing, applications of lime and fertilizer, and a well planned clipping and harvesting schedule.

This soil is suited to woodland. The native trees are white oak, black oak, scarlet oak, and Virginia pine. The understory vegetation is mainly red maple, flowering dogwood, and greenbrier. Species preferred for planting include eastern white pine, shortleaf pine, and white oak. Table 7 provides specific information relating to potential productivity. The main management concern is plant competition. If openings are made in the canopy, invading brushy plants can delay natural regeneration.

This soil is poorly suited to most urban uses. The slope and the hazard of slippage are limitations affecting most kinds of building site development and sanitary facilities. The moderately slow permeability also is a limitation on sites for some sanitary facilities. Low strength is a limitation on sites for local roads and streets. Also, it limits the use of the soil as roadfill. Proper design, proper installation procedures, and adequate site preparation can help to overcome these limitations.

The capability classification is VIe.

WbE2—Westbend silt loam, 20 to 45 percent slopes, eroded. This deep, well drained, steep and very steep soil is on narrow ridgetops and side slopes and on toe slopes in the Knobs section of Powell County. Erosion has removed about 25 to 75 percent of the original surface layer. Individual areas range from about 50 to several hundred acres in size.

Typically, the surface layer is light yellowish brown silt loam about 2 inches thick. The subsurface layer is

yellowish brown silt loam about 5 inches thick. The upper part of the subsoil is yellowish brown silty clay loam about 19 inches thick. The next part is yellowish brown and olive gray channery silty clay loam about 7 inches thick. The lower part is light olive gray, mottled channery silty clay loam about 4 inches thick. The substratum is light olive gray and olive very channery silty clay loam about 8 inches thick. Soft, olive shale bedrock is at a depth of about 45 inches.

This soil is low in natural fertility and organic matter content. Permeability is moderately slow, and the available water capacity is high. The root zone is deep and can be easily penetrated by roots. The depth to bedrock ranges from 40 to 60 inches.

Included with this soil in mapping are small areas of soils that are similar to the Westbend soil but are less than 40 inches deep over bedrock. Also included are a few areas of Latham soils and areas of severely eroded Westbend soils that have shallow gullies. Included soils make up about 20 percent of the map unit.

Most areas of the Westbend soil are used as woodland. A few areas are used for pasture.

Most areas of this soil are poorly suited to row crops, hay, and pasture because of the slope.

This soil is suited to woodland. The native trees are white oak, black oak, scarlet oak, and Virginia pine. The understory vegetation is mainly red maple, flowering dogwood, and greenbrier. Species preferred for planting include eastern white pine, shortleaf pine, and white oak. Table 7 provides specific information relating to potential productivity. The slope restricts the use of wheeled and tracked equipment. The main management concern is plant competition. If openings are made in the canopy, invading brushy plants can delay natural regeneration.

This soil is poorly suited to urban uses. The slope and the hazard of slippage are limitations affecting most kinds of building site development and sanitary facilities.

The capability classification is VIIe.

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. The acreage of high-quality farmland is limited, and the U.S. Department of Agriculture recognizes that government at local, state, and federal levels, as well as individuals, must encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland soils, as defined by the U.S. Department of Agriculture, are soils that are best suited to food, feed, forage, fiber, and oilseed crops. Such soils have properties that favor the economic production of sustained high yields of crops. The soils need only to be treated and managed by acceptable farming methods. The moisture supply must be adequate, and the growing season must be sufficiently long. Prime farmland soils produce the highest yields with minimal expenditure of energy and economic resources. Farming these soils results in the least damage to the environment.

Prime farmland soils may presently be used as cropland, pasture, or woodland or for other purposes. They are used for food or fiber or are available for these uses. Urban or built-up land, public land, and water areas cannot be considered prime farmland. Urban or built-up land is any contiguous unit of land 10 acres or more in size that is used for such purposes as housing, industrial, or commercial sites, sites for institutions or public buildings, small parks, golf courses, cemeteries, railroad yards, airports, sanitary landfills, sewage treatment plants, and water-control structures. Public land is land not available for farming in national forests, national parks, military reservations, and state parks.

Prime farmland soils usually receive an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and growing season are favorable. The acidity or alkalinity level of the soils is acceptable. The soils have few or no rocks and are permeable to water and air. They are not excessively erodible or saturated with water for long periods and are not frequently flooded during the growing season. The slope ranges mainly from 0 to 6 percent.

About 27,073 acres, or about 10 percent of the survey area, is prime farmland or has the potential to be prime farmland. Areas of prime farmland are scattered throughout both counties but are primarily along the Red River and its tributaries. Most areas are either on flood plains along streams or on nearby terraces. They are mainly in general soil map unit 4 of both counties. They are used mainly for crops.

The map units in Powell and Wolfe Counties that are considered prime farmland are listed at the end of this section. The location of each map unit is shown on the detailed soil maps at the back of this publication. The extent of each unit is given in table 4. The soil qualities that affect use and management are described in the section "Detailed Soil Map Units." This list does not constitute a recommendation for a particular land use.

Some soils that have a seasonal high water table and all soils that are frequently flooded during the growing season qualify as prime farmland only in areas where these limitations have been overcome by drainage measures or flood control. The need for these measures is indicated in parentheses after the map unit name in the following list. Onsite evaluation is necessary to determine if the limitations have been overcome by corrective measures.

The soils identified as prime farmland in Powell and Wolfe Counties are:

AgA	Allegheny loam, 0 to 2 percent slopes
AgB	Allegheny loam, 2 to 6 percent slopes
AoB	Allegheny-Cotaco complex, 2 to 6 percent slopes
CoA	Cotaco silt loam, 0 to 2 percent slopes
CoB	Cotaco silt loam, 2 to 6 percent slopes
Gs	Grigsby silt loam, frequently flooded (where protected from flooding or not frequently flooded during the growing season)
Gu	Grigsby-Orrville complex, frequently flooded (where drained and protected from flooding or not frequently flooded during the growing season)
Gy	Grigsby-Skidmore-Morehead complex, 0 to 4 percent slopes
JaB	Jessietown silt loam, 2 to 6 percent slopes

KnA	Knowlton silt loam, 0 to 2 percent slopes (where drained)
Ne	Newark silt loam, frequently flooded (where drained and protected from flooding or not frequently flooded during the growing season)
Or	Orrville silt loam, occasionally flooded (where drained)
RdB	Rowdy loam, 2 to 6 percent slopes
RgA	Rowdy-Grigsby complex, 0 to 4 percent slopes, occasionally flooded

Use and Management of the Soils

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

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and 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

William H. Amos, Jr., agronomist, and Donald A. Hurst, district conservationist, Soil Conservation Service, helped prepare this section.

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

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

In 1988, about 10,940 acres in the survey area was used for crops, including hay *(13)*. About 44,600 acres was used for pasture *(25, 26)*. In Powell County about 19,800 acres was used for pasture, 3,000 acres for hay, and 1,910 acres for corn, soybeans, and burley tobacco *(25)*. In Wolfe County about 24,800 acres was used for pasture, 3,500 acres for hay, and 1,530 acres for corn and burley tobacco *(26)*.

Cropland

Soil erosion is a primary management concern in areas of Powell and Wolfe Counties that are used as cropland. Soils that have slopes of 2 percent or more are susceptible to excessive erosion when cultivated. Sheet and rill erosion removes the surface layer, which is normally high in content of organic matter, plant nutrients, and micro-organisms. Erosion is especially damaging to soils that have a restricted root zone. Loss of the surface layer reduces tilth, the available water capacity, and crop yields and results in an unsightly landscape.

Such practices as a conservation cropping system, conservation tillage, crop residue management, contour farming, stripcropping, cover crops, grassed waterways, diversions, and terraces help to control erosion.

Pasture and Hayland

A successful livestock program is dependent on a forage program that will supply adequate amounts of homegrown feeds of good quality. Such a program can furnish as much as 78 percent of the feed for beef cattle and 66 percent for dairy cattle *(11, 12)*.

The soils in the survey area vary widely in their ability to produce forage because of differences in depth to bedrock or limiting layers, internal drainage, available water capacity, and many other properties. Selecting the plant species or mixture of species appropriate to the specific soil helps to realize the greatest returns and the maximum soil and water conservation.

Areas of level to gently sloping, deep, well drained soils are best suited to the highest producing crops, such as corn silage, alfalfa, or a mixture of alfalfa-orchardgrass or alfalfa-timothy. Maintaining a cover of sod in the steeper areas helps to minimize erosion. In areas where the soils are at least 2 feet deep and are well drained, a combination of alfalfa and a cool-season grass is suitable. On soils that are less than 2 feet deep or are not well drained, clover-grass mixtures or pure grass stands can be used. Legumes can be established in grass-dominant sods through renovation.

Legumes should be used to the maximum extent possible because they generally produce higher quality feed than grasses and result in higher animal performance. Taller growing legumes, such as alfalfa and red clover, are more versatile than other legumes, such as white clover, that are used primarily for grazing. Orchardgrass, timothy, and tall fescue are suitable for hay and silage.

Tall fescue is an important cool-season grass that is suited to a wide range of soil conditions. It is used for both pasture and hay. This species is commonly permitted to accumulate in the field during the period August through November and is stockpiled for deferred grazing during late fall and winter. Applications of nitrogen fertilizer are important for maximum production during the stockpiling period. The rates of application should be based on desired production levels.

Additional information about pasture and hayland management is available at the local office of the Soil Conservation Service or the Kentucky Cooperative Extension Service.

Yields Per Acre

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

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

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

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

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

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for use as cropland. 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 *(21)*. Only class and subclass are used in this survey.

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

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that restrict the choice of plants or that require moderate conservation practices (fig. 14).

Figure 14.—Newark silt loam, frequently flooded, in the foreground, and Grigsby silt loam, frequently flooded, in the background. These soils are in capability class II.

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 they 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 a 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 partially 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.

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

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

Woodland Management and Productivity

Charles A. Foster, forester, Soil Conservation Service, helped prepare this section.

Powell and Wolfe Counties are rural areas characterized by steep slopes and narrow valleys. Woodland dominates the landscape. In Powell County, it covers 79,300 acres, or about 72 percent of the total land area. In Wolfe County, it makes up 101,200 acres, or about 70 percent of the total land area. The dominant forest type in both counties is oak-hickory, which makes up 70 percent of the woodland acreage. Other forest types include oak-pine, elm-ash-red maple, maple-beech-birch, loblolly-shortleaf pine, and white pine *(15)*.

The tracts of woodland in the survey area are mostly small, private holdings that are essentially unmanaged. Most of the forest land is capable of growing 50 cubic feet or more of wood per acre per year, but actual growth is about 33 cubic feet per acre per year.

Several obstacles exist in managing private forest land. For example, many stands are not well stocked with desirable, high-quality trees. Also, 24 percent of the woodland tracts are held for less than 10 years before resale, and only 9 percent of the landowners use the woodland specifically for timber production.

With proper management, tree quality and stocking patterns can be improved. Removing low-quality trees from fully stocked or understocked stands of all sizes and regenerating sawtimber stands after harvest are suitable management practices.

The wood industry in Powell and Wolfe Counties consists primarily of 15 commercial sawmills that produce crossties, rough lumber, firewood, tobacco sticks, pallet lumber, and peeled posts. A pressure treatment plant in Powell County produces treated posts, poles, fence boards, and crossties. Two mills in Wolfe County produce peeled posts for treatment, and another mill produces wooden pallets. The survey area also supplies logs and standing trees to several mills in adjacent counties.

Soils vary in their ability to produce trees. Available water capacity and depth of the root zone have major effects on tree growth. Fertility and texture also influence tree growth. Elevation, aspect, and climate determine the kinds of trees that can grow on a site. Elevation and aspect are of particular importance in mountainous areas.

This soil survey can be used by woodland managers planning ways to increase the productivity of forest land. Some soils respond better to applications of fertilizer than others, and some are more susceptible to landslides and erosion after roads are built and timber is harvested. Some soils require special reforestation efforts. In the section "Detailed Soil Map Units," the description of each map unit in the survey area suitable for timber includes information about productivity, limitations in harvesting timber, and management concerns in producing timber. Table 7 summarizes this forestry information and rates the soils for a number of factors to be considered in management. *Slight, moderate,* and *severe* are used to indicate the degree of the major soil limitations to be considered in forest management.

Ratings of the *erosion hazard* indicate the probability that damage may occur if site preparation or harvesting activities expose the soil. The risk is *slight* if no particular preventive measures are needed under ordinary conditions; *moderate* if erosion-control measures are needed for particular silvicultural activities; and *severe* if special precautions are needed to control erosion for most silvicultural activities. Ratings of moderate or severe indicate the need for construction of higher standard roads, additional maintenance of roads, additional care in planning harvesting and reforestation activities, or the use of special equipment.

Ratings of *equipment limitation* indicate limits on the use of forest management equipment, year-round or seasonal, because of such soil characteristics as slope, wetness, stoniness, or susceptibility of the surface layer to compaction. As slope gradient and length increase, it becomes more difficult to use wheeled equipment. On the steeper slopes, tracked equipment is needed. On the steepest slopes, even tracked equipment cannot be operated and more sophisticated systems are needed. The rating is *slight* if equipment use is restricted by soil wetness for less than 2 months and if special equipment is not needed. The rating is *moderate* if slopes are so steep that wheeled equipment cannot be operated safely across the slope, if wetness restricts equipment use for 2 to 6 months per year, if stoniness restricts the use of ground-based equipment, or if special equipment is needed to prevent or minimize compaction. The rating is *severe* if slopes are so steep that tracked equipment cannot be operated safely across the slope, if wetness restricts equipment use for more than 6 months per year, if stoniness restricts the use of ground-based equipment, or if special equipment is needed to prevent or minimize compaction. Ratings of moderate or severe indicate a need to choose the most suitable equipment and to carefully plan the timing of harvesting and other management activities.

Ratings of *seedling mortality* refer to the probability of the death of naturally occurring or properly planted seedlings of good stock in periods of normal rainfall, as influenced by kinds of soil or topographic features. Seedling mortality is caused primarily by too much water or too little water. The factors used in rating a soil

for seedling mortality are texture of the surface layer, depth to a seasonal high water table and the length of the period when the water table is high, rock fragments in the surface layer, rooting depth, and the aspect of the slope. The mortality rate generally is highest on soils that have a sandy or clayey surface layer. The risk is *slight* if, after site preparation, expected mortality is less than 25 percent; *moderate* if expected mortality is between 25 and 50 percent; and *severe* if expected mortality exceeds 50 percent. Ratings of moderate or severe indicate that it may be necessary to use containerized or larger than usual planting stock or to make special site preparations, such as bedding, furrowing, installing a surface drainage system, and providing artificial shade for seedlings. Reinforcement planting is often needed if the risk is moderate or severe.

Ratings of *plant competition* indicate the likelihood of the growth or invasion of undesirable plants. Plant competition is more severe on the more productive soils, on poorly drained soils, and on soils having a restricted root zone that holds moisture. The risk is *slight* if competition from undesirable plants hinders adequate natural or artificial reforestation but does not necessitate intensive site preparation and maintenance. The risk is *moderate* if competition from undesirable plants hinders natural or artificial reforestation to the extent that intensive site preparation and maintenance are needed. The risk is *severe* if competition from undesirable plants prevents adequate natural or artificial reforestation unless the site is intensively prepared and maintained. A moderate or severe rating indicates the need for site preparation to ensure the development of an adequately stocked stand. Managers must plan site preparation measures to ensure reforestation without delays.

The *potential productivity* of *common trees* on a soil is expressed as a *site index* and a *volume* number. Common trees are listed in the order of their observed general occurrence. Generally, only two or three tree species dominate. The first tree listed for each soil is the indicator species for that soil. An indicator species is a tree that is common in the area and that is generally the most productive on a given soil.

The *site index* is determined by taking height measurements and determining the age of selected trees within stands of a given species. This index is the average height, in feet, that the trees attain in a specified number of years. This index applies to fully stocked, even-aged, unmanaged stands. The estimates of the productivity of the soils in this survey are based on published data *(4, 6, 7, 8, 10, 16, 17, 18)*.

The *volume* is the yield likely to be produced by the most important trees, expressed in cubic feet per acre per year calculated at the age of culmination of mean annual increment.

Trees to plant are those that are used for reforestation or, under suitable conditions, natural regeneration. They are suited to the soils and can produce a commercial wood crop. The desired product, topographic position (such as a low, wet area), and personal preference are three factors among many that can influence the choice of trees for use in reforestation.

Recreation

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

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

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

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have gentle slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but

remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

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

William H. Casey, biologist, Soil Conservation Service, helped prepare this section.

The wildlife population of Powell and Wolfe Counties consists of about 44 species of mammals, 61 species of reptiles and amphibians, and 102 species of birds that are either summer or year-round residents. More than 200 other kinds of birds travel through Kentucky each year, and many of these can be found in the survey area.

Sport hunting, commercial trapping, and wildlife observation and photography are important activities in the survey area *(3)*. The species that are most often hunted are gray squirrel, ruffed grouse, raccoon, and white-tailed deer. Those most commonly trapped include mink, muskrat, fox, and, to a lesser extent, beaver. Photographers and birdwatchers are especially interested in rare or unusual species that are seldom seen or are difficult to approach. Also of concern are endangered wildlife species. Two species whose ranges include the survey area have been declared endangered by the U.S. Fish and Wildlife Service. These are the red-cockaded woodpecker and the Virginia big-eared bat.

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

In table 9, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife *(33)*. 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, bluegrass, orchardgrass, 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, tick trefoil, wild carrot, frostweed cisters, and cinquefoil.

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

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

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, cattail, rushes, sedges, and reeds.

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

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

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

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, and deer.

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

Engineering

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

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

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

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

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the 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, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

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

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

Building Site Development

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

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

Dwellings and *small commercial buildings* are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. Depth to a high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 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, depth to a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost-action potential, and depth to a high water table affect the traffic-supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, depth to a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

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

costs, and possibly increased maintenance are required.

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

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

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

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

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

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

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

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

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

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

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

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

Construction Materials

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

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

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help 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 depth to the water table is less than 1 foot. These soils may have layers of suitable material, but the material is less than 3 feet thick.

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

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

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

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

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

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

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel 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, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal high water table at or near the surface.

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

retention of moisture and releases a variety of plant nutrients as it decomposes.

Water Management

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

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

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

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

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

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

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

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

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

Soil Properties

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

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics. These results are reported in table 20.

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 *(22)*. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

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

Engineering Index Properties

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

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "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 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the "Glossary."

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

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

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

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

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

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

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

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

Physical and Chemical Properties

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

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

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

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at ⅓ bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure *(5)*.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior *(19)*.

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

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

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

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

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

high, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion. Losses are expressed in tons per acre per year. These estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.02 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

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

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

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

Soil and Water Features

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

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

The four hydrologic soil groups are:

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

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

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

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

Flooding, the temporary covering of the soil surface by flowing water, is caused by overflowing streams or by runoff from adjacent slopes. Shallow water standing or flowing for short periods after rainfall or snowmelt is not considered flooding. Standing water in swamps and marshes or in a closed depression is considered ponding.

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

Frequency, duration, and probable dates of occurrence are estimated. Frequency generally is expressed as *none, rare, occasional,* or *frequent. None* means that flooding is not probable. *Rare* means that flooding is unlikely but possible under unusual weather conditions (the chance of flooding is nearly 0 percent to 5 percent in any year). *Occasional* means that flooding occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year). *Frequent* means that flooding occurs often under normal weather conditions (the chance of flooding is more than 50 percent in any year). Duration is expressed as *very brief* (less than 2 days), *brief* (2 to 7 days), *long* (7 days to 1 month), and *very long* (more than 1 month). The time of year that floods are most likely to occur is expressed in months. About two-thirds to three-fourths of all flooding occurs during the stated period.

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

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

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a

saturated zone, namely grayish colors or mottles in the soil. Indicated in table 16 are the depth to the seasonal high water table; the kind of water table—that is, perched or apparent; and the months of the year that the water table commonly is highest. A water table that is seasonally high for less than 1 month is not indicated in table 16.

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

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

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

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

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

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

Physical and Chemical Analyses and Sand Mineralogy of Selected Soils

The results of physical analysis of several typical pedons in the survey area are given in table 17 and the results of chemical analysis in table 18. Sand mineralogy of selected soils is given in table 19. The data are for soils sampled at carefully selected sites. The pedons are typical of the series and are described in the section "Soil Series and Their Morphology." Soil samples were analyzed by the Kentucky Agricultural Experiment Station.

Most determinations, except those for grain-size analysis and bulk density, were made on soil material smaller than 2 millimeters in diameter. Measurements reported as percent or quantity of unit weight were calculated on an ovendry basis. The methods used in obtaining the data are indicated in the list that follows. The codes in parentheses refer to published methods *(23)*.

Coarse materials—(2-75 mm fraction) weight estimates of the percentages of all materials less than 75 mm (3B1).

Sand—(0.05-2.0 mm fraction) weight percentages of materials less than 2 mm (3A1).

Silt—(0.002-0.05 mm fraction) pipette extraction, weight percentages of all materials less than 2 mm (3A1).

Clay—(fraction less than 0.002 mm) pipette extraction, weight percentages of materials less than 2 mm (3A1).

Organic carbon—dichromate, ferric sulfate titration (6A1a).

Extractable cations—ammonium acetate pH 7.0, uncorrected; calcium (6N2), magnesium (6O2), sodium (6P2), potassium (6Q2).

Extractable acidity—potassium chloride-triethanolamine (6H3a).

Cation-exchange capacity—ammonium acetate, pH 7.0 (5A1b).

Cation-exchange capacity—sum of cations (5A3a).

Cation-exchange capacity—ammonium acetate, pH 7.0 (5A6a).

Base saturation—sum of cations, TEA, pH 8.2 (5C3).

Reaction (pH)—1:1 water dilution (8C1a).

Reaction (pH)—potassium chloride (8C1c).

Aluminum—potassium chloride extraction (6G).

Engineering Index Test Data

Table 20 shows laboratory test data for two pedons sampled at carefully selected sites in the survey area. The pedons are typical of the series and are described in the section "Soil Series and Their Morphology." The soil samples were tested by the Soil Mechanics

Laboratory, Soil Conservation Service, South National Technical Center, Fort Worth, Texas.

The testing methods generally are those of the American Association of State Highway and Transportation Officials (AASHTO) or the American Society for Testing and Materials (ASTM).

The tests and methods are AASHTO classification—M 145 (AASHTO), D 3282 (ASTM); Unified classification—D 2487 (ASTM); Mechanical analysis—T 88 (AASHTO), D 2217 (ASTM); Liquid limit—T 89 (AASHTO), D 423 (ASTM); Plasticity index—T 90 (AASHTO), D 424 (ASTM); Moisture density, Method A—T 99 (AASHTO), D 698 (ASTM); and Specific gravity—D 854-91 (ASTM).

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories *(24)*. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or on laboratory measurements. Table 21 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 udic moisture regime, 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; 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 is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic 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 class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine, mixed, mesic Typic Hapludalfs.

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

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The location of these pedons are indicated by a special symbol on the soil maps. The detailed description of each soil horizon follows standards in the "Soil Survey Manual" *(20)*. Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" *(24)*. Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

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

Allegheny Series

The Alleghèny series consists of very deep, well drained, moderately permeable soils that formed in loamy alluvium washed chiefly from acid sandstone and

shale. These soils are on terraces along the major streams of the survey area. Slopes range from 0 to 25 percent. The soils are fine-loamy, mixed, mesic Typic Hapludults.

Allegheny soils are associated on the landscape with Cotaco, Knowlton, and Rowdy soils. Cotaco soils are moderately well drained and somewhat poorly drained. Knowlton soils are poorly drained and are fine-silty. Rowdy soils do not have an argillic horizon.

Typical pedon of Allegheny loam, 0 to 2 percent slopes; in Powell County; about 0.5 mile north of downtown Stanton on Kentucky Highway 213, west on Kentucky Highway 2026 about 2.0 miles to the end of the road, northeast along the stream terrace break to near the bank of the Red River:

Ap—0 to 6 inches; brown (10YR 4/3) loam; weak fine granular structure; very friable; common fine roots; medium acid; clear smooth boundary.

E—6 to 17 inches; yellowish brown (10YR 5/6) loam; weak fine and medium granular structure; very friable; common fine roots; few tubular pores; medium acid; clear wavy boundary.

BE—17 to 28 inches; yellowish brown (10YR 5/6) loam; moderate fine and medium subangular blocky structure; friable; common fine and medium roots; few fine tubular pores; sand grains bridged and coated with clay; few quartz pebbles; very strongly acid; clear wavy boundary.

Bt—28 to 50 inches; strong brown (7.5YR 5/8) loam; moderate medium subangular blocky structure; friable; few fine roots; few fine tubular pores; common distinct clay films; few quartz pebbles; strongly acid; gradual wavy boundary.

C—50 to 60 inches; yellowish brown (10YR 5/6) and pale brown (10YR 6/3) loam; massive; firm; common quartz pebbles; extremely acid.

The thickness of the solum ranges from 30 to more than 60 inches. The depth to bedrock is more than 60 inches. In areas that have not been limed, reaction ranges from extremely acid to strongly acid throughout the profile.

The Ap horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 2 to 4. The E and BE horizons have hue of 10YR, value of 4 or 5, and chroma of 4 to 6. They are loam, fine sandy loam, or silt loam. The Bt horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 8. It is silty clay loam, sandy clay loam, or loam. In some pedons it is mottled in shades of brown, red, yellow, or gray in the lower part. The C horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 to 8. It is commonly mottled in shades of brown, red, yellow, or gray. It has textures similar to those of the Bt horizon.

Alticrest Series

The Alticrest series consists of moderately deep, well drained and somewhat excessively drained, moderately rapidly permeable soils that formed in material weathered from acid sandstone. In Wolfe County these soils are on narrow ridgetops and the upper side slopes. In Powell County they are in areas underlain by rocks of the Pennsylvanian Geologic System. In places they are associated with ledges of rock outcrop. Slopes range from about 20 to 40 percent. The soils are coarse-loamy, siliceous, mesic Typic Dystrochrepts.

Alticrest soils are associated on the landscape with Gilpin, Latham, Lily, Rigley, Helechawa, and Shelocta soils. Gilpin, Lily, and Shelocta soils are fine-loamy. Latham soils are clayey. Helechawa and Shelocta soils are deep or very deep over bedrock, and Rigley soils are very deep over bedrock. Helechawa and Rigley soils are coarse-loamy.

Typical pedon of Alticrest sandy loam, in an area of Alticrest-Ramsey-Rock outcrop complex, 20 to 65 percent slopes; in Wolfe County; about 3.2 miles northeast on Sterling Road from the town of Standing Rock, near the boundary between Wolfe and Lee Counties, on a narrow ridgetop at the end of Big Bend Ridge:

Oi—3 inches to 1 inch; recent leaf litter.

Oe—1 inch to 0; partially decomposed organic material.

A—0 to 5 inches; dark brown (10YR 4/3) sandy loam; weak fine granular structure; very friable; common fine and medium roots; common sandstone channers; strongly acid; abrupt smooth boundary.

E—5 to 10 inches; yellowish brown (10YR 5/4) sandy loam; weak fine and medium subangular blocky structure; very friable; common fine and medium roots; few fine pores; common sandstone channers; very strongly acid; clear smooth boundary.

Bw1—10 to 14 inches; strong brown (7.5YR 5/6) sandy loam; weak fine and medium subangular blocky structure; few fine roots; few fine pores and root channels; about 12 percent sandstone channers; strongly acid; clear smooth boundary.

Bw2—14 to 31 inches; strong brown (7.5YR 5/6) sandy loam; weak fine and medium subangular blocky structure; few fine roots; few fine pores and root channels; about 14 percent sandstone fragments; very strongly acid; clear smooth boundary.

C—31 to 38 inches; yellowish brown (10YR 5/6) channery sandy loam; massive; friable; about 15 percent sandstone channers; very strongly acid; abrupt smooth boundary.

R—38 inches; sandstone bedrock.

The thickness of the solum and the depth to bedrock

range from 20 to 40 inches. The content of sandstone rock fragments or quartz pebbles ranges from 0 to 15 percent throughout the profile. Reaction is very strongly acid or strongly acid.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 to 4. It is sandy loam, loam, or fine sandy loam. The E horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 2 to 8. It is sandy loam, loam, or fine sandy loam. The Bw horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 to 8. It is loam, sandy loam, or fine sandy loam. The C horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 3 to 6. It is sand, loamy sand, or sandy loam in the fine-earth fraction. Some pedons do not have a C horizon.

Berks Series

The Berks series consists of moderately deep, well drained, moderately permeable or moderately rapidly permeable soils that formed mainly in material weathered from interbedded siltstone and shale of the Cowbell Formation. These soils are in the Knobs section of Powell County. Slopes range from 20 to 70 percent. The soils are loamy-skeletal, mixed, mesic Typic Dystrochrepts.

Berks soils are associated on the landscape with Bledsoe, Carpenter, Faywood, Gilpin, and Shelocta soils. Bledsoe soils are fine textured and are more than 60 inches deep over bedrock. Carpenter soils are fine-loamy and are more than 40 inches deep over bedrock. Faywood soils are fine textured. Gilpin soils are fine-loamy.

Typical pedon of Berks channery silt loam, in an area of Bledsoe-Berks-Rock outcrop complex, 20 to 70 percent slopes; in Powell County; about 2 miles south on Kentucky Highway 11 from the Mountain Parkway interchange at Slade, to Natural Bridge State Park, south on State Park Road to Lower Hood Branch, behind the park maintenance garage:

A—0 to 5 inches; brown (10YR 5/3) channery silt loam; weak fine and medium granular structure; very friable; common fine roots; about 25 percent sandstone channers; medium acid; clear smooth boundary.

E—5 to 11 inches; light yellowish brown (10YR 6/4) channery silt loam; moderate medium and fine subangular blocky structure; friable; few fine and medium roots; about 25 percent siltstone channers; medium acid; clear smooth boundary.

Bw1—11 to 23 inches; light yellowish brown (10YR 6/4) very channery silt loam; moderate medium and fine subangular blocky structure; few fine and medium roots; few tubular pores; few thin pale brown (10YR 6/3) silt coatings on channers; about 40 percent randomly oriented siltstone channers; medium acid; gradual wavy boundary.

Bw2—23 to 34 inches; light yellowish brown (10YR 6/4) very channery silt loam; moderate medium subangular blocky structure; very friable; few fine roots; about 50 percent siltstone channers, mostly horizontally oriented; medium acid; gradual wavy boundary.

C—34 to 38 inches; light yellowish brown (10YR 6/4) extremely channery silt loam; massive; very friable; about 80 percent siltstone channers and flagstones; medium acid; abrupt smooth boundary.

R—38 inches; hard siltstone bedrock.

The thickness of the solum ranges from 12 to 40 inches. The depth to bedrock ranges from 20 to 40 inches. The content of rock fragments ranges from 15 to 60 percent in the solum and from 35 to 90 percent in the C horizon. Reaction ranges from extremely acid to slightly acid throughout the profile.

The A horizon has hue of 10YR, value of 3 to 5, and chroma of 2 to 4. The E horizon has hue of 10YR, value of 4 to 8, and chroma of 3 to 5. It is loam or silt loam in the fine-earth fraction. The Bw horizon has hue of 7.5YR to 2.5Y, value of 4 to 6, and chroma of 3 to 8. It is silt loam, loam, or silty clay loam in the fine-earth fraction. The C horizon has hue of 7.5YR to 2.5Y, value of 4 to 6, and chroma of 2 to 6. It is silt loam or loam in the fine-earth fraction.

Bethesda Series

The Bethesda series consists of very deep, well drained, moderately slowly permeable soils on smooth landscapes formed by the reshaping of spoil material from the surface mining of coal. These soils are on ridgetops, benches, and side slopes throughout the southern part of Wolfe County. Slopes range from 2 to 70 percent. The soils are loamy-skeletal, mixed, acid, mesic Typic Udorthents.

Bethesda soils are intermingled with Fairpoint soils on mined landscapes. Fairpoint soils are less acid than the Bethesda soils. Alticrest, Gilpin, Latham, Ramsey, and Shelocta soils are on adjacent landscapes. Alticrest, Gilpin, and Latham soils are 20 to 40 inches deep over bedrock. Alticrest soils are coarse-loamy. Gilpin soils are fine-loamy. Latham soils are clayey. Ramsey soils are less than 20 inches deep over bedrock and are loamy. Shelocta soils are more than 40 inches deep over bedrock and are fine-loamy.

Typical pedon of Bethesda channery loam, in an area of Bethesda and Fairpoint soils, 2 to 70 percent slopes; in Wolfe County; about 6.4 miles southwest of Campton on Sandy Ridge Road, north of Crow Cemetery, 1,000 feet east of the side of the road:

A—0 to 7 inches; light yellowish brown (10YR 6/4) channery loam; common medium faint pale brown (10YR 6/3) mottles; massive; friable; common fine roots; few fine pores; about 15 percent siltstone channers as much as 3 inches across; strongly acid; clear smooth boundary.
C1—7 to 26 inches; yellowish brown (10YR 5/8) very channery silty clay loam; massive; firm; few fine roots; about 50 percent randomly oriented channers and flagstones 2 to 12 inches across; strongly acid; clear smooth boundary.
C2—26 to 40 inches; dark gray (N 4/0) extremely channery silt loam; massive; very firm; about 70 percent thin shale fragments; extremely acid; clear smooth boundary.
C3—40 to 60 inches; yellowish brown (10YR 5/8) extremely channery loam; massive; firm; about 60 percent shale and coal fragments; very strongly acid.

The depth to bedrock is more than 60 inches. In areas that have not been limed, reaction ranges from extremely acid to strongly acid throughout the profile. The content of rock fragments ranges from 35 to 80 percent, by volume, below the surface layer. The fragments range mostly from 2 millimeters to 12 inches across, but stones and boulders are included.

The A horizon has hue of 7.5YR to 5Y, value of 3 to 6, and chroma of 1 to 8, or it is neutral in hue and has value of 3 to 6. The C horizon has colors similar to those of the A horizon. It is loam, silt loam, silty clay loam, or clay loam in the fine-earth fraction.

Bledsoe Series

The Bledsoe series consists of very deep, well drained, moderately slowly permeable soils that formed in colluvial material weathered chiefly from limestone, sandstone, and siltstone. Slopes range from 20 to 70 percent but average about 45 percent. The soils are fine, mixed, mesic Typic Hapludalfs.

Bledsoe soils are associated on the landscape with Berks, Carpenter, Gilpin, Faywood, and Shelocta soils. Berks soils are loamy-skeletal. Carpenter, Gilpin, and Shelocta soils are fine-loamy. Carpenter and Shelocta soils are more than 40 inches deep over bedrock. Gilpin and Faywood soils are 20 to 40 inches deep over bedrock.

Typical pedon of Bledsoe silt loam, in an area of Bledsoe-Berks-Rock outcrop complex, 20 to 70 percent slopes; in Powell County; about 8.1 miles south of Stanton on Kentucky Highways 15 and 11 to Middle Fork Church, across the river on the access road to the rock crusher, about 0.1 mile south, in a cove:

A—0 to 8 inches; dark brown (10YR 4/3) silt loam; weak fine granular structure; very friable; common medium and many fine roots; few fine pores; about 5 percent sandstone channers and quartz pebbles; slightly acid; abrupt smooth boundary.
BE—8 to 16 inches; strong brown (7.5YR 5/6) silt loam; moderate medium subangular blocky structure; firm; few medium and common fine roots; common fine pores; few faint clay films along root channels; about 10 percent quartz pebbles and sandstone channers; common dark concretions; slightly acid; gradual smooth boundary.
Bt1—16 to 33 inches; strong brown (7.5YR 5/6) silty clay loam; weak medium and fine angular blocky structure; firm; few medium and fine roots; common fine pores; common distinct clay films along root channels and on faces of peds; about 10 percent siltstone and sandstone channers; few dark brown and reddish brown concretions; slightly acid; clear smooth boundary.
Bt2—33 to 42 inches; strong brown (7.5YR 5/6) silty clay loam; moderate fine and medium angular blocky structure; firm; few fine roots; few fine pores; common distinct clay films on faces of peds; about 10 percent siltstone and sandstone channers; slightly acid; clear smooth boundary.
BC—42 to 55 inches; strong brown (7.5YR 5/6) silty clay loam; moderate coarse angular blocky structure parting to weak fine angular blocky; firm; few fine roots; few fine pores; few distinct clay films along pore channels and on faces of peds; few distinct light yellowish brown (10YR 6/4) silt coatings on faces of peds; about 10 percent siltstone and sandstone channers; many iron and manganese concretions; medium acid; clear smooth boundary.
C—55 to 60 inches; strong brown (7.5YR 5/6) channery silty clay loam; massive; about 25 percent limestone, siltstone, and sandstone channers; many iron and manganese concretions; medium acid.

The thickness of the solum ranges from 40 to more than 80 inches. The depth to bedrock is more than 60 inches. The content of limestone, siltstone, and sandstone rock fragments ranges from 0 to 25 percent above a depth of 40 inches and from 0 to 40 percent below this depth. Reaction ranges from medium acid to mildly alkaline throughout the profile.

The A horizon has hue of 10YR or 7.5YR, value of 3 or 4, and chroma of 2 to 4. The BE horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 4 to 8. It is silt loam or silty clay loam or the gravelly or flaggy analogs of these textures. The Bt and BC horizons have hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3

to 6. They are silty clay loam, silty clay, or clay or the gravelly or flaggy analogs of these textures. In some pedons they are mottled below a depth of 3 feet. The C horizon has colors and textures similar to those of the Bt and BC horizons. In some pedons, particularly on the lower slopes, the colluvial material is thin and a 2C horizon has formed in material weathered from soft, clayey shale. This horizon has colors in shades of gray, olive, or brown.

Carpenter Series

The Carpenter series consists of deep and very deep, well drained, moderately permeable soils that formed in loamy colluvium over material weathered mainly from shale or siltstone. These soils are on colluvial side slopes and toe slopes in the Knobs section of Powell County. Slopes range from about 20 to 45 percent. The soils are fine-loamy, mixed, mesic Ultic Hapludalfs.

Carpenter soils are associated on the landscape with Berks, Bledsoe, Gilpin, and Shelocta soils. Berks soils are loamy-skeletal. Berks and Gilpin soils are 20 to 40 inches deep over bedrock. Bledsoe soils are fine textured. Shelocta soils have a low base saturation.

Typical pedon of Carpenter silt loam, in an area of Carpenter-Bledsoe-Berks complex, 20 to 70 percent slopes; in Powell County; about 0.6 mile northeast of Bowen on Kentucky Highway 613 to the intersection with Kentucky Highway 599, northeast 1.1 miles to the farm access road that crosses the Red River, east across the river to a very steep hillside:

Oi—3 inches to 2; deciduous forest litter.
Oe—2 inches to 0; partially decomposed organic litter.
A—0 to 3 inches; olive brown (2.5Y 4/4) silt loam; weak fine granular structure; very friable; common medium and many fine roots; about 5 percent sandstone channers; slightly acid; abrupt wavy boundary.
BE—3 to 13 inches; light olive brown (2.5Y 5/4) silt loam; moderate medium subangular blocky structure; very friable; many fine and few coarse roots; few fine pores; about 10 percent sandstone and shale fragments; very strongly acid; clear wavy boundary.
Bt—13 to 36 inches; light yellowish brown (2.5Y 6/4) silty clay loam; moderate coarse and medium subangular blocky and weak fine angular blocky structure; friable; few fine, medium, and coarse roots; few old root channels; common distinct clay films on faces of peds; about 10 percent sandstone fragments and shale channers; medium acid; abrupt smooth boundary.
BC—36 to 45 inches; light olive brown (2.5Y 5/4) silty clay loam; weak medium subangular blocky structure; friable; few fine, medium, and coarse roots; about 5 percent shale channers and reddish calcareous concretions; medium acid; clear smooth boundary.
C—45 to 60 inches; olive (5Y 5/4) clay loam; massive; firm; few fine roots; about 10 percent shale channers; medium acid.

The thickness of the solum ranges from 40 to 60 inches. The depth to soft shale or siltstone bedrock ranges from 40 to more than 80 inches. The content of rock fragments ranges from 5 to 15 percent in the A horizon and from 5 to 35 percent in the B and C horizons. Reaction ranges from very strongly acid to slightly acid in the upper part of the solum and from very strongly acid to medium acid in the lower part of the solum and in the C horizon.

The A horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 4. The BE horizon has hue of 7.5YR to 2.5Y, value of 4 or 5, and chroma of 3 to 6. It is silt loam or silty clay loam in the fine-earth fraction. The Bt horizon has hue of 7.5YR to 5Y, value of 4 to 6, and chroma of 3 to 8. It is silty clay loam, clay loam, or loam in the fine-earth fraction. In some pedons it has mottles in shades of red, gray, or brown. The BC horizon and the 2C horizon, if it occurs, have colors and textures similar to those of the Bt horizon.

Cotaco Series

The Cotaco series consists of very deep, moderately well drained or somewhat poorly drained, moderately permeable soils that formed in loamy alluvium washed mainly from acid sandstone and shale. These soils are on stream terraces and stream terrace remnants in hilly areas along the Red River and its tributaries. Slopes range from 0 to 6 percent. The soils are fine-loamy, mixed, mesic Aquic Hapludults.

Cotaco soils are associated on the landscape with Allegheny and Knowlton soils. Allegheny soils are well drained. Knowlton soils are on stream terraces and are poorly drained. They are fine-silty.

Typical pedon of Cotaco silt loam, 2 to 6 percent slopes; in Wolfe County; about 1.4 miles southeast of Hazel Green on the west side of Kentucky Highway 1010 near the intersection with Landsaw-Johnson Fork Road:

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) silt loam; moderate medium granular structure parting to weak fine granular; very friable; few fine and medium roots; about 2 percent pebbles;

slightly acid; abrupt smooth boundary.
BA—10 to 16 inches; silt loam that is dark brown (10YR 4/3) in ped interiors and dark grayish brown (10YR 4/2) on ped faces; moderate medium and coarse subangular blocky structure; friable; few fine and medium roots; about 2 percent pebbles; few fine pores; slightly acid; clear smooth boundary.
Bt1—16 to 24 inches; dark brown (10YR 4/3) silt loam; few fine faint light brownish gray (10YR 6/2) mottles; moderate fine and medium subangular blocky structure; friable; few fine roots; about 2 percent pebbles; few fine pores; few distinct clay films on faces of peds; strongly acid; clear smooth boundary.
Bt2—24 to 40 inches; yellowish brown (10YR 5/4) loam; many medium distinct grayish brown (2.5Y 5/2) mottles; moderate medium subangular blocky structure; friable; few fine roots; about 2 percent pebbles; few fine pores; common distinct clay films on faces of peds; strongly acid; clear smooth boundary.
BC—40 to 46 inches; yellowish brown (10YR 5/4) loam; many medium distinct grayish brown (2.5Y 5/2) and strong brown (7.5YR 5/8) mottles; massive; about 5 percent subrounded sandstone pebbles; few fine roots; few fine dark concretions; strongly acid; clear smooth boundary.
C—46 to 60 inches; mottled yellowish brown (10YR 5/6), light brownish gray (2.5Y 6/2), and strong brown (7.5YR 5/8) clay loam; massive; about 5 percent subrounded sandstone pebbles; few fine dark concretions; very strongly acid.

The thickness of the solum ranges from 30 to 60 inches. The depth to bedrock is more than 60 inches. The content of sandstone, shale, or siltstone fragments ranges from 2 to 35 percent in the solum and from 2 to 50 percent in the C horizon. In areas that have not been limed, reaction ranges from extremely acid to strongly acid throughout the profile.

The Ap horizon has hue of 10YR, value of 4 to 6, and chroma of 2 to 4. The BA horizon has hue of 10YR, value of 4 to 6, and chroma of 3 to 6. It is loam, silt loam, or fine sandy loam. The Bt horizon has hue of 2.5Y to 7.5YR, value of 4 to 6, and chroma of 3 to 8. It is silt loam, loam, clay loam, or sandy clay loam in the fine-earth fraction. It is mottled in shades of gray, brown, or red. The BC horizon has colors and textures similar to those of the Bt horizon. The C horizon has hue of 7.5YR to 2.5Y or is neutral in hue and has value of 4 to 8 and chroma of 0 to 8, or it is mottled with these colors and has no dominant matrix colors. It is silt loam, loam, clay loam, or sandy clay loam in the fine-earth fraction. In some pedons it is stratified.

Fairpoint Series

The Fairpoint series consists of very deep, well drained, moderately slowly permeable soils on smooth landscapes formed by the reshaping of spoil material from surface mining of coal. These soils are on ridgetops, benches, and side slopes throughout the southern part of Wolfe County. Slopes range from 2 to 70 percent. The soils are loamy-skeletal, mixed, nonacid, mesic Typic Udorthents.

Fairpoint soils are intermingled with Bethesda soils on the landscape. Bethesda soils are very strongly acid or strongly acid. Alticrest, Gilpin, Latham, Ramsey, and Shelocta soils are on adjacent, undisturbed landscapes. Alticrest soils are less than 40 inches deep over bedrock and are coarse-loamy. Ramsey soils are less than 20 inches deep over bedrock and are loamy. Gilpin and Latham soils are 20 to 40 inches deep over bedrock. Gilpin soils are fine-loamy, and Latham soils are fine textured. Shelocta soils are more than 48 inches deep over bedrock and are fine-loamy.

Typical pedon of Fairpoint channery silt loam, in an area of Bethesda and Fairpoint soils, 2 to 70 percent slopes; in Wolfe County; about 5.5 miles southwest of Campton on Sandy Ridge Road to a mine area, 300 feet west of the road:

A—0 to 6 inches; mixed dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/6) channery silt loam; moderate medium granular structure; friable; many fine roots; about 20 percent siltstone fragments; slightly acid; clear smooth boundary.
C1—6 to 30 inches; dark grayish brown (10YR 4/2) very channery silt loam; massive; firm; few roots in the upper part; about 40 percent siltstone and shale fragments; neutral; gradual wavy boundary.
C2—30 to 60 inches; dark grayish brown (10YR 4/2) very channery silt loam; massive; firm; about 60 percent siltstone, shale, and sandstone fragments; slightly acid.

The depth to bedrock is more than 5 feet. Reaction ranges from medium acid to neutral throughout the profile, except in the surface layer in areas that have been limed. The content of rock fragments ranges from 20 to 80 percent but averages about 45 percent. The fragments range mainly from 2 millimeters to 6 inches across, but stones and boulders are included.

The A horizon has hue of 7.5YR to 2.5Y, value of 3 to 6, and chroma of 1 to 6, or it is neutral in hue and has value of 3 to 6. The C horizon is channery to extremely channery clay loam, silty clay loam, silt loam, or loam. It has hue of 7.5YR to 5Y, value of 3 to 6, and chroma of 1 to 8, or it is neutral in hue and has value of 3 to 6.

Faywood Series

The Faywood series consists of moderately deep, well drained, moderately slowly permeable or slowly permeable soils that formed mainly in material weathered from the Newman Limestone Formation. These soils are on ridgetops and side slopes. Slopes range from 20 to 45 percent. The soils are fine, mixed, mesic Typic Hapludalfs.

Faywood soils are associated on the landscape with Bledsoe, Carpenter, Helechawa, and Shelocta soils. Bledsoe soils are very deep and formed in mixed colluvium. Carpenter and Shelocta soils are deep or very deep and are fine-loamy. Helechawa soils are very deep and are coarse-loamy.

Typical pedon of Faywood silt loam, 20 to 35 percent slopes, eroded; in Powell County; about 2 miles south of Stanton on Kentucky Highway 213, about midway between two communication towers, 300 feet west of the road:

Oi—2 inches to 1 inch; recent hardwood litter.
Oe—1 inch to 0; very dark grayish brown (10YR 3/2), partially decomposed organic material.
A—0 to 2 inches; dark grayish brown (10YR 4/2) silt loam; weak fine granular structure; very friable; common fine and medium roots; about 5 percent limestone fragments; strongly acid; clear smooth boundary.
Bt1—2 to 6 inches; yellowish brown (10YR 5/6) silty clay; moderate medium subangular blocky structure parting to moderate fine angular blocky; firm; few medium and common fine roots; common distinct clay films on faces of peds; brown (10YR 5/3) coatings on faces of peds; about 5 percent limestone fragments; strongly acid; clear smooth boundary.
Bt2—6 to 20 inches; strong brown (7.5YR 5/6) clay; moderate medium subangular blocky structure; common fine and few medium roots; common distinct clay films on faces of peds; yellowish brown (10YR 5/4) coatings on faces of peds; medium acid; clear smooth boundary.
BC—20 to 32 inches; light olive brown (2.5Y 5/4) and olive gray (5Y 5/2) clay; weak medium subangular blocky structure; few fine and medium roots; few faint clay films on faces of peds; neutral; gradual wavy boundary.
C—32 to 38 inches; pale olive (5Y 6/3) clay; common medium distinct gray (5Y 5/1) and light olive brown (2.5Y 5/4) mottles; massive; very firm; mildly alkaline.
R—38 inches; limestone bedrock.

The depth to bedrock and the thickness of the solum range from 20 to 40 inches. Reaction ranges from strongly acid to neutral in the upper part of the solum and from medium acid to mildly alkaline in the lower part. The content of rock fragments ranges from 0 to 15 percent throughout the solum.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. The Bt horizon has hue of 7.5YR to 2.5Y and value and chroma of 4 to 6. It is silty clay loam, silty clay, or clay. In some pedons it has mottles in shades of red, brown, yellow, gray, or olive in the lower part. The BC and C horizons have colors and textures similar to those of the lower part of the Bt horizon.

Gilpin Series

The Gilpin series consists of moderately deep, well drained, moderately permeable soils that formed in material weathered from siltstone, sandstone, and shale of the Pennsylvanian age in the Breathitt Geologic Formation. These soils are along the western edge of Powell County and throughout Wolfe County. They are commonly on long, narrow, convex ridgetops and the upper side slopes. Slopes range from 4 to 65 percent. The soils are fine-loamy, mixed, mesic Typic Hapludults.

Gilpin soils are associated on the landscape with Alticrest, Latham, Lily, and Ramsey soils on ridgetops and with Shelocta soils on side slopes. Alticrest soils are coarse-loamy. Latham soils are clayey. Lily soils have siliceous mineralogy. Shelocta, Rigley, and Helechawa soils are more than 40 inches deep over bedrock. They formed in mixed colluvium on side slopes.

Typical pedon of Gilpin silt loam, in an area of Shelocta-Gilpin complex, 20 to 65 percent slopes; in Wolfe County; about 4.5 miles southwest of Campton on Sandy Ridge Road and east on the unimproved ridgetop road to the cemetery, about 500 feet southwest of the cemetery:

Ap—0 to 7 inches; dark brown (10YR 4/3) silt loam; moderate fine and medium granular structure; very friable; many fine and medium roots; common fine root channels; about 5 percent shale and siltstone channers; medium acid; abrupt wavy boundary.
Bt1—7 to 18 inches; strong brown (7.5YR 5/8) silt loam; moderate fine and medium subangular blocky structure; friable; common fine roots; common fine tubular pores; few distinct clay films on faces of peds; about 10 percent shale channers; medium acid; clear smooth boundary.
Bt2—18 to 30 inches; yellowish brown (10YR 5/8) silty clay loam; moderate fine and medium subangular and angular blocky structure; friable; few fine roots;

few fine pores; few distinct clay films on faces of peds; about 10 percent shale and siltstone channers; very strongly acid; clear smooth boundary.

C—30 to 35 inches; yellowish brown (10YR 5/8) channery silt loam; massive; about 30 percent shale fragments; very strongly acid; abrupt smooth boundary.

R—35 inches; yellowish brown (10YR 5/6), fractured siltstone and shale.

The thickness of the solum ranges from 18 to 36 inches. Bedrock is at a depth of 20 to 40 inches. Thin, flat rock fragments of shale, siltstone, or sandstone make up 5 to 40 percent of individual horizons in the solum and 30 to 60 percent of the C horizon. In areas that have not been limed, reaction ranges from extremely acid to strongly acid throughout the profile.

Pedons in undisturbed areas have a thin, dark A horizon, which is underlain by a grayish brown AB horizon 2 to 5 inches thick. The Ap horizon has hue of 10YR, value of 3 to 5, and chroma of 2 to 4. Some pedons have a BE horizon with textures and colors similar to those of the Bt horizon. The Bt horizon has hue of 7.5YR to 2.5Y, value of 5, and chroma of 4 to 8. It is silt loam, loam, or silty clay loam in the fine-earth fraction. Some pedons have a BC horizon. In places this horizon is directly above the bedrock. The C horizon has colors in shades of dark brown, yellowish brown, olive brown, and light olive brown. It is silt loam, loam, or silty clay loam in the fine-earth fraction.

Grigsby Series

The Grigsby series consists of very deep, well drained, moderately rapidly permeable soils that formed in recent alluvium washed chiefly from sandstone, siltstone, and shale influenced by limestone and dolomite. These soils are on the flood plains along the Red River and its major tributaries. Slopes range from 0 to 4 percent. The soils are coarse-loamy, mixed, mesic Dystric Fluventic Eutrochrepts.

Grigsby soils are associated on the landscape with Newark soils on flood plains and Allegheny, Cotaco, Knowlton, and Rowdy soils on stream terraces. They are also associated with Orrville soils along tributary streams and with Skidmore and Morehead soils in narrow valleys. Morehead soils are fine-silty. They are on low stream terraces and are somewhat poorly drained and moderately well drained. Newark soils are somewhat poorly drained. They are fine-silty. Allegheny, Cotaco, and Rowdy soils are on stream terraces. They are fine-loamy. Cotaco soils are moderately well drained or somewhat poorly drained. Orrville soils are somewhat poorly drained and are on flood plains. They are fine-loamy.

Typical pedon of Grigsby silt loam, frequently flooded; in Powell County; about 1 mile east of Rosslyn and 300 feet south of Mountain Parkway, near the confluence of Cane Creek and the Red River:

Ap—0 to 8 inches; brown (10YR 4/3) silt loam; weak fine granular structure; very friable; common fine and medium roots; common fine wormholes; about 5 percent sandstone pebbles; slightly acid; abrupt smooth boundary.

Bw1—8 to 16 inches; dark yellowish brown (10YR 4/4) sandy loam; moderate medium subangular blocky structure; very friable; few fine roots; few fine pores, wormholes, and wormcasts; slightly acid; gradual smooth boundary.

Bw2—16 to 39 inches; brownish yellow (10YR 6/6) sandy loam; weak fine subangular blocky structure; friable; few fine roots; common medium and fine wormholes and pores; slightly acid; gradual smooth boundary.

C—39 to 60 inches; yellowish brown (10YR 5/6) sandy loam; massive; few fine roots; slightly acid.

The thickness of the solum ranges from 30 to 50 inches. The depth to bedrock is more than 60 inches. The content of coarse fragments, mostly pebbles, ranges from 0 to 15 percent in the A and B horizons and from 0 to 60 percent in the C horizon. Reaction ranges from medium acid to neutral in the solum and from strongly acid to neutral in the C horizon.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. The B horizon has hue of 10YR, value of 4 to 6, and chroma of 3 to 6. In some pedons it has mottles in shades of brown or gray below a depth of 24 inches. It is loam, sandy loam, fine sandy loam, or silt loam. The C horizon is commonly stratified. It is loam, fine sandy loam, sandy loam, or loamy fine sand or the gravelly or very gravelly analogs of these textures.

Hazleton Series

The Hazleton series consists of deep and very deep, well drained, moderately rapidly permeable or rapidly permeable soils that formed in loamy material weathered from mixed shale and sandstone. These soils are in the northern part of Powell County on steep side slopes above the Newman Limestone Formation. Slopes range from 20 to 60 percent. The soils are loamy-skeletal, mixed, mesic Typic Dystrochrepts.

Hazleton soils are associated on the landscape with Alticrest, Gilpin, Helechawa, Latham, Ramsey, Rigley, and Shelocta soils and rock outcrop. Alticrest, Gilpin,

and Latham soils are 20 to 40 inches deep over bedrock and contain less than 35 percent rock fragments. Alticrest soils are coarse-loamy and siliceous. Ramsey soils are loamy and siliceous and are less than 20 inches deep over bedrock. Gilpin soils are fine-loamy, and Latham soils are clayey. Helechawa, Rigley, and Shelocta soils are more than 40 inches deep over bedrock and contain less than 35 percent rock fragments in the control section. Helechawa and Rigley soils are coarse-loamy, and Shelocta soils are fine-loamy.

Typical pedon of Hazleton channery sandy loam, in an area of Gilpin-Hazleton-Rock outcrop association, 20 to 60 percent slopes; in Powell County; about 2.3 miles north of Rosslyn on Kentucky Highways 1184 and 615 to the junction with Kentucky Highway 599, about 4.5 miles north on Kentucky Highway 599, to the head of Lower Cane Creek, about 0.1 mile east on the ridge road to the farm access road and about 100 yards south of the road:

Oi—3 inches to 1 inch; recent leaf litter.
Oe—1 inch to 0; very dark gray (10YR 3/1), partially decomposed forest litter.
A—0 to 2 inches; very dark grayish brown (10YR 3/2) channery sandy loam; weak fine granular structure; very friable; common fine and medium roots; about 20 percent thin flat sandstone channers; strongly acid; clear smooth boundary.
Bw1—2 to 19 inches; yellowish brown (10YR 5/6) very channery sandy loam; weak fine subangular blocky structure; very friable; common fine and medium roots and few large tree roots; about 40 percent thin flat sandstone channers; very strongly acid; gradual wavy boundary.
Bw2—19 to 35 inches; strong brown (7.5YR 5/6) very channery sandy loam; moderate fine subangular blocky structure; very friable; common fine and medium roots; about 50 percent sandstone channers and flagstones; very strongly acid; gradual wavy boundary.
BC—35 to 42 inches; reddish brown (5YR 5/4) very channery sandy loam; weak fine subangular blocky structure; few fine roots; about 50 percent sandstone channers and flagstones; very strongly acid; gradual wavy boundary.
C—42 to 56 inches; strong brown (7.5YR 5/6) very channery loam; massive; friable; few fine roots; about 60 percent sandstone channers and flagstones; very strongly acid; abrupt smooth boundary.
R—56 inches; weathered, soft sandstone.

The thickness of the solum ranges from 25 to 50 inches. The depth to bedrock ranges from 40 to more than 72 inches. The content of sandstone fragments ranges from 5 to 70 percent in the solum and from 35 to 80 percent in the C horizon. In areas that have not been limed, reaction ranges from extremely acid to strongly acid throughout the profile.

The A horizon has hue of 10YR, value of 2 to 4, and chroma of 1 or 2. Some pedons have an E horizon, which has hue of 10YR, value of 4 or 5, and chroma of 1 to 4. This horizon is fine sandy loam, sandy loam, or loam in the fine-earth fraction. The Bw and BC horizons have hue of 10YR to 5YR, value of 3 to 6, and chroma of 3 to 8. They are loam, sandy loam, or loamy sand in the fine-earth fraction. The C horizon has hue of 5YR to 2.5Y, value of 3 to 6, and chroma of 3 to 8. It is loam or loamy sand in the fine-earth fraction.

Helechawa Series

The Helechawa series consists of deep and very deep, somewhat excessively drained, moderately rapidly permeable soils that formed in loamy colluvium and material weathered from sandstone. These soils are on side slopes, commonly below outcrops of sandstone in the southeastern part of Powell County and the northwestern part of Wolfe County. Slopes range from 20 to 55 percent. The soils are coarse-loamy, siliceous, mesic Typic Dystrochrepts.

Helechawa soils are associated on the landscape with Alticrest, Faywood, Gilpin, Latham, Lily, Ramsey, and Shelocta soils. Alticrest soils are 20 to 40 inches deep over bedrock. Faywood, Gilpin, Latham, and Lily soils are 20 to 40 inches deep over bedrock and contain more clay in the B horizon than the Helechawa soils. Gilpin and Lily soils are fine-loamy, Latham soils are clayey, and Faywood soils are fine textured. Ramsey soils are less than 20 inches deep over bedrock and are loamy. Shelocta soils are more than 40 inches deep over bedrock and are fine-loamy.

Typical pedon of Helechawa loamy sand, in an area of Helechawa-Rock outcrop complex, 35 to 55 percent slopes; in Wolfe County; about 4.5 miles south of the Mountain Parkway and Slade interchange on Kentucky Highway 11, about 0.5 mile west on the road toward oil and gas wells located near the head of a hollow, about halfway between the road and rock outcrop:

A—0 to 3 inches; dark brown (10YR 3/3) loamy sand; weak fine granular structure; very friable; very strongly acid; clear smooth boundary.
BE—3 to 12 inches; dark yellowish brown (10YR 4/4) sandy loam; weak fine and medium subangular blocky structure; very friable; common fine and medium roots; about 2 percent sandstone fragments; very strongly acid; clear wavy boundary.
Bw1—12 to 27 inches; yellowish brown (10YR 5/8)

sandy loam; weak medium and coarse subangular blocky structure; friable; common fine and few medium roots; few distinct coatings on faces of peds and in root channels; very strongly acid; clear smooth boundary.

Bw2—27 to 45 inches; yellowish brown (10YR 5/8) sandy loam; weak medium and coarse subangular blocky structure; friable; common fine and medium roots; about 2 percent sandstone fragments; very strongly acid; clear wavy boundary.

BC—45 to 64 inches; strong brown (7.5YR 5/6) sandy loam; weak medium subangular blocky structure; friable; few fine and medium roots; thin distinct clay films on faces of peds and in root channels; about 5 percent sandstone fragments; very strongly acid.

The thickness of the solum ranges from 30 to more than 60 inches. The depth to bedrock ranges from 40 to more than 60 inches. The content of rock fragments ranges from 0 to 35 percent in the solum and from 5 to 80 percent in the C horizon. Reaction typically ranges from extremely acid to strongly acid throughout the profile, but in some pedons it ranges from extremely acid to slightly acid in the A horizon.

The A horizon has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 3 or 4. The Bw horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 3 to 6. It is sandy loam, fine sandy loam, loam, or silt loam. The BC horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 3 to 6. It is loam, fine sandy loam, or sandy loam.

Jessietown Series

The Jessietown series consists of moderately deep, well drained, moderately permeable soils that formed in material weathered from black, fissile shale. These soils are on convex ridgetops and complex side slopes along the boundary of Clark, Montgomery, and Powell Counties. Slopes range from 2 to 45 percent. The soils are fine-silty, mixed, mesic Typic Hapludults.

Jessietown soils are associated on the landscape with Muse, Rohan, Cotaco, and Allegheny soils. Rohan soils are less than 20 inches deep over bedrock and are loamy-skeletal. Muse soils are 40 to 80 inches deep over bedrock and are clayey. Allegheny and Cotaco soils are on stream terraces and are fine-loamy. Cotaco soils are moderately well drained to somewhat poorly drained.

Typical pedon of Jessietown silt loam, in an area of Jessietown-Muse-Rohan complex, 20 to 45 percent slopes; in Powell County; about 4.8 miles west of Stanton, 1,500 feet north of the Clay City interchange on Mountain Parkway, 300 feet east of a paved county road that is parallel to and northeast of Mountain Parkway, 300 feet from the crest of a small ridge, on a west-facing slope:

Oi—3 inches to 1 inch; recent forest litter.

Oe—1 inch to 0; partially decomposed forest litter.

A—0 to 2 inches; dark yellowish brown (10YR 4/4) silt loam; moderate fine and medium granular structure; very friable; many fine and medium roots and few coarse roots; about 5 percent thin black shale fragments; very strongly acid; clear smooth boundary.

E—2 to 11 inches; yellowish brown (10YR 5/4) silt loam; moderate fine and medium subangular blocky structure; friable; few fine and medium roots; few fine root channels; about 10 percent siltstone and black shale fragments; very strongly acid; clear smooth boundary.

Bt1—11 to 19 inches; yellowish brown (10YR 5/8) silty clay loam; moderate fine and medium subangular blocky structure; firm; few fine and medium roots; few distinct clay films on faces of peds; about 5 percent thin black shale fragments; very strongly acid; clear smooth boundary.

Bt2—19 to 34 inches; strong brown (7.5YR 5/8) silty clay loam; moderate fine and medium subangular blocky and angular blocky structure; firm; few fine roots; common distinct clay films on faces of peds; about 10 percent black shale fragments; very strongly acid; abrupt smooth boundary.

Cr—34 to 38 inches; soft, weathered shale.

R—38 inches; hard, black, fissile shale.

The thickness of the solum and the depth to bedrock range from 20 to 40 inches. The content of black shale, sandstone, or siltstone fragments ranges from 0 to 5 percent in the upper part of the solum and from 5 to 35 percent in the lower part. In areas that have not been limed, reaction ranges from extremely acid to strongly acid throughout the profile.

The A horizon has hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 2 to 4. It is silt loam or silty clay loam. The E horizon has hue of 7.5YR or 10YR and value and chroma of 4 to 6. It is silt loam or silty clay loam. The Bt horizon has hue of 5YR to 10YR, value of 4 to 6, and chroma of 4 to 8. It is silt loam or silty clay loam. In some pedons it is mottled in shades of red, brown, or yellow.

Knowlton Series

The Knowlton series consists of very deep, poorly drained, slowly permeable soils that formed in alluvium washed from black, fissile shale, sandstone, gray siltstone, shale, and limestone. These soils are on stream terraces along the Red River and its tributaries.

Landscapes are smooth and slightly convex. Slopes range from 0 to 2 percent. The soils are fine-silty, mixed, mesic Typic Ochraquults.

Knowlton soils are associated on the landscape with Allegheny, Cotaco, Rowdy, Grigsby, Newark, and Orrville soils. Allegheny, Cotaco, and Rowdy soils are on stream terraces or colluvial fans and are fine-loamy. Allegheny and Rowdy soils are well drained. Cotaco soils are moderately well drained or somewhat poorly drained. Grigsby, Newark, and Orrville soils are on flood plains. They do not have an argillic horizon. Grigsby soils are well drained and are coarse-loamy. Newark and Orrville soils are somewhat poorly drained. Newark soils are fine-silty, and Orrville soils are fine-loamy.

Typical pedon of Knowlton silt loam, 0 to 2 percent slopes; in Powell County; northeast of Clay City across the Red River, southeast about 1.7 miles on Woody Ware Road, 500 feet north toward the upland break:

Ap—0 to 6 inches; grayish brown (2.5Y 5/2) silt loam; weak fine granular structure; very friable; many fine and medium grass roots; few quartz pebbles; strongly acid; clear wavy boundary.

BE—6 to 17 inches; light brownish gray (10YR 6/2) silt loam; weak coarse platy structure parting to weak medium subangular blocky; friable; common fine and medium roots; few quartz pebbles; strongly acid; gradual smooth boundary.

Btg1—17 to 27 inches; light brownish gray (2.5Y 6/2) silt loam; many medium distinct brownish yellow (10YR 6/8) mottles; weak coarse angular blocky structure; firm; few faint clay films on faces of peds; few fine roots; few quartz pebbles; very strongly acid; clear smooth boundary.

Btg2—27 to 46 inches; light gray (10YR 7/1) silt loam; many medium distinct strong brown (7.5YR 5/8) mottles; moderate medium prismatic structure parting to moderate coarse angular blocky; firm; few roots; few faint clay films on faces of peds; few quartz pebbles; very strongly acid; gradual wavy boundary.

Btg3—46 to 66 inches; light gray (10YR 7/1) silt loam; moderate medium distinct strong brown (7.5YR 5/8) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; common distinct clay films on faces of peds; few quartz pebbles; very strongly acid.

The thickness of the solum ranges from 40 to more than 60 inches. The depth to bedrock ranges from 60 to more than 120 inches. The content of rock fragments, mostly sandstone channers and quartz pebbles, ranges from 0 to 15 percent throughout the profile. Reaction ranges from strongly acid to neutral in the Ap horizon and from very strongly acid to medium acid in the B horizon.

The Ap horizon has hue of 10YR to 5Y, value of 4 to 6, and chroma of 1 to 4. The BE horizon has hue of 10YR to 5Y, value of 4 to 7, and chroma of 1 or 2. It is silt loam, silty clay loam, or clay loam. The Btg horizon has hue of 10YR to 5Y, value of 5 to 7, and chroma of 1 or 2. It is mottled in shades of red, brown, or yellow. It is silt loam, silty clay loam, loam, or clay loam. Some pedons have a BCg or Cg horizon. This horizon has hue of 7.5YR to 5Y, value of 1 to 5, and chroma of 1 to 4. It has textures similar to those of the Btg horizon.

Latham Series

The Latham series consists of moderately deep, moderately well drained, slowly permeable soils that formed in residuum derived from acid clay shale. These soils are commonly influenced by colluvium in the upper part. They are on narrow ridgetops and the upper side slopes throughout the survey area. Slopes range from 8 to 65 percent. The soils are clayey, mixed, mesic Aquic Hapludults.

Latham soils are associated on the landscape with Alticrest, Gilpin, Lily, and Rigley soils. Alticrest and Rigley soils are coarse-loamy. Gilpin and Lily soils are fine-loamy.

Typical pedon of Latham silt loam, 8 to 25 percent slopes; in Wolfe County; about 0.2 mile north to Pine Ridge on Kentucky Highway 715 and about 1.0 mile east on Rock Bridge Road to an area managed for pine, about 50 feet from the road in a pine grove:

Oi—4 inches to 2; slightly decomposed leaf and needle litter.

Oe—2 inches to 0; partially decomposed forest litter.

A—0 to 2 inches; very dark grayish brown (10YR 3/2) silt loam; weak fine granular structure; very friable; common fine roots; about 5 percent sandstone channers; strongly acid; abrupt smooth boundary.

E—2 to 9 inches; pale brown (10YR 6/3) silt loam; weak fine granular and subangular blocky structure; very friable; common fine roots; about 5 percent sandstone channers; very strongly acid; gradual smooth boundary.

BE—9 to 17 inches; reddish yellow (7.5YR 6/8) silt loam; moderate fine and medium subangular blocky structure; friable; few fine and medium roots; few fine pores; very strongly acid; about 5 percent sandstone channers; clear smooth boundary.

2Bt1—17 to 26 inches; brownish yellow (10YR 6/6) silty clay loam; moderate medium subangular and angular blocky structure; friable; few fine and medium roots; few fine pores; few distinct clay films

on faces of peds; very strongly acid; clear smooth boundary.
2Bt2—26 to 34 inches; brownish yellow (10YR 6/6) silty clay loam; common medium distinct light gray (10YR 7/1) and strong brown (7.5YR 5/6) mottles; moderate medium subangular and angular blocky structure; firm; few fine roots; few distinct clay films on faces of peds; very strongly acid; clear wavy boundary.
2Cr—34 to 38 inches; mottled brownish yellow (10YR 6/6) and gray (10YR 7/1), weathered shale.

The thickness of the solum and the depth to paralithic contact range from 20 to 40 inches. Reaction ranges from extremely acid to slightly acid in the A horizon and is extremely acid or very strongly acid and in the E, BE, and 2Bt horizons. The content of rock fragments ranges from 0 to 30 percent in the B horizon. The fragments are dominantly shale, siltstone, or sandstone. In some pedons, the upper part of the solum to a depth of about 18 inches is colluvial material and the content of coarse fragments ranges from 5 to 35 percent. The depth to horizons that contain more than 35 percent clay ranges from 6 to 18 inches.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. The Ap horizon, if it occurs, has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. The E horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 3 to 6. It is silt loam or silty clay loam. The BE horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 3 to 8. It is silt loam or silty clay loam. The 2Bt horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 2 to 8. In some pedons it has subhorizons with hue of 5YR or 2.5YR. It is silty clay, clay, or silty clay loam. Some pedons have a BC or C horizon, which is 4 to 6 inches thick. This horizon has hue of 2.5Y or 10YR, value of 5 to 8, and chroma of 1 to 6. It is silty clay loam or silty clay or the channery analogs of these textures.

Lily Series

The Lily series consists of moderately deep, well drained, moderately rapidly permeable soils that formed in residuum derived from level-bedded, acid sandstone. These soils are on convex side slopes and ridgetops adjacent to the Red River and its major tributaries in western and southern Wolfe County. Slopes range from 12 to 35 percent. The soils are fine-loamy, siliceous, mesic Typic Hapludults.

Lily soils are associated on the landscape with Alticrest, Gilpin, Latham, Ramsey, Helechawa, Rigley, and Shelocta soils. Alticrest soils are coarse-loamy. Gilpin soils have mixed mineralogy. Latham soils are clayey and formed in acid shale. Ramsey soils are loamy and are less than 20 inches deep over bedrock. Helechawa and Rigley soils are coarse-loamy and are on colluvial benches and side slopes. Helechawa soils are more than 40 inches deep over bedrock, and Rigley soils are more than 60 inches deep over bedrock. Shelocta soils are on colluvial benches and side slopes and are more than 48 inches deep over bedrock.

Typical pedon of Lily sandy loam, 12 to 25 percent slopes; in Wolfe County; about 0.2 mile north of Pine Ridge on Kentucky Highway 715 to Rock Bridge Road, about 1.7 miles east on Rock Bridge Road to an area managed for wildlife:

Oi—3 inches to 1 inch; recent hardwood forest litter.
Oe—1 inch to 0; partially decomposed forest litter.
A—0 to 2 inches; dark grayish brown (10YR 4/2) sandy loam; weak fine granular structure; very friable; common fine roots; about 5 percent sandstone channers; slightly acid; clear wavy boundary.
E—2 to 5 inches; dark brown (10YR 4/3) sandy loam; weak fine granular structure; very friable; common fine and medium roots; about 5 percent sandstone channers; strongly acid; clear smooth boundary.
Bt1—5 to 24 inches; yellowish brown (10YR 5/6) sandy clay loam; weak medium subangular blocky structure; friable; few fine roots; common fine pores; common distinct clay films along root channels and on faces of peds; about 10 percent sandstone channers; strongly acid; clear smooth boundary.
Bt2—24 to 32 inches; strong brown (7.5YR 5/8) channery sandy clay loam; weak medium subangular blocky structure; few distinct clay films on faces of peds; about 30 percent sandstone channers; strongly acid; abrupt smooth boundary.
R—32 inches; sandstone bedrock.

The thickness of the solum and the depth to sandstone bedrock range from 20 to 40 inches. The content of sandstone fragments ranges from 0 to 30 percent to a depth of about 24 inches and from 0 to 35 percent below this depth. In areas that have not been limed, reaction ranges from extremely acid to strongly acid throughout the profile.

The A and E horizons have hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 2 to 4. Some pedons have a BE horizon, which has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 2 to 4. This horizon is loam, fine sandy loam, or sandy loam in the fine-earth fraction. The Bt horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 4 to 8. It is loam, sandy clay loam, or clay loam in the fine-earth fraction. In some pedons it has mottles in shades of red, brown, or yellow in the lower part.

Morehead Series

The Morehead series consists of very deep, somewhat poorly drained or moderately well drained, moderately permeable soils that formed in loamy alluvial or colluvial materials washed mainly from acid sandstone and shale uplands but influenced by nonacid shale and limestone. These soils are on low stream terraces along the tributary streams of the Red River. Slopes range from 0 to 4 percent. The soils are fine-silty, mixed, mesic Aquic Hapludults.

Morehead soils are associated on the landscape with Allegheny, Cotaco, Grigsby, Knowlton, Rowdy, and Skidmore soils. Allegheny and Rowdy soils are well drained and are fine-loamy. Cotaco soils are moderately well drained or somewhat poorly drained and are fine-loamy. Grigsby soils are well drained and are coarse-loamy. Knowlton soils are poorly drained. Skidmore soils are well drained and are loamy-skeletal.

Typical pedon of Morehead silt loam, in an area of Grigsby-Skidmore-Morehead complex, 0 to 4 percent slopes; in Powell County; about 1.92 miles south on Cat Creek Road from the intersection with Kentucky Highway 15 south of Stanton to the terrace landscape on the east side of the road near Cat Creek Church:

A—0 to 2 inches; dark brown (10YR 4/3) silt loam; weak medium and fine subangular blocky structure; friable; common fine roots; slightly acid; clear smooth boundary.

E—2 to 5 inches; grayish brown (10YR 5/2) silt loam; weak medium and fine subangular blocky structure; friable; common fine roots; about 2 percent pebbles; slightly acid; clear wavy boundary.

Bt1—5 to 13 inches; light olive brown (2.5Y 5/4) silty clay loam; weak medium and fine subangular blocky structure; friable; common fine roots; few faint clay films on faces of peds; few fine tubular pores; about 2 percent pebbles; very strongly acid; clear wavy boundary.

Bt2—13 to 21 inches; light olive brown (2.5Y 5/4) silty clay loam; common medium distinct light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; friable; few roots; thin clay films on faces of peds; very strongly acid; clear wavy boundary.

Bt3—21 to 42 inches; light olive brown (2.5Y 5/4) silt loam; many medium distinct light brownish gray (10YR 6/2) and dark brown (7.5YR 4/4) mottles; weak medium subangular blocky structure; very friable; few roots; common distinct clay films on faces of peds and lining pores; strongly acid; clear wavy boundary.

C—42 to 60 inches; light brownish gray (10YR 6/2) very gravelly loam; common medium distinct brown (10YR 5/3) mottles; massive; very friable; about 40 percent gravel; very strongly acid.

The thickness of the solum ranges from 40 to 60 inches. The depth to bedrock ranges from 5 to more than 10 feet. The content of coarse fragments is less than 15 percent in the solum. In areas that have not been limed, reaction is strongly acid or very strongly acid throughout the profile.

The A and E horizons have hue of 10YR, value of 4 or 5, and chroma of 2 to 6. The Bt horizon has hue of 2.5Y or 10YR, value of 5 or 6, and chroma of 4 to 6. It is mottled in shades of gray or brown below a depth of 8 to 24 inches. It is silt loam or silty clay loam. The C horizon has hue of 10YR or 2.5Y, value of 5 to 7, and chroma of 1 to 6. It is mottled in shades of gray or brown. It is silt loam, loam, or silty clay loam in the fine-earth fraction.

Muse Series

The Muse series consists of deep and very deep, well drained, slowly permeable soils that formed in colluvium or in material weathered from black, fissile shale. These soils are on toe slopes and benches in the western part of Powell County. Slopes range from 20 to 45 percent. The soils are clayey, mixed, mesic Typic Hapludults.

Muse soils are associated on the landscape with Jessietown and Rohan soils. Rohan soils are loamy-skeletal and are less than 20 inches deep over bedrock. Jessietown soils are fine-silty and are 20 to 40 inches deep over bedrock.

Typical pedon of Muse silt loam, in an area of Jessietown-Muse-Rohan complex, 20 to 45 percent slopes; in Powell County; about 700 feet west of the junction of Kentucky Highway 1028 and Kentucky Highway 82, near the Clay City interchange on Mountain Parkway:

Ap—0 to 7 inches; dark brown (10YR 4/3) silt loam; moderate fine and medium granular structure; very friable; many fine and medium roots; few coarse roots; very strongly acid; clear smooth boundary.

BE—7 to 24 inches; yellowish brown (10YR 5/4) silt loam; weak very fine and fine subangular blocky structure; common fine and medium roots; few small shale fragments and quartz pebbles; very strongly acid; clear wavy boundary.

Bt1—24 to 36 inches; strong brown (7.5YR 5/8) silty clay loam; moderate fine and medium subangular and angular blocky structure; friable; few fine and medium roots; common thin clay films on faces of peds; very strongly acid; gradual wavy boundary.

Bt2—36 to 50 inches; strong brown (7.5YR 5/6) gravelly silty clay; moderate fine and medium angular blocky structure; firm; many distinct clay films on faces of peds; about 15 percent thin shale fragments; very strongly acid; clear wavy boundary.
C—50 to 65 inches; yellowish red (5YR 5/6) gravelly silty clay loam; massive; firm; about 30 percent black shale fragments; very strongly acid.
R—65 inches; black, fissile shale.

The thickness of the solum ranges from 40 to 60 inches. The depth to bedrock ranges from 40 to 80 inches. The content of rock fragments, mostly shale, ranges from 0 to 35 percent in the solum and from 0 to 60 percent in the C horizon. Reaction is very strongly acid or strongly acid throughout the profile.

The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 1 to 3. The BE horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. It is silty clay loam or silt loam. The Bt horizon has hue of 7.5YR or 5YR, value of 4 or 5, and chroma of 4 to 8. It is silty clay loam, silty clay, or clay. In some pedons it has mottles with chroma of 2 or less in the lower part. The C horizon has colors and textures similar to those of the Bt horizon.

Newark Series

The Newark series consists of very deep, somewhat poorly drained, moderately permeable soils that formed in alluvium washed from limestone, dolomite, sandstone, shale, and siltstone. These soils are on flood plains along the Red River and its tributaries. Slopes range from 0 to 2 percent. The soils are fine-silty, mixed, nonacid, mesic Aeric Fluvaquents.

Newark soils are associated on the landscape with Grigsby and Orrville soils. Grigsby soils are well drained and are coarse-loamy. Orrville soils are fine-loamy.

Typical pedon of Newark silt loam, frequently flooded; in Powell County; about 0.5 mile north of Clay City to Beech Fork Road, east on Beech Fork Road about 1.1 miles, on the southeast side of the road in the Red River flood plain:

Ap—0 to 8 inches; brown (10YR 4/3) silt loam; many fine distinct yellowish brown (10YR 5/8) stains along root channels; moderate fine granular structure; very friable; many fine roots; few fine pores; medium acid; abrupt smooth boundary.
Bw—8 to 28 inches; brown (10YR 5/3) silt loam; common medium distinct grayish brown (2.5Y 5/2) mottles; common medium prominent yellowish red (5YR 5/8) stains along root channels; moderate coarse subangular blocky structure parting to moderate fine and medium subangular blocky; friable; few fine roots; common fine pores; about 5 percent black shale fragments; few fine iron concretions; medium acid; clear smooth boundary.
Bg—28 to 50 inches; light brownish gray (10YR 6/2) silt loam; common fine distinct reddish brown (5YR 5/4) stains along root channels; moderate coarse subangular blocky structure; firm; few fine roots; few fine pores; medium acid; clear wavy boundary.
Cg—50 to 60 inches; light brownish gray (10YR 6/2) silt loam; massive; firm; few fine roots; medium acid.

The thickness of the solum ranges from 20 to 50 inches. The depth to bedrock is more than 5 feet. The content of rock fragments, mostly gravel, ranges from 0 to 5 percent in the solum and from 0 to 25 percent in the Cg horizon. Reaction ranges from medium acid to mildly alkaline throughout the profile.

The Ap horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 or 3. The Bw horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 or 4. It is mottled in shades of gray and brown. It is silt loam or silty clay loam. The Bg horizon has hue of 10YR or 2.5Y, value of 4 to 7, and chroma of 1 or 2. It is mottled in shades of brown. It is silt loam or silty clay loam. The Cg horizon has hue of 10YR or 2.5Y, value of 4 to 7, and chroma of 1 or 2. It is mottled in shades of brown. It is silt loam or silty clay loam in the fine-earth fraction and is stratified in places.

Orrville Series

The Orrville series consists of very deep, somewhat poorly drained soils that formed in mixed alluvium derived from sandstone, siltstone, and limestone. These soils are on flood plains. Permeability is moderate in the solum and moderate or moderately rapid in the substratum. Slopes range from 0 to 4 percent. The soils are fine-loamy, mixed, nonacid, mesic Aeric Fluvaquents.

Orrville soils are associated on the landscape with Grigsby, Newark, and Knowlton soils. Grigsby soils are well drained and are coarse-loamy. Newark soils are fine-silty. Knowlton soils are poorly drained and are on low stream terraces. They are fine-silty.

Typical pedon of Orrville silt loam, in an area of Grigsby-Orrville complex, frequently flooded; in Wolfe County; about 4.3 miles east of Campton on Kentucky Highway 191 and about 2.4 miles southeast on Kentucky Highway 1812 to the confluence of Stillwater Creek and Murphy Fork at Landsaw:

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam; weak fine granular structure; very friable; common fine roots; few fine pores; slightly acid; abrupt smooth boundary.

Bw—9 to 18 inches; dark yellowish brown (10YR 4/4) loam; many medium distinct pale brown (10YR 6/3) and grayish brown (10YR 5/2) mottles; moderate medium and fine subangular blocky structure; very friable; few fine roots; few fine pores; slightly acid; clear smooth boundary.
Bg—18 to 34 inches; light brownish gray (10YR 6/2) loam; many medium distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; few fine roots; few fine pores; about 2 percent small pebbles; few dark concretions; slightly acid; clear smooth boundary.
BC—34 to 42 inches; pale brown (10YR 6/3) sandy loam; many coarse and medium prominent yellowish brown (10YR 5/8) mottles; massive; few fine roots; slightly acid; abrupt smooth boundary.
C—42 to 50 inches; yellowish brown (10YR 5/6) loamy sand; common coarse distinct gray (N 5/0) mottles; single grain; medium acid; abrupt smooth boundary.
Cg—50 to 60 inches; gray (2.5Y 5/0) loamy sand; common medium distinct strong brown (7.5YR 5/6) mottles; single grain; medium acid.

The thickness of the solum ranges from 24 to 50 inches. The depth to bedrock is more than 60 inches. The content of coarse fragments, mainly gravel and quartz pebbles, ranges from 0 to 5 percent in the A horizon, from 0 to 15 percent in the B horizon, and from 0 to 25 percent in the C horizon. Reaction ranges from strongly acid to neutral in the A and C horizons and from strongly acid to slightly acid in the B horizon.

The Ap horizon has hue of 10YR or 2.5Y, value of 4, and chroma of 2. The Bw horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 to 6. It is mottled in shades of brown or gray. It is silt loam, loam, or silty clay loam. The Bg horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 to 6, or it is neutral in hue and has value of 4 to 6. It is mottled in shades of brown or gray. It is loam, silt loam, or silty clay loam. The BC and C horizons have hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 to 6. They are mottled in shades of brown or gray. They are silt loam, loam, or sandy loam. The Cg horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 to 6, or it is neutral in hue and has value of 4 to 6. It is mottled in shades of brown or gray. It is silt loam, loam, or sandy loam. In places it is stratified below a depth of 40 inches.

Ramsey Series

The Ramsey series consists of shallow, somewhat excessively drained, rapidly permeable soils on ridgetops and the upper side slopes in the southern part of Powell County and throughout most of Wolfe County. Slopes range from 20 to 65 percent. The soils are loamy, siliceous, mesic Lithic Dystrochrepts.

Ramsey soils are associated on the landscape with Alticrest, Gilpin, Latham, and Lily soils. Alticrest soils are coarse-loamy and are 20 to 40 inches deep over bedrock. Gilpin and Lily soils are fine-loamy and are 20 to 40 inches deep over bedrock. The moderately well drained Latham soils are clayey and are more than 20 inches deep over bedrock.

Typical pedon of Ramsey fine sandy loam, in an area of Alticrest-Ramsey-Rock outcrop complex, 20 to 65 percent slopes; in Powell County; about 5.5 miles south of Stanton on Kentucky Highway 213, about 0.5 mile north on Knowlton Ridge adjacent to the road on the east side:

Oi—3 inches to 1 inch; recent forest litter.
Oe—1 inch to 0; very dark grayish brown (10YR 3/2), partially decomposed organic material.
A—0 to 3 inches; dark brown (10YR 4/3) fine sandy loam; moderate fine granular structure; very friable; few fine and medium roots; about 3 percent quartz pebbles; very strongly acid; clear smooth boundary.
Bw1—3 to 7 inches; yellowish brown (10YR 5/4) sandy loam; weak medium subangular blocky structure; common fine and medium roots; about 10 percent subrounded sandstone fragments and rounded quartz pebbles; very strongly acid; clear wavy boundary.
Bw2—7 to 18 inches; strong brown (7.5YR 5/6) gravelly sandy loam; weak medium subangular blocky structure; common medium and coarse roots; about 20 percent subrounded quartz pebbles; very strongly acid.
R—18 inches; acid sandstone bedrock.

The thickness of the solum and the depth to bedrock range from 7 to 20 inches. The content of rock fragments ranges from 3 to 35 percent in each horizon. Reaction is strongly acid or very strongly acid throughout the profile.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. The Bw horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is sandy loam or fine sandy loam in the fine-earth fraction. Some pedons have a C horizon of loamy sand. This horizon has colors similar to those of the Bw horizon.

Rigley Series

The Rigley series consists of very deep, well drained, moderately rapidly permeable soils on side slopes in coves and on foot slopes. These soils formed in colluvium on highly dissected landscapes and are commonly below areas of sandstone rock outcrop. Slopes range from 15 to 35 percent. The soils are

coarse-loamy, mixed, mesic Typic Hapludults.

Rigley soils are associated on the landscape with Helechawa, Gilpin, Lily, and Shelocta soils. Lily and Gilpin soils are 20 to 40 inches deep over bedrock and are fine-loamy. Helechawa soils are 40 to 60 inches deep over bedrock and are siliceous. Shelocta soils are fine-loamy and are more than 48 inches deep over bedrock.

Typical pedon of Rigley sandy loam, in an area of Lily-Gilpin-Rigley complex, 15 to 35 percent slopes; in Wolfe County; about 1.8 miles north of Pine Ridge, on Kentucky Highway 715 to a cove on the east side of the road overlooking Reffits Branch:

Oi—3 inches to 1 inch; recent hardwood leaf litter.
Oe—1 inch to 0; partially decomposed organic duff.
A—0 to 2 inches; dark grayish brown (10YR 4/2) sandy loam; weak fine granular structure; very friable; common fine roots; about 5 percent quartz pebbles; strongly acid; abrupt smooth boundary.
E—2 to 7 inches; yellowish brown (10YR 5/6) sandy loam; weak fine granular and subangular blocky structure; very friable; about 5 percent fine roots; few pebbles; very strongly acid; clear smooth boundary.
BE—7 to 24 inches; yellowish brown (10YR 5/4) sandy loam; weak fine and medium subangular blocky structure parting to weak fine granular; very friable; few fine roots; few fine pores; about 5 percent sandstone and quartz pebbles; very strongly acid; clear smooth boundary.
Bt1—24 to 35 inches; yellowish brown (10YR 5/4) sandy loam; moderate medium subangular blocky structure; friable; few fine roots; few faint clay films on faces of peds; about 5 percent sandstone channers and flagstones as much as 8 inches across; about 5 percent fine quartz pebbles; very strongly acid; clear smooth boundary.
Bt2—35 to 53 inches; yellowish brown (10YR 5/8) sandy loam; moderate fine and medium subangular blocky structure; friable; few fine roots; few fine pores; few distinct clay films on faces of peds; about 10 percent sandstone channers and flagstones; strongly acid; clear smooth boundary.
C—53 to 62 inches; strong brown (7.5YR 5/8) channery sandy loam; massive; about 20 percent sandstone channers and flagstones; very strongly acid; abrupt smooth boundary.
R—62 inches; sandstone bedrock.

The thickness of the solum ranges from 40 to 60 inches. The depth to sandstone, siltstone, or shale bedrock ranges from 60 to more than 100 inches. The content of quartz pebbles, channers, flagstones, and boulders ranges from 5 to 35 percent in the solum and from 20 to 70 percent in the C horizon. Reaction ranges from very strongly acid to neutral in the A horizon and from extremely acid to strongly acid in the rest of the profile.

The A horizon has hue of 10YR, value of 3 to 5, and chroma of 2 or 3. The E horizon has hue of 7.5YR to 10YR, value of 4 to 6, and chroma of 2 to 4. It is sandy loam or fine sandy loam. The BE horizon has colors and textures similar to those of the Bt horizon. The Bt horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 4 to 8. It is sandy loam or loam in the fine-earth fraction. In some pedons it has mottles in shades of brown or yellow and in shades of gray in the lower part. The C horizon has colors similar to those of the Bt horizon. It is sandy loam, loam, sandy clay loam, or clay loam in the fine-earth fraction.

Rohan Series

The Rohan series consists of shallow, well drained, moderately permeable or moderately slowly permeable soils that formed in loamy residuum or colluvium weathered from black, fissile shale. These soils are along the northern and northwestern edges of Powell County. Slopes range from 20 to 45 percent. The soils are loamy-skeletal, mixed, mesic Lithic Dystrochrepts.

Rohan soils are associated on the landscape with Jessietown and Muse soils. Jessietown soils are fine-silty and are 20 to 40 inches deep over bedrock. Muse soils are clayey and are more than 40 inches deep over bedrock.

Typical pedon of Rohan gravelly silt loam, in an area of Jessietown-Muse-Rohan complex, 20 to 45 percent slopes; in Powell County; about 1.5 miles west on Kentucky Highway 1028 from the junction of Kentucky Highways 1028 and 82, near the Clay City interchange of Mountain Parkway, on the right side of the highway, north of the road to shoulder slope:

Oi—4 inches to 2; recent forest litter.
Oe—2 inches to 0; very dark grayish brown (10YR 3/2), partially decomposed organic material.
A—0 to 4 inches; dark brown (10YR 4/3) gravelly silt loam; moderate medium granular structure; very friable; many fine and medium and few coarse roots; about 20 percent thin flat black shale fragments; very strongly acid; clear smooth boundary.
Bw—4 to 15 inches; yellowish brown (10YR 5/4) very gravelly silt loam; moderate fine and medium subangular blocky structure; common fine and medium roots; about 40 percent thin flat shale fragments; very strongly acid; abrupt wavy boundary.
Cr—15 to 19 inches; strong brown (7.5YR 5/6),

weathered shale; clear smooth boundary.
R—19 inches; hard, black, fissile shale.

The thickness of the solum ranges from 8 to 20 inches. The depth to bedrock ranges from 10 to 20 inches. The content of shale fragments ranges from 5 to 75 percent but averages about 35 percent in the control section. Reaction ranges from very strongly acid to medium acid in the A horizon and from extremely acid to strongly acid in the Bw horizon.

The A horizon has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 2 to 4. The Bw horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 3 to 6. It is silt loam or silty clay loam in the fine-earth fraction. Some pedons have a C horizon, which has colors and textures similar to those of the Bw horizon. The content of shale fragments in the C horizon ranges from 35 to 70 percent, and reaction ranges from extremely acid to strongly acid.

Rowdy Series

The Rowdy series consists of very deep, well drained, moderately permeable soils that formed in loamy alluvium washed chiefly from sandstone, siltstone, and shale. These soils are on low stream terraces and alluvial fans along the Red River and its tributaries. Slopes range from 0 to 6 percent. The soils are fine-loamy, mixed, mesic Fluventic Dystrochrepts.

Rowdy soils are associated on the landscape with Allegheny, Cotaco, Knowlton, Grigsby, Newark, and Orrville soils. Allegheny, Cotaco, and Knowlton soils are on stream terraces. Allegheny soils have an argillic horizon. Cotaco soils are moderately well drained to somewhat poorly drained. Knowlton soils are poorly drained and are fine-silty. Grigsby, Newark, and Orrville soils are on flood plains adjacent to areas of the Rowdy soils. Grigsby soils are coarse-loamy. Newark and Orrville soils are somewhat poorly drained. Newark soils are fine-silty.

Typical pedon of Rowdy loam, 2 to 6 percent slopes; in Wolfe County; about 3.2 miles northwest of Hazel Green on Kentucky Highway 1010 and 0.4 mile east of the intersection of Kentucky Highway 1010 and Stamper Branch Road, 1,000 feet northwest of the confluence of Stamper Branch and the Red River:

Ap—0 to 10 inches; dark brown (10YR 4/3) loam; moderate fine granular structure; very friable; few medium and common fine roots; few fine pores; neutral; abrupt smooth boundary.
BE—10 to 25 inches; yellowish brown (10YR 5/6) silt loam; moderate fine and medium subangular blocky structure; very friable; few fine roots; common fine pores; common brown silt coatings on faces of peds; slightly acid; clear smooth boundary.
Bw1—25 to 34 inches; yellowish brown (10YR 5/6) silt loam; moderate fine and medium subangular blocky structure; friable; few fine roots; few faint clay films; slightly acid; clear smooth boundary.
Bw2—34 to 45 inches; yellowish brown (10YR 5/6) silt loam; moderate fine and medium subangular blocky structure; firm; few fine roots; few fine pores; few faint clay films; medium acid; clear smooth boundary.
BC—45 to 58 inches; yellowish brown (10YR 5/6) loam; weak medium subangular blocky structure parting to weak fine granular; few fine roots; medium acid; clear smooth boundary.
C—58 to 65 inches; yellowish brown (10YR 5/6) sandy loam; massive; firm; few fine coal fragments; medium acid.

The thickness of the solum ranges from 40 to more than 60 inches. The depth to bedrock is more than 60 inches. The content of rock fragments ranges from 0 to 30 percent in the A and B horizons and from 0 to 60 percent in the C horizon. In areas that have not been limed, reaction ranges from very strongly acid to medium acid.

The Ap horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 2 to 4. The BE horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. The Bw horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is loam, silt loam, or sandy clay loam or the gravelly analogs of these textures. The BC horizon has colors and textures similar to those of the Bw horizon. The C horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 3 to 6. In some pedons it has mottles in shades of gray or brown. It is loam, fine sandy loam, sandy loam, clay loam, or sandy clay loam or the gravelly or very gravelly analogs of these textures. In some pedons it is stratified.

Shelocta Series

The Shelocta series consists of deep and very deep, well drained, moderately permeable soils that formed in colluvium derived from sandstone, siltstone, and shale. These soils are on side slopes, foot slopes, and benches throughout Wolfe County and south of the Knobs area in Powell County. Slopes range from 20 to 65 percent. The soils are fine-loamy, mixed, mesic Typic Hapludults.

Shelocta soils are associated on the landscape with Gilpin, Hazleton, Helechawa, and Latham soils. Gilpin soils are 20 to 40 inches deep over bedrock. They formed in residuum. Hazleton soils are loamy-skeletal. Helechawa soils are coarse-loamy. The moderately well

drained Latham soils are clayey and are 20 to 40 inches deep over bedrock.

Typical pedon of Shelocta gravelly silt loam, in an area of Shelocta-Gilpin complex, 20 to 65 percent slopes; in Wolfe County; about 3.6 miles southwest of Hazel Green near the head of Perkins Fork, in a cove 500 feet northwest of Buchanan Road near an oil exploration site:

Oi1—2 inches to 1 inch; organic forest litter.
Oi2—1 inch to 0; organic duff.
A—0 to 3 inches; dark brown (10YR 3/3) gravelly silt loam; weak fine granular structure; very friable; many fine and medium roots; about 15 percent sandstone channers; medium acid; clear smooth boundary.
AB—3 to 6 inches; dark yellowish brown (10YR 3/4) gravelly silt loam; moderate fine and medium granular and platy structure; friable; common fine and medium roots; few fine pores; about 15 percent sandstone channers; medium acid; clear smooth boundary.
BE—6 to 17 inches; dark yellowish brown (10YR 4/4) silt loam; moderate fine and medium subangular blocky structure; friable; common fine and medium and few coarse roots; few patchy coatings on faces of peds; about 5 percent sandstone channers and flagstones; medium acid; clear smooth boundary.
Bt1—17 to 31 inches; yellowish brown (10YR 5/6) silt loam; moderate fine and medium subangular blocky structure; firm; few fine and medium roots; few fine pores; few fine patchy clay films on faces of peds; few fine dark concretions; about 5 percent sandstone channers and pebbles; strongly acid; gradual smooth boundary.
Bt2—31 to 45 inches; yellowish brown (10YR 5/6) silt loam; moderate fine and medium subangular blocky structure; firm; few fine and medium roots; few distinct clay films on faces of peds; about 10 percent sandstone channers and pebbles; strongly acid; clear smooth boundary.
BC—45 to 60 inches; yellowish brown (10YR 5/6) channery silt loam; weak fine and medium subangular blocky structure; few fine, medium, and coarse roots; few fine pores; about 15 percent sandstone channers and pebbles; very strongly acid; clear smooth boundary.
C—60 to 70 inches; yellowish brown (10YR 5/6) channery silty clay loam; common medium distinct light brownish gray (10YR 6/2) mottles; massive; few fine, medium, and coarse roots; about 20 percent sandstone channers and pebbles; very strongly acid.

The thickness of the solum ranges from 40 to more than 60 inches. The depth to hard bedrock ranges from 48 to more than 120 inches. The content of rock fragments 2 millimeters to 15 inches in size ranges from 5 to 35 percent in the A and B horizons and from 5 to 60 percent in the C horizon. In areas that have not been limed, reaction ranges from extremely acid to strongly acid throughout the profile.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. The AB horizon has hue of 10YR, value of 3 to 5, and chroma of 2 to 4. It is silt loam or loam in the fine-earth fraction. The BE horizon has hue of 10YR, value of 3 to 7, and chroma of 2 to 4. It is silt loam or loam in the fine-earth fraction. The Bt horizon has hue of 7.5YR, 10YR, or 2.5YR, value of 4 to 6, and chroma of 4 to 8. It is silty clay loam or silt loam in the fine-earth fraction. The BC and C horizons have textures and colors similar to those of the Bt horizon.

Shrouts Series

The Shrouts series consists of moderately deep, well drained, slowly permeable soils that formed in material weathered from dolomite, shale, and soft limestone. These soils are on side slopes in the northwestern part of Powell County. Slopes range from 15 to 35 percent. The soils are fine, mixed, mesic Typic Hapludalfs.

Shrouts soils are associated on the landscape with Woolper and Faywood soils. Woolper soils have a mollic epipedon and are more than 60 inches deep over bedrock. Faywood soils are 20 to 40 inches deep over limestone bedrock interbedded with calcareous shale.

Typical pedon of Shrouts silt loam, in an area of Shrouts-Woolper complex, 15 to 35 percent slopes; in Powell County; about 3.8 miles west on Kentucky Highway 1028 from the intersection with Kentucky Highway 82, near the Clay City exit of Mountain Parkway, to a barn on the south side of the road, 0.2 mile south on the farm access road:

Ap—0 to 9 inches; dark brown (10YR 4/3) silt loam; moderate fine and medium granular and subangular blocky structure; friable; many small roots; few pores; mildly alkaline; clear smooth boundary.
Bt—9 to 25 inches; olive gray (5Y 5/2) and greenish gray (5GY 6/1) silty clay; moderate medium angular blocky structure; very firm; few fine roots; few pores; many distinct clay films on faces of peds; mildly alkaline; clear smooth boundary.
Cr—25 to 70 inches; olive gray (5Y 5/2) and greenish gray (5GY 5/1), soft clay shale.

The thickness of the solum ranges from 14 to 40 inches. The depth to soft shale bedrock ranges from 20 to 40 inches. The content of chert, dolomite, limestone, or shale ranges from 0 to 20 percent in the solum.

Reaction ranges from strongly acid to moderately alkaline.

The Ap horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 or 4. The Bt horizon has hue of 10YR, 2.5Y, 5Y, or 5GY, value of 5 or 6, and chroma of 1 to 6. It is silty clay or clay in the fine-earth fraction. Some pedons have a C horizon, which has hue of 2.5Y, 5Y, or 5GY, value of 5 or 6, and chroma of 1 to 6. This horizon is silty clay or clay in the fine-earth fraction. The content of rock fragments in this horizon ranges from 1 to 35 percent.

Skidmore Series

The Skidmore series consists of deep and very deep, well drained, moderately rapidly permeable soils that formed in mixed alluvium that washed downslope from side slopes and was deposited as alluvial fans at the mouth of drainageways along the tributary streams of the Red River. Slopes range from 0 to 4 percent. The soils are loamy-skeletal, mixed, mesic Dystric Fluventic Eutrochrepts.

Skidmore soils are associated on the landscape with Allegheny, Cotaco, Grigsby, Knowlton, Newark, Morehead, and Rowdy soils. Allegheny, Cotaco, and Rowdy soils are on stream terraces or colluvial fans and are fine-loamy. Cotaco soils are moderately well drained or somewhat poorly drained. Grigsby and Newark soils are on flood plains. Grigsby soils are coarse-loamy. Knowlton, Morehead, and Newark soils are fine-silty. Newark soils are somewhat poorly drained. The very deep, poorly drained Knowlton soils are on stream terraces. The somewhat poorly drained or moderately well drained Morehead soils are on low stream terraces.

Typical pedon of Skidmore gravelly loam, in an area of Grigsby-Skidmore-Morehead complex, 0 to 4 percent slopes; in Powell County; about 1.2 miles northeast on Kentucky Highway 599 from the intersection with Kentucky Highway 615 east of Cat Creek, southwest of the highway, across the flood plain to a farmstead:

Ap—0 to 10 inches; brown (10YR 4/3) gravelly loam; weak fine granular structure; very friable; many fine grass roots; about 20 percent gravel; medium acid; clear smooth boundary.

E/B—10 to 20 inches; dark yellowish brown (10YR 4/4) very gravelly loam; moderate fine and medium granular and subangular blocky structure; friable; few fine roots; about 40 percent rounded and subrounded rock fragments; slightly acid; clear wavy boundary.

Bw—20 to 40 inches; dark yellowish brown (10YR 4/4) very gravelly clay loam; weak medium subangular blocky structure; friable; few fine roots; few wormholes and wormcasts; about 40 percent rounded and subrounded fragments; slightly acid; gradual wavy boundary.

C—40 to 60 inches; dark yellowish brown (10YR 4/4) very gravelly clay loam; massive; about 50 percent rounded and subrounded gravel; slightly acid.

The thickness of the solum ranges from 20 to 40 inches. The depth to bedrock ranges from 40 to more than 100 inches. The content of rock fragments ranges from 10 to 50 percent in the Ap, E/B, and Bw horizons and from 35 to 90 percent in the C horizon. Reaction ranges from medium acid to mildly alkaline throughout the profile.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. The E/B horizon has colors similar to those of the Ap horizon. The Bw and C horizons have hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 to 6. They are loam, clay loam, fine sandy loam, or sandy loam in the fine-earth fraction. In some pedons they have mottles with chroma of 1 or 2 below a depth of 2 feet.

Westbend Series

The Westbend series consists of deep, well drained, moderately rapidly permeable soils that formed in loamy residuum and colluvium weathered principally from interbedded soft siltstone and shale of the Nancy Member of the Borden Geologic Formation. These soils are on side slopes, narrow ridgetops, and toe slopes in the Knobs area of western Powell County. Slopes range from 6 to 45 percent. The soils are fine-silty, mixed, mesic Typic Hapludalfs.

Westbend soils are associated on the landscape with Bledsoe, Berks, and Carpenter soils on side slopes and Grigsby soils on the adjacent flood plains. Bledsoe soils are clayey and are more than 60 inches deep over bedrock. Berks soils are loamy-skeletal and are less than 40 inches deep over bedrock. Carpenter soils are fine-loamy and formed in colluvium. Grigsby soils are coarse-loamy and are on flood plains.

Typical pedon of Westbend silt loam, 20 to 45 percent slopes, eroded; in Powell County; about 1.7 miles west of the Stanton exit on Mountain Parkway, 150 feet south of the right-of-way:

A—0 to 2 inches; light yellowish brown (10YR 6/4) silt loam; moderate fine granular structure; very friable; many fine and medium roots; very strongly acid; clear smooth boundary.

BA—2 to 7 inches; yellowish brown (10YR 5/6) silt loam; weak fine and medium subangular blocky structure; friable; common fine and medium roots;

about 1 percent angular coarse fragments; very strongly acid; clear wavy boundary.

Bt1—7 to 19 inches; yellowish brown (10YR 5/6) silty clay loam; moderate medium subangular blocky structure; firm; about 2 percent strong brown (7.5YR 5/6), oxidized shale fragments; common light yellowish brown (10YR 6/4) coatings on fragments; common fine and medium roots; few faint clay films on faces of peds; very strongly acid; clear wavy boundary.

Bt2—19 to 26 inches; yellowish brown (10YR 5/6) silty clay loam; common light yellowish brown (10YR 6/4) coatings on faces of peds and rock fragments and light olive gray (5Y 6/2) coatings in pores; moderate medium angular and subangular blocky structure; firm; about 2 percent strong brown (7.5YR 5/6), oxidized shale fragments; few fine and medium roots; few patchy clay films on faces of peds; strongly acid; gradual wavy boundary.

Bt3—26 to 33 inches; yellowish brown (10YR 5/6) and olive gray (5Y 5/2) channery silty clay loam; moderate medium angular and subangular blocky structure; firm; about 15 percent soft shale fragments breakable by hand pressure; few fine and medium roots; common distinct clay films on faces of peds; medium acid; gradual wavy boundary.

BC—33 to 37 inches; light olive gray (5Y 6/2) channery silty clay loam; common distinct yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; firm; about 20 percent olive brown (2.5Y 4/4), soft shale fragments; few fine and medium roots; medium acid; diffuse wavy boundary.

C—37 to 45 inches; light olive gray (2.5Y 5/4) and olive (5Y 5/3) very channery silty clay loam; about 40 percent soft shale and ironstone fragments; relict shale structure; firm; few fine roots; medium acid; clear wavy boundary.

Cr—45 to 55 inches; olive (5Y 5/3), soft shale; light olive gray (5Y 6/2) coatings.

The thickness of the solum ranges from 35 to 55 inches. The depth to soft shale bedrock ranges from 40 to 60 inches. The content of rock fragments ranges from 0 to 2 percent in the upper part of the solum, from 0 to 20 percent in the lower part of the solum, and from 30 to 65 percent in the C horizon. Reaction ranges from extremely acid to slightly acid in the A horizon and from very strongly acid to neutral in the B and C horizons.

The A horizon has hue of 10YR, value of 3 to 6, and chroma of 2 to 4. The BA horizon has hue of 10YR, 7.5YR, or 2.5Y, value of 4 or 5, and chroma of 3 to 6. It is silt loam, loam, or silty clay loam. The Bt horizon has hue of 7.5YR, 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 3 to 6. It is silt loam in the fine-earth fraction. The BC horizon has colors and textures similar to those of the Bt horizon. The C horizon has hue of 2.5Y or 5Y, value of 4 to 6, and chroma of 3 or 4. It is silt loam or silty clay loam in the fine-earth fraction.

Woolper Series

The Woolper series consists of very deep, well drained, moderately slowly permeable soils that formed in colluvium derived from dolomitic limestone and shale. These soils are on side slopes and benches in the northwestern part of Powell County along the Red River and its tributaries. Slopes range from 15 to 35 percent. The soils are fine, mixed, mesic Typic Argiudolls.

Woolper soils are associated on the landscape with Shrouts and Faywood soils. Shrouts soils are moderately deep over shale bedrock. Faywood soils are moderately deep over limestone interbedded with thin layers of shale.

Typical pedon of Woolper silty clay loam, in an area of Shrouts-Woolper complex, 15 to 35 percent slopes; in Powell County; about 3.8 miles west of the junction of Kentucky Highways 82 and 1028, on Kentucky Highway 1028, near the Clay City exit to Mountain Parkway, to a barn on the south side of the highway, south behind the barn about 0.2 mile to roadcut on the farm road:

A—0 to 14 inches; dark brown (7.5YR 3/2) silty clay loam; moderate medium granular structure parting to angular blocky; common fine and medium roots; about 5 percent dolomite fragments 2 to 3 inches across; mildly alkaline; gradual wavy boundary.

Bt1—14 to 32 inches; dark brown (7.5YR 3/2) silty clay loam; strong medium and coarse angular blocky structure; firm; few fine roots; many distinct clay films on faces of peds; black (10YR 2/1) coatings in root channels; common black concretions; about 12 percent dolomite fragments; mildly alkaline; abrupt smooth boundary.

Bt2—32 to 46 inches; brown (7.5YR 5/4) and yellowish brown (10YR 5/4) silty clay; moderate medium angular blocky structure; firm; few fine roots; many distinct clay films on faces of peds; black (10YR 2/1) coatings in root channels; common black concretions; about 12 percent dolomite fragments; mildly alkaline; abrupt smooth boundary.

C—46 to 65 inches; yellowish brown (10YR 5/4) silty clay; massive; very firm; mildly alkaline.

The thickness of the solum ranges from 40 to 60 inches. The depth to bedrock is more than 60 inches. Reaction ranges from slightly acid to mildly alkaline throughout the profile. The content of rock fragments, mostly limestone, ranges from 0 to 15 percent

throughout. The thickness of the mollic epipedon ranges from 10 to about 24 inches.

The A horizon has hue of 10YR, 7.5YR, or 2.5Y and value and chroma of 2 or 3. The Bt horizon has hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 2 to 4. It is silty clay loam, silty clay, or clay. In some pedons it has few or common mottles in shades of gray below the upper 10 inches. The C horizon has hue of 10YR, 7.5YR, or 2.5Y, value of 3 to 5, and chroma of 2 to 4. It is silty clay or clay. In some pedons it has mottles in shades of brown, gray, and olive.

Formation of the Soils

This section relates the factors of soil formation to the soils in the survey area and explains the processes of horizon differentiation.

Factors of Soil Formation

The interaction of the five main factors of soil formation results in differences among soils. These factors are the physical and chemical composition of the parent material; the climate during and after the accumulation of the parent material; the kinds of plants and animals on and in the soils; relief, or lay of the land, and its effect on drainage; and the length of time the soil-forming factors have been in progress *(9)*. The relative importance of each of these factors differs from one soil to another. In some areas one factor may dominate the formation of soil characteristics, and in other areas another factor may dominate. Because the interrelationships of the soil-forming factors are so complex, the effect of any one factor is difficult to determine. In Powell and Wolfe Counties, the differences in the soils resulted mainly from the influences of relief and parent material.

Parent Material

Parent material is the unconsolidated mass in which soils form. It is a product of the weathering or decomposition of underlying bedrock or transported materials. Parent material influences the physical, mineral, and chemical properties of the soil and, to a large extent, the rate at which soil formation takes place. In Powell and Wolfe Counties, the soils formed mainly in colluvial deposits on hillsides; in fluvial deposits along rivers and streams and some high-level fluvial deposits along the Red River; and in material weathered from bedrock. Shelocta soils, for example, formed in colluvium on hillsides. Grigsby and Orrville soils formed in fluvial deposits on low flood plains along rivers and streams. Allegheny and Cotaco soils formed in fluvial deposits on terraces. Gilpin soils formed in material weathered from bedrock.

Most of the surface rock formations in Powell and Wolfe Counties consist of interbedded sandstone, siltstone, and shale. In places, these strata are interspersed with coal seams of the Pennsylvanian age. Shelocta, Gilpin, and Latham soils are examples of soils that formed as the result of weathering of these interbedded materials. In the Knobs section of Powell County, the main exposures of rock are shales of the Devonian and Mississippian ages. These shales are commonly on steep hillsides. Jessietown and Rohan soils formed in material weathered from black shale, and Westbend soils formed in material weathered from gray shale.

Climate

Climate affects the physical, chemical, and biological relationships in soils *(9)*. It influences the kind and number of plants and animals on and in the soils, the weathering and decomposition of rocks and minerals, the susceptibility of the soils to erosion, and the rate of soil formation.

The climate of Powell and Wolfe Counties is humid and temperate. The average annual precipitation is 46 inches, and the mean annual air temperature is 58 degrees F. Because the soils are seldom completely dry, the leaching process occurs throughout the year. Most of the soluble bases have been leached out of the surface layer and the upper part of the subsoil. As a result, most of the soils have a leached, acid surface layer and a subsoil that is finer textured than the surface layer. Gilpin and Allegheny soils are strongly leached.

Plant and Animal Life

Plants affect soil formation mainly by adding organic matter. Animals, bacteria, and fungi contribute to soil formation by converting the remains of plants to organic matter and plant nutrients. The organic matter imparts a dark color to the soil material, and the humus, or decomposed organic matter, aids in the formation of soil structure.

Most of the soils in Powell and Wolfe Counties formed under hardwood forests. Soils that formed under this type of vegetation typically have a thin, dark surface layer and a brighter colored subsoil.

Local differences in drainage, parent material,

elevation, aspect, and other features contribute to forest density, composition of plant species, and kinds of associated ground cover. Variations in soils reflect these differences. Bledsoe soils on cool aspects, for example, have a slightly darker and thicker surface layer than the same soils on warm aspects. Because slopes on cool aspects receive less direct sunlight, they have a slightly lower soil temperature and have more favorable moisture conditions for vegetation than slopes on warm aspects. Soils on cool aspects produce more understory and overstory vegetation, and the decaying leaf litter results in the formation of a thicker and darker surface layer.

Humans have greatly altered the surface layer and the soil environment by clearing the forests and plowing the soil. They have mixed the soil layers, moved soil from place to place, added fertilizer and lime, and introduced new plant species. In places, as a result of accelerated erosion, most of the original surface layer has been removed and the less productive subsoil exposed.

Relief

Relief influences soil formation primarily through its effects on drainage, erosion, soil depth, and plant cover. In Powell and Wolfe Counties, it is characterized primarily by ridges and valleys. The ridges are long, narrow, and sloping, and the hillsides are steep. The nearly level valleys are long and narrow and are frequently flooded.

Soils on steep slopes, such as Bledsoe and Shelocta soils, formed in colluvial material transported downslope by gravity or water, or both. Soils on ridges, such as Gilpin and Lily soils, generally are less than 40 inches deep over bedrock, mainly because of a rapid rate of geologic erosion. Soils on steep slopes generally have fewer, less distinct horizons than soils that formed in the less sloping areas because the runoff rate is much more rapid in steep areas. In the less sloping areas, more rain penetrates the surface and the horizons are more distinct.

Relief generally determines depth to the water table, which is an important factor in soil development. Soils in some nearly level areas show evidence of wetness, for example, mottles in the subsoil. In some nearly level, concave areas, the soils are saturated for extended periods of time. Soils in these areas are commonly gray and have mottles in the subsoil. Knowlton soils are examples of wet soils in the lower positions on the landscape.

Time

A long period of time is required for the development of distinct soil profiles. The length of time required depends mainly upon the nature of the parent material and the relief.

In this survey area relatively young soils are on flood plains, in coves and on concave slopes, and on some steep slopes. These soils have weakly developed subsoil horizons *(9)*. Examples are Berks, Grigsby, Helechawa, and Rowdy soils.

Some of the soils on old, high terraces, ridgetops, and hillsides have been in place long enough to acquire well developed subsoil horizons that have a significant accumulation of illuvial clay. Some examples are Allegheny, Gilpin, Rigley, and Shelocta soils.

Processes of Horizon Differentiation

The effects of the soil-forming factors are evidenced by the different layers, or horizons, in a soil profile. The soil profile extends from the surface layer downward to materials that have been little altered by the soil-forming processes *(24)*.

Most soil profiles have three major horizons—the A, B, and C horizons. They may also have an O or E horizon. Lowercase letters are used in horizon designators to indicate differences within the major horizons. The designator Bt, for example, represents the part of the B horizon that has received an accumulation of clay from the overlying horizons. Shelocta soils have a Bt horizon. Numbers are used after the letter to indicate vertical subdivision within the horizon, for example, Bt1 or Bt2.

Soils that formed under forest vegetation commonly have an O horizon at the surface. This horizon is an accumulation of organic material, such as leaves and twigs, or is humified organic material that has not been significantly mixed with mineral material.

The A horizon is a mineral horizon at or near the surface. It is darkened by humified organic material. An E horizon may lie beneath the A horizon. Both the A and E horizons are characterized by maximum leaching and eluviation of clay, iron, and exchangeable bases. The E horizon is not darkened by organic material. It is generally the lightest colored horizon in the profile.

The B horizon normally underlies the A or E horizon. It is called the subsoil. It is characterized by maximum accumulation or illuviation of clay, iron, aluminum, and other compounds leached from the surface and subsurface layers. In some soils, such as Berks soils, the B horizon formed mainly by alteration of the original parent material in place rather than by the illuviation of clay, iron, and aluminum. The parent material may be altered by weathering or by the release of iron, which can result in brown or red colors, the development of soil structure, or both. The B horizon commonly has blocky or prismatic structure. It is generally finer in

texture than the A horizon and of a stronger color than the A horizon or the underlying C horizon. The C horizon consists of materials that have been little altered by the soil-forming processes, but it may be modified by weathering.

Many young soils, such as those that formed in recent alluvium or in man-deposited fills, do not have a B horizon. In these soils the C horizon may be directly below an A horizon or may be at the surface.

The formation of a succession of soil horizons is the result of one or more of the following processes: accumulation of organic matter; leaching of soluble constituents and exchangeable bases; the biochemical reduction and subsequent transfer of iron; the formation of soil structure; and the formation and translocation of clay minerals. These processes often operate simultaneously and have probably been active for thousands of years in old soils.

Organic matter accumulates as plant residue and applied organic material decompose and are incorporated into the soil. These accumulations darken the mineral soil material and form the surface layer, or A horizon. Soils that formed under forest vegetation have received organic material mainly in the form of leaf litter on the surface. This material is not mixed deeply into the soil. Soils that formed under prairie vegetation, however, have accumulated organic matter deeply into the profile and thus may have a thick, dark surface layer.

In Powell and Wolfe Counties, most of the soils in the uplands have well developed soil horizons as a result of weathering and of the processes of eluviation and illuviation. The leaching of lime or other soluble constituents from the A horizon is necessary for the illuviation of clay in the subsoil. Clay minerals are removed from the A horizon as water percolates downward through the soil profile, are translocated in suspension to the lower horizons, and are deposited as clay films on mineral grains, in pores, and on ped surfaces in layers that are rich in lime or basic cations. Clay can also form in place in the B horizon by the interaction of dissolved silica and aluminum leached from overlying horizons. These processes result in concentrations of sand- and silt-sized quartz grains in the A and E horizons and an increase in the content of clay in the B horizon.

Leaching has been sufficient to remove most of the exchangeable bases from the B horizon of the upland soils in the survey area. Bledsoe and Westbend soils, however, which are classified as Alfisols, are less acid and retain a greater supply of plant nutrients, such as calcium and magnesium, than the more extremely weathered and leached soils that are classified as Ultisols, such as Carpenter and Gilpin soils.

The processes of eluviation and illuviation are retarded in the soils that formed on flood plains because of the continuous addition of sediments during periods of stream overflow. Such minimally developed soils are classified as Entisols or Inceptisols.

The reduction and transfer of iron occurs in soils that do not have good natural drainage, such as Orrville soils. These soils are on bottom land and are periodically saturated, and the wetness has resulted in gray colors and in mottles in the subsoil. In well drained soils in the uplands, however, iron released during the weathering of primary minerals forms iron oxides, which coat soil particles and result in red and brown colors in the subsoil.

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Glossary

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

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

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

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

Aspect. The direction in which a slope faces. Warm aspects are slopes of more than 15 percent that face an azimuth of 135 to 315 degrees. Cool aspects are slopes of more than 15 percent that face an azimuth of 315 to 135 degrees.

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

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

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

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

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

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

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

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

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

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a fragment.

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

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

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

Coarse textured soil. Sand or loamy sand.

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

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

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that

it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

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

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

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are:

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

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

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

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

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

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

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

Devonian period. The fourth period of the Paleozoic era of geologic time, extending from the end of the Silurian period (about 405 million years ago) to the beginning of the Mississippian period (about 345 million years ago).

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

Dolomite. A sedimentary rock that is made up mainly of calcium and magnesium carbonate.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat

poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

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

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

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

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

Erosion (accelerated)—Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

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

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

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

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

Fissile. A characteristic or quality of any rock that permits its distinct separation into parallel laminae, or layers, as in shale.

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

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

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.

Geology. The field of science that deals with the origin, composition, structure, and history of the earth, especially as revealed by the rocks and the processes by which changes in the rocks occur.

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

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

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

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.6 centimeters) in diameter.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

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

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 at the surface of a mineral soil.

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

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

B horizon.—The mineral horizon below an O, A, or E horizon. The B horizon is, in part, a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics, such as accumulation of clay, sesquioxides, humus, or a combination of these; prismatic or blocky structure; redder or browner colors than those in the A horizon; or a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

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

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

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

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

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

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

Infiltration. The downward entry of water into the immediate surface of soil or other material. This contrasts 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.

Landscape (geology). The distinct association of landforms, especially as modified by geologic forces, that can be seen in a single view.

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 that are 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.

Limestone. A sedimentary rock that is more than 50 percent calcium carbonate, primarily in the form of calcite. Limestone generally forms through a combination of organic and inorganic processes and includes soluble and insoluble constituents. Some limestone is fossiliferous.

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

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

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

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

Mineral soil. Soil that is mainly mineral material and

low in organic material. Its bulk density is more than that of organic soil.

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

Mississippian period. The fifth period of the Paleozoic era of geologic time, extending from the end of the Devonian period (about 345 million years ago) to the beginning of the Pennsylvanian period (about 310 million years ago).

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

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

Mountains and Eastern Coalfields. A physiographic region of Kentucky characterized by layers of sandstone, siltstone, and shale and coalbeds formed during the Pennsylvanian period.

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

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

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

Ordovician period. The second period of the Paleozoic era of geologic time, extending from the end of the Cambrian period (about 500 million years ago) to the beginning of the Silurian period (about 425 million years ago).

Organic matter. Plant and animal residue in the soil in various stages of decomposition. The content of organic matter is *low* if less than 2 percent, *moderate* if 2 to 4 percent, and *high* if more than 4 percent.

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

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

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

Pennsylvanian period. The sixth period of the Paleozoic era of geologic time, extending from the end of the Mississippian period (about 310 million years ago) to the beginning of the Permian period (about 270 million years ago) and characterized by warm climates and swampy areas.

Percolation. The downward movement of water through the soil.

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

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

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

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

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

Piping (in tables). Subsurface tunnels or pipelike cavities are formed by water moving through the soil.

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

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

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

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

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

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

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

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

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

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

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

Rill. A steep-sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rippable. Rippable bedrock or hardpan can be excavated using a single-tooth ripping attachment mounted on a tractor with a 200-300 draw bar horsepower rating.

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

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

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

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

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

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

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

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the substratum. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Silurian period. The third period of the Paleozoic era of geologic time, extending from the end of the Ordovician period (about 425 million years ago) to the beginning of the Devonian period (about 405 million years ago).

Sinkhole. A depression in the landscape where limestone has been dissolved.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slippage (in tables). The soil mass is 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. The slope classes in this survey are:

Nearly level	0 to 2 percent
Gently sloping	2 to 6 percent
Sloping	6 to 12 percent
Moderately steep	12 to 20 percent
Steep	20 to 30 percent
Very steep	30 to 80 percent

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

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

Soil depth. The depth of the soil over bedrock. The soil depth classes in this survey are:

Very shallow	less than 10 inches
Shallow	10 to 20 inches
Moderately deep	20 to 40 inches
Deep	40 to 60 inches
Very deep	more than 60 inches

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

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

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

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

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

Stratified. Arranged in layers (strata). The term refers to geologic material. Layers in soils that result from the processes of soil formation are called horizons; those inherited from the parent material are called strata.

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

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

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

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the E horizon. Generally refers to a leached horizon lighter in color and lower in organic matter content than the overlying surface layer.

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

Terrace. An embankment, or ridge, constructed on the contour or at a slight angle to the contour across sloping soils. The terrace intercepts surface runoff, so that water soaks into the soil or flows slowly to a prepared outlet.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Tertiary period. The first period of the Cenozoic era of geologic time, extending from the end of the Mesozoic era (about 63 million years ago) to the beginning of the Quaternary period (about 1 million years ago).

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). An otherwise suitable soil material that is too thin for the specified use.

Tilth, soil. The physical condition of the soil as related

to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topography. The configuration of a surface, including its relief and the position of its natural and manmade features.

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.

Unstable fill (in tables). There is a risk of caving or sloughing on banks of fill material.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Variegation. Refers to patterns of contrasting colors that are assumed to be inherited from the parent material rather than to be the result of poor drainage.

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

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

(Recorded in the period 1951-83 at Mount Sterling, Kentucky)

Month	Temperature						Precipitation				
				2 years in 10 will have--				2 years in 10 will have--			
	Average daily maximum	Average daily minimum	Average	Maximum temperature higher than--	Minimum temperature lower than--	Average number of growing degree days*	Average	Less than--	More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January	42.4	23.7	33.1	68	-9	73	3.97	1.94	5.72	9	6.9
February	46.9	26.0	36.5	73	-3	98	3.58	1.81	5.11	8	4.6
March	57.0	34.5	45.8	82	12	253	4.65	2.54	6.51	9	2.7
April	69.1	44.1	56.6	86	24	498	4.05	2.21	5.65	8	.2
May	76.9	53.1	65.0	90	32	775	4.24	2.60	5.70	8	.0
June	83.1	60.9	72.0	93	45	960	4.02	2.83	5.11	8	.0
July	86.0	64.8	75.4	96	52	1,097	5.18	3.11	7.04	8	.0
August	85.1	63.4	74.3	95	49	1,063	4.02	1.76	5.93	6	.0
September	79.8	57.1	68.5	93	39	855	3.56	1.94	4.97	6	.0
October	69.6	45.3	57.5	86	25	543	2.26	1.23	3.21	5	.0
November	56.7	35.5	46.1	79	13	207	2.91	1.72	3.96	7	.7
December	46.9	28.2	37.6	70	0	112	3.84	1.93	5.50	8	1.5
Yearly:											
Average	66.6	44.7	55.7	---	---	---	---	---	---	---	---
Extreme	---	---	---	97	-10	---	---	---	---	---	---
Total	---	---	---	---	---	6,534	46.28	40.21	52.00	90	16.6

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

TABLE 2.--FREEZE DATES IN SPRING AND FALL

(Recorded in the period 1951-83 at Mount Sterling, Kentucky)

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. 8	Apr. 20	May 6
2 years in 10 later than--	Apr. 2	Apr. 15	May 1
5 years in 10 later than--	Mar. 23	Apr. 5	Apr. 21
First freezing temperature in fall:			
1 year in 10 earlier than--	Oct. 26	Oct. 18	Oct. 9
2 years in 10 earlier than--	Oct. 31	Oct. 23	Oct. 13
5 years in 10 earlier than--	Nov. 10	Nov. 2	Oct. 22

TABLE 3.--GROWING SEASON

(Recorded in the period 1951-83 at Mount Sterling, Kentucky)

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	210	187	161
8 years in 10	217	195	168
5 years in 10	232	210	183
2 years in 10	246	225	199
1 year in 10	254	233	206

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Powell County	Wolfe County	Total-- Area	Extent
		Acres	Acres	Acres	Pct
AgA	Allegheny loam, 0 to 2 percent slopes	432	0	432	0.2
AgB	Allegheny loam, 2 to 6 percent slopes	2,434	723	3,157	1.2
AgC2	Allegheny loam, 6 to 15 percent slopes, eroded	595	832	1,427	0.6
AgD3	Allegheny loam, 15 to 25 percent slopes, severely eroded	832	981	1,813	0.7
AoB	Allegheny-Cotaco complex, 2 to 6 percent slopes	249	134	383	0.1
ArF	Alticrest-Ramsey-Rock outcrop complex, 20 to 65 percent slopes	7,737	8,051	15,788	6.1
BeF	Bethesda and Fairpoint soils, 2 to 70 percent slopes	0	1,970	1,970	0.8
BsF	Bledsoe-Berks-Rock outcrop complex, 20 to 70 percent slopes	6,526	2,889	9,415	3.7
CkF	Carpenter-Bledsoe-Berks complex, 20 to 70 percent slopes	31,975	42	32,017	12.4
CoA	Cotaco silt loam, 0 to 2 percent slopes	229	0	229	0.1
CoB	Cotaco silt loam, 2 to 6 percent slopes	1,039	101	1,140	0.4
FaE2	Faywood silt loam, 20 to 35 percent slopes, eroded	2,126	0	2,126	0.8
GnC	Gilpin silt loam, 4 to 12 percent slopes	184	651	835	0.3
GnD	Gilpin silt loam, 12 to 25 percent slopes	1,086	3,351	4,437	1.7
GpE	Gilpin-Shelocta complex, 25 to 35 percent slopes	156	4,397	4,553	1.8
GrF	Gilpin-Hazleton-Rock outcrop association, 20 to 60 percent slopes	1,412	0	1,412	0.5
Gs	Grigsby silt loam, frequently flooded	6,258	1,310	7,568	2.9
Gu	Grigsby-Orrville complex, frequently flooded	329	3,533	3,862	1.5
Gy	Grigsby-Skidmore-Morehead complex, 0 to 4 percent slopes	1,658	90	1,748	0.7
HaF	Helechawa-Faywood complex, 20 to 45 percent slopes	741	0	741	0.3
HeF	Helechawa-Rock outcrop complex, 35 to 55 percent slopes	13,100	15,016	28,116	10.9
JaB	Jessietown silt loam, 2 to 6 percent slopes	208	0	208	0.1
JeD3	Jessietown silty clay loam, 12 to 30 percent slopes, severely eroded	597	0	597	0.2
JoF	Jessietown-Muse-Rohan complex, 20 to 45 percent slopes	11,532	264	11,796	4.6
KnA	Knowlton silt loam, 0 to 2 percent slopes	2,484	118	2,602	1.0
LaD	Latham silt loam, 8 to 25 percent slopes	4	750	754	0.3
LeF	Latham-Gilpin-Alticrest complex, 20 to 65 percent slopes	1,517	25,851	27,368	10.6
LgE	Latham-Gilpin complex, 15 to 35 percent slopes	0	4,226	4,226	1.6
LoD	Lily sandy loam, 12 to 25 percent slopes	0	734	734	0.3
LyE	Lily-Gilpin-Rigley complex, 15 to 35 percent slopes	249	1,222	1,471	0.6
Ne	Newark silt loam, frequently flooded	2,635	69	2,704	1.0
Or	Orrville silt loam, occasionally flooded	0	226	226	0.1
Pt	Pits, quarries	269	0	269	0.1
RdB	Rowdy loam, 2 to 6 percent slopes	104	468	572	0.2
RgA	Rowdy-Grigsby complex, 0 to 4 percent slopes, occasionally flooded	0	2,242	2,242	0.9
SaF	Shelocta-Gilpin complex, 20 to 65 percent slopes	4,271	62,021	66,292	25.7
SeE	Shrouts-Woolper complex, 15 to 35 percent slopes	2,006	0	2,006	0.8
WbD2	Westbend silt loam, 6 to 25 percent slopes, eroded	852	0	852	0.3
WbE2	Westbend silt loam, 20 to 45 percent slopes, eroded	8,691	0	8,691	3.4
	Water areas less than 40 acres in size	754	394	1,148	0.5
	Total	115,271	142,656	257,927	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	Tobacco	Soybeans	Wheat	Grass-legume hay	Pasture
		Bu	Lb	Bu	Bu	Ton	AUM*
AgA---------- Allegheny	I	125	3,000	40	45	4.0	8.0
AgB---------- Allegheny	IIe	120	3,000	40	45	4.0	8.0
AgC2--------- Allegheny	IIIe	110	2,500	35	40	3.5	7.0
AgD3--------- Allegheny	VIe	---	---	---	---	3.0	4.0
AoB---------- Allegheny-Cotaco	IIe	115	2,800	40	40	4.0	8.0
ArF**: Alticrest-Ramsey--------	VIIe	---	---	---	---	---	---
Rock outcrop--	VIIIs	---	---	---	---	---	---
BeF---------- Bethesda and Fairpoint	VIIe	---	---	---	---	---	---
BsF**: Bledsoe-Berks--	VIIe	---	---	---	---	---	---
Rock outcrop---	VIIIs	---	---	---	---	---	---
CkF---------- Carpenter-Bledsoe-Berks	VIIe	---	---	---	---	---	---
CoA---------- Cotaco	IIw	105	2,400	40	35	4.0	8.0
CoB---------- Cotaco	IIe	110	2,800	40	40	4.0	8.0
FaE2--------- Faywood	VIe	---	---	---	---	---	4.0
GnC---------- Gilpin	IIIe	85	2,000	25	30	3.0	6.0
GnD---------- Gilpin	IVe	80	---	---	30	2.5	6
GpE---------- Gilpin-Shelocta	VIIe	---	---	---	---	---	---
GrF**: Gilpin-Hazleton	VIIe	---	---	---	---	---	---
Rock outcrop---	VIIIs	---	---	---	---	---	---

See footnotes at end of table.

TABLE 5.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn	Tobacco	Soybeans	Wheat	Grass-legume hay	Pasture
		Bu	Lb	Bu	Bu	Ton	AUM*
Gs---------- Grigsby	IIw	110	2,600	35	35	3.5	8.0
Gu---------- Grigsby-Orrville	IIw	110	2,600	35	35	3.5	6.0
Gy---------- Grigsby-Skidmore-Morehead	IIw	100	2,400	30	30	3.0	6.0
HaF---------- Helechawa-Faywood	VIIe	---	---	---	---	---	---
HeF**:							
Helechawa------	VIIe	---	---	---	---	---	---
Rock outcrop---	VIIIs	---	---	---	---	---	---
JaB---------- Jessietown	IIe	100	2,800	35	40	4.0	7.0
JeD3---------- Jessietown	VIe	---	---	---	---	2.0	3.5
JoF---------- Jessietown-Muse-Rohan	VIIe	---	---	---	---	---	---
KnA---------- Knowlton	IIIw	100	---	30	30	3.0	7.0
LaD---------- Latham	VIe	---	---	---	---	2.5	4.0
LeF---------- Latham-Gilpin-Alticrest	VIIe	---	---	---	---	---	---
LgE---------- Latham-Gilpin	VIe	---	---	---	---	---	4.0
LoD---------- Lily	IVe	---	---	---	---	2.5	4.0
LyE---------- Lily-Gilpin-Rigley	VIe	---	---	---	---	---	4.0
Ne---------- Newark	IIw	110	2,500	35	35	3.5	8.0
Or---------- Orrville	IIw	110	2,500	35	35	3.5	8.0
Pt**---------- Pits, quarries	VIIIs	---	---	---	---	---	---

See footnotes at end of table.

TABLE 5.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn	Tobacco	Soybeans	Wheat	Grass-legume hay	Pasture
		Bu	Lb	Bu	Bu	Ton	AUM*
RdB---------- Rowdy	IIe	120	3,000	40	45	4.0	8.0
RgA---------- Rowdy-Grigsby	IIw	115	2,600	35	35	3.5	8.0
SaF---------- Shelocta-Gilpin	VIIe	---	---	---	---	---	---
SeE---------- Shrouts-Woolper	VIe	---	---	---	---	---	4.5
WbD2---------- Westbend	VIe	---	---	---	---	2.5	4.0
WbE2---------- Westbend	VIIe	---	---	---	---	---	---

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

** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 6.--CAPABILITY CLASSES AND SUBCLASSES

(Miscellaneous areas are excluded. Dashes indicate no acreage)

Class	Total acreage	Major management concerns (Subclass)		
		Erosion (e)	Wetness (w)	Soil problem (s)
		Acres	Acres	Acres
I:				
Powell County	432	---	---	---
Wolfe County	---	---	---	---
II:				
Powell County	15,141	4,034	11,107	---
Wolfe County	8,895	1,425	7,470	---
III:				
Powell County	3,263	779	2,484	---
Wolfe County	1,602	1,484	118	---
IV:				
Powell County	1,086	1,086	---	---
Wolfe County	4,085	4,085	---	---
V:				
Powell County	---	---	---	---
Wolfe County	---	---	---	---
VI:				
Powell County	6,666	6,666	---	---
Wolfe County	7,179	7,179	---	---
VII:				
Powell County	83,015	83,015	---	---
Wolfe County	116,000	116,000	---	---
VIII:				
Powell County	4,914	---	---	4,914
Wolfe County	4,501	---	---	4,501

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY

(Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available)

Soil name and map symbol	Management concerns				Potential productivity			Trees to plant
	Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Common trees	Site index	Volume*	
AgA, AgB, AgC2--Allegheny	Slight	Slight	Slight	Severe	Shortleaf pine	80	130	Eastern white pine, yellow poplar, black walnut, shortleaf pine, white oak, ash, northern red oak.
					Yellow poplar	93	95	
					Virginia pine	72	112	
					Sugar maple	---	---	
					White ash	---	---	
					Northern red oak	---	---	
					American elm	---	---	
					Red maple	---	---	
					Pignut hickory	---	---	
					Black oak	78	60	
					White oak	70	52	
					Eastern redcedar	---	---	
					Black cherry	---	---	
AgD3--Allegheny	Moderate	Moderate	Slight	Severe	Shortleaf pine	80	130	Eastern white pine, yellow poplar, black walnut, shortleaf pine, white oak, ash, northern red oak.
					Yellow poplar	93	95	
					Virginia pine	72	112	
					Sugar maple	---	---	
					White ash	---	---	
					Northern red oak	---	---	
					American elm	---	---	
					Red maple	---	---	
					Pignut hickory	---	---	
					Black oak	78	60	
					White oak	70	52	
					Eastern redcedar	---	---	
					Black cherry	---	---	
AoB**:								
Allegheny	Slight	Slight	Slight	Severe	Shortleaf pine	80	130	Eastern white pine, yellow poplar, black walnut, shortleaf pine, white oak, ash, northern red oak.
					Yellow poplar	93	95	
					Virginia pine	72	112	
					Sugar maple	---	---	
					White ash	---	---	
					Northern red oak	---	---	
					American elm	---	---	
					Red maple	---	---	
					Pignut hickory	---	---	
					Black oak	78	60	
					White oak	70	52	
					Eastern redcedar	---	---	
					Black cherry	---	---	
Cotaco	Slight	Slight	Slight	Severe	Virginia pine	81	123	Eastern white pine, yellow poplar, white oak, sweetgum, shortleaf pine.
					Yellow poplar	95	98	
					Black oak	87	69	
					Sweet birch	---	---	
					White oak	83	65	
ArF**:								
Alticrest (cool aspect)	Severe	Severe	Moderate	Moderate	Black oak	70	52	Shortleaf pine, eastern white pine.
					Virginia pine	70	109	
					Shortleaf pine	70	108	
					Chestnut oak	64	47	
					Hickory	---	---	

See footnotes at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Management concerns				Potential productivity			Trees to plant
	Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Common trees	Site index	Volume*	
ArF**:								
Ramsey (cool aspect)	Severe	Severe	Severe	Slight	Black oak	69	51	Eastern white pine, shortleaf pine, white oak, yellow poplar.
					Chestnut oak	67	49	
					White oak	72	54	
					Yellow poplar	92	93	
					Hickory	---	---	
					Red maple	---	---	
					American beech	---	---	
Rock outcrop.								
ArF**:								
Alticrest (warm aspect)	Severe	Severe	Slight	Moderate	Black oak	58	41	Shortleaf pine, Virginia pine, white oak.
					Virginia pine	60	91	
					Shortleaf pine	60	58	
					Chestnut oak	54	38	
					Scarlet oak	---	---	
Ramsey (warm aspect)	Severe	Severe	Moderate	Slight	Chestnut oak	60	43	Shortleaf pine, Virginia pine, white oak.
					Shortleaf pine	54	76	
					Black oak	60	43	
					Red maple	---	---	
					White oak	---	---	
					Scarlet oak	---	---	
					Virginia pine	54	77	
					Post oak	43	28	
Rock outcrop.								
BeF**:								
Bethesda	Severe	Severe	Moderate	Moderate	Loblolly pine	69	91	Eastern white pine, black locust, white oak, shortleaf pine.
					Eastern cottonwood	---	---	
					Black oak	73	55	
					Black locust	92	---	
Fairpoint	Severe	Severe	Moderate	Moderate	Yellow poplar	94	97	Eastern white pine, black locust, yellow poplar, shortleaf pine.
					Loblolly pine	82	114	
					Black locust	---	---	
					Shortleaf pine	---	---	
BsF**:								
Bledsoe (cool aspect)	Severe	Severe	Slight	Severe	Yellow poplar	104	114	Yellow poplar, white ash, white oak, northern red oak.
					Black walnut	---	---	
					White ash	---	---	
					Slippery elm	---	---	
					Sugar maple	---	---	
					Black cherry	---	---	
Berks (cool aspect)	Moderate	Severe	Slight	Moderate	Scarlet oak	75	57	Eastern white pine, yellow poplar, shortleaf pine, white oak.
					Black oak	80	62	
					Virginia pine	58	86	
					White oak	70	52	
					Hickory	---	---	
					Yellow poplar	78	104	
					Red maple	---	---	
Rock outcrop.								

See footnotes at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Management concerns				Potential productivity			Trees to plant
	Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Common trees	Site index	Volume*	
BsF**:								
Bledsoe (warm aspect)	Severe	Severe	Moderate	Severe	Yellow poplar	84	79	White oak, white ash.
					Virginia pine	65	100	
					Pignut hickory	74	---	
					Shagbark hickory	---	---	
					Sassafras	---	---	
					Black locust	---	---	
					Blackgum	---	---	
Berks (warm aspect)	Moderate	Severe	Moderate	Moderate	Scarlet oak	58	41	Virginia pine, shortleaf pine, white oak.
					Black oak	71	53	
					Virginia pine	52	73	
					Shortleaf pine	---	---	
					Hickory	---	---	
					White oak	63	46	
Rock outcrop.								
CkF**:								
Carpenter (cool aspect)	Severe	Severe	Slight	Severe	White oak	71	53	Yellow poplar, black walnut, white oak, northern red oak, eastern white pine, shortleaf pine, white ash.
					Black oak	73	55	
					Scarlet oak	75	57	
					Chestnut oak	70	52	
					Hickory	---	---	
					Northern red oak	70	52	
					Virginia pine	74	114	
Bledsoe (cool aspect)	Severe	Severe	Slight	Severe	Yellow poplar	104	114	Northern red oak, white oak, white ash.
					Black walnut	---	---	
					White ash	---	---	
					Slippery elm	---	---	
					Sugar maple	---	---	
					Black cherry	---	---	
Berks (cool aspect)	Moderate	Severe	Slight	Moderate	Scarlet oak	75	57	Eastern white pine, yellow poplar, shortleaf pine, white oak.
					Black oak	80	62	
					Virginia pine	58	86	
					White oak	70	52	
					Hickory	---	---	
					Yellow poplar	98	104	
CkF**:								
Carpenter (warm aspect)	Severe	Severe	Moderate	Severe	White oak	58	41	Shortleaf pine, white oak.
					Virginia pine	64	98	
					Black oak	---	---	
					Chestnut oak	58	41	
					Hickory	---	---	
					Scarlet oak	---	---	
Bledsoe (warm aspect)	Severe	Severe	Moderate	Severe	Yellow poplar	84	79	White oak, white ash.
					Virginia pine	65	100	
					Pignut hickory	74	---	
					Shagbark hickory	---	---	
					Sassafras	---	---	
					Black locust	---	---	
					Blackgum	---	---	

See footnotes at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Management concerns				Potential productivity			Trees to plant
	Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Common trees	Site index	Volume*	
CkF**:								
Berks (warm aspect)	Moderate	Severe	Moderate	Moderate	Scarlet oak	58	41	Virginia pine, shortleaf pine, white oak.
					Black oak	71	53	
					Virginia pine	52	73	
					Chestnut oak	---	---	
					Shortleaf pine	---	---	
					Hickory	---	---	
CoA, CoB Cotaco	Slight	Slight	Slight	Severe	Virginia pine	81	123	Eastern white pine, yellow poplar, white oak, sweetgum, shortleaf pine.
					Yellow poplar	95	98	
					Black oak	87	69	
					Sweet birch	---	---	
					White oak	83	65	
FaE2 Faywood	Moderate	Moderate	Slight	Moderate	Northern red oak	74	56	White oak, eastern white pine, white ash, northern red oak.
					Black oak	75	57	
					White oak	73	55	
					Hickory	---	---	
					White ash	65	---	
					Chinkapin oak	---	---	
					Sugar maple	---	---	
					Southern red oak	---	---	
GnC Gilpin	Slight	Slight	Slight	Moderate	Black oak	80	62	Eastern white pine, white oak, yellow poplar, shortleaf pine.
					Yellow poplar	95	98	
					Eastern white pine	96	178	
					Shortleaf pine	---	---	
					White oak	---	---	
					Chestnut oak	73	55	
GnD Gilpin (cool aspect)	Moderate	Moderate	Slight	Moderate	Black oak	80	62	Eastern white pine, white oak, yellow poplar, shortleaf pine.
					Yellow poplar	95	98	
					Eastern white pine	96	178	
					Shortleaf pine	---	---	
					White oak	---	---	
					Chestnut oak	73	55	
GnD Gilpin (warm aspect)	Moderate	Moderate	Moderate	Moderate	Black oak	74	56	Shortleaf pine, white oak.
					White oak	61	44	
					Scarlet oak	72	54	
					Chestnut oak	68	50	
					Shortleaf pine	60	88	
					Virginia pine	---	---	
GpE**:								
Gilpin (cool aspect)	Moderate	Moderate	Slight	Moderate	Black oak	80	62	Eastern white pine, white oak, yellow poplar, shortleaf pine.
					Yellow poplar	95	98	
					Eastern white pine	96	178	
					Shortleaf pine	---	---	
					White oak	---	---	
					Chestnut oak	73	55	
Shelocta (cool aspect)	Moderate	Moderate	Slight	Severe	White oak	79	61	Shortleaf pine, white oak, eastern white pine, yellow poplar, black walnut, white ash, northern red oak.
					Yellow poplar	102	110	
					American beech	---	---	
					Scarlet oak	70	52	
					Red maple	---	---	
					Black oak	79	61	
					Shortleaf pine	77	124	

See footnotes at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Management concerns				Potential productivity			Trees to plant
	Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Common trees	Site index	Volume*	
GpE**:								
Gilpin, (warm aspect)	Moderate	Moderate	Moderate	Moderate	Black oak	74	56	Shortleaf pine, white oak.
					White oak	61	44	
					Scarlet oak	72	54	
					Chestnut oak	68	50	
					Shortleaf pine	60	88	
					Virginia pine	---	---	
Shelocta, (warm aspect)	Moderate	Moderate	Moderate	Severe	White oak	65	52	Eastern white pine, shortleaf pine, white oak.
					Scarlet oak	68	50	
					Yellow poplar	92	93	
					Red maple	81	---	
					Chestnut oak	68	50	
GrF**:								
Gilpin, (cool aspect)	Severe	Severe	Slight	Moderate	Black oak	80	62	Japanese larch, Virginia pine, eastern white pine, black cherry, yellow poplar.
					Yellow poplar	95	98	
					White oak	75	57	
					White pine	96	---	
Hazleton, (cool aspect)	Severe	Severe	Slight	Moderate	Northern red oak	70	52	Eastern white pine, shortleaf pine, white oak.
					Yellow poplar	80	71	
					Black oak	---	---	
					White oak	---	---	
					Hickory	---	---	
Rock outcrop.								
GrF**:								
Gilpin, (warm aspect)	Severe	Severe	Moderate	Moderate	Black oak	74	56	Shortleaf pine, white oak.
					White oak	61	44	
					Scarlet oak	72	54	
					Chestnut oak	68	50	
Hazleton, (warm aspect)	Severe	Severe	Moderate	Moderate	Black oak	60	43	Shortleaf pine, white oak.
					White oak	57	40	
					Hickory	---	---	
					Shortleaf pine	---	---	
Rock outcrop.								
Gs, Grigsby	Slight	Slight	Moderate	Severe	Yellow poplar	110	124	Yellow poplar, black walnut, eastern white pine, shortleaf pine, white oak, northern red oak, white ash.
					Northern red oak	85	67	
					White oak	85	67	
					Black walnut	---	---	
					American sycamore	---	---	
					Sweetgum	---	---	
					Red maple	---	---	
					Hickory	---	---	

See footnotes at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Management concerns				Potential productivity			Trees to plant
	Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Common trees	Site index	Volume*	
Gu**:								
Grigsby	Slight	Slight	Moderate	Severe	Yellow poplar	110	124	Yellow poplar, black walnut, eastern white pine, shortleaf pine, white oak, northern red oak, white ash.
					Northern red oak	85	67	
					White oak	85	67	
					Black walnut	---	---	
					American sycamore	---	---	
					Sweetgum	---	---	
					Red maple	---	---	
					Hickory	---	---	
Orrville	Slight	Moderate	Moderate	Severe	Yellow poplar	90	90	Eastern white pine, yellow poplar, green ash, white oak, American sycamore, sweetgum.
					Sugar maple	---	---	
					Black willow	---	---	
					River birch	---	---	
					White oak	---	---	
					Green ash	---	---	
					Black cherry	---	---	
					American sycamore	---	---	
					Red maple	---	---	
					Boxelder	---	---	
Gy**:								
Grigsby	Slight	Slight	Moderate	Severe	Yellow poplar	110	124	Yellow poplar, black walnut, eastern white pine, shortleaf pine, white oak, northern red oak, white ash.
					Northern red oak	85	67	
					White oak	85	67	
					Black walnut	---	---	
					American sycamore	---	---	
					Sweetgum	---	---	
					Red maple	---	---	
					Hickory	---	---	
Skidmore	Slight	Slight	Moderate	Severe	Yellow poplar	103	112	Yellow poplar, white ash, eastern white pine, American sycamore.
					Sweetgum	---	---	
					American sycamore	---	---	
					River birch	---	---	
Morehead	Slight	Moderate	Moderate	Severe	Yellow poplar	82	75	Shortleaf pine, yellow poplar, sweetgum, eastern white pine, green ash.
					White oak	---	---	
					Virginia pine	---	---	
					Red maple	---	---	
					Pin oak	---	---	
					Black oak	---	---	
					River birch	---	---	
					Shortleaf pine	84	138	
HaF**:								
Helechawa (cool aspect)	Moderate	Severe	Moderate	Moderate	Scarlet oak	70	52	White oak, shortleaf pine.
					Chestnut oak	65	47	
					White oak	65	47	
					Virginia pine	65	100	

See footnotes at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Management concerns				Potential productivity			Trees to plant
	Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Common trees	Site index	Volume*	
HaF*:								
Faywood (cool aspect)	Severe	Severe	Slight	Moderate	Northern red oak	70	52	White oak, eastern white pine, white ash, northern red oak.
					Scarlet oak	72	54	
					White oak	60	43	
					Hickory	---	---	
					White ash	---	---	
					Chinkapin oak	---	---	
					Sugar maple	---	---	
					Southern red oak	---	---	
HaF**:								
Helechawa (warm aspect)	Moderate	Severe	Slight	Moderate	White oak	75	57	Yellow poplar, white oak, eastern white pine, shortleaf pine.
					Chestnut oak	---	---	
					Yellow poplar	85	81	
					Virginia pine	75	115	
					Cucumbertree	---	---	
					Eastern white pine	108	202	
Faywood (warm aspect)	Severe	Severe	Slight	Moderate	Northern red oak	74	56	White oak, eastern white pine, white ash, northern red oak.
					Scarlet oak	75	57	
					White oak	73	55	
					Hickory	---	---	
					White ash	65	---	
					Chinkapin oak	---	---	
					Sugar maple	---	---	
					Southern red oak	---	---	
HeF**:								
Helechawa (cool aspect)	Moderate	Severe	Severe	Moderate	Scarlet oak	70	52	White oak, shortleaf pine.
					Chestnut oak	65	47	
					White oak	65	47	
					Virginia pine	65	100	
Rock outcrop.								
HeF**:								
Helechawa (warm aspect)	Moderate	Severe	Slight	Moderate	White oak	75	57	Yellow poplar, white oak, eastern white pine, shortleaf pine.
					Chestnut oak	---	---	
					Yellow poplar	85	81	
					Virginia pine	75	115	
					Cucumbertree	---	---	
					Eastern white pine	108	202	
Rock outcrop.								
JaB--Jessietown	Slight	Moderate	Slight	Severe	Virginia pine	62	95	Virginia pine, white oak, shortleaf pine.
					White oak	60	43	
					Hickory	---	---	
					Black oak	62	45	
					Red maple	---	---	
					Eastern redcedar	---	---	
					Chestnut oak	58	41	
JeD3--Jessietown	Moderate	Moderate	Moderate	Severe	Virginia pine	55	80	Virginia pine, shortleaf pine.
					White oak	---	---	
					Scarlet oak	---	---	
					Hickory	---	---	

See footnotes at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Management concerns				Potential productivity			Trees to plant
	Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Common trees	Site index	Volume*	
JoF**:								
Jessietown (cool aspect)	Severe	Severe	Slight	Severe	Virginia pine	62	95	Virginia pine, white oak, shortleaf pine.
					White oak	60	43	
					Hickory	---	---	
					Black oak	62	45	
					Red maple	---	---	
					Eastern redcedar	---	---	
					Chestnut oak	58	41	
Muse (cool aspect)	Severe	Severe	Slight	Severe	White oak	62	45	Shortleaf pine, white oak, eastern white pine, yellow poplar, northern red oak.
					Virginia pine	64	98	
					Red maple	---	---	
					Yellow poplar	110	124	
					Black oak	58	41	
					Hickory	---	---	
Rohan (cool aspect)	Moderate	Moderate	Moderate	Slight	Chestnut oak	67	43	Virginia pine, shortleaf pine.
					Virginia pine	58	94	
					Scarlet oak	56	43	
					White oak	---	---	
					Shortleaf pine	---	---	
JoF**:								
Jessietown (warm aspect)	Moderate	Moderate	Slight	Severe	Virginia pine	62	95	Virginia pine, white oak, shortleaf pine.
					White oak	60	43	
					Hickory	---	---	
					Black oak	62	45	
					Red maple	---	---	
					Eastern redcedar	---	---	
					Chestnut oak	58	41	
Muse (warm aspect)	Moderate	Moderate	Slight	Severe	Shortleaf pine	79	128	Shortleaf pine, white oak, eastern white pine, yellow poplar, northern red oak.
					Virginia pine	64	98	
					White oak	59	43	
					Red maple	---	---	
					Yellow poplar	---	---	
					Black oak	56	40	
					Chestnut oak	---	---	
Rohan (warm aspect)	Moderate	Moderate	Moderate	Slight	Chestnut oak	52	41	Virginia pine, shortleaf pine.
					Scarlet oak	53	41	
					Hickory	---	---	
					Black oak	---	---	
					Virginia pine	52	84	
KnA Knowlton	Slight	Moderate	Moderate	Severe	Sweetgum	90	68	Sweetgum, pin oak, green ash, American sycamore.
					Black oak	---	---	
					Pin oak	90	68	
					Red maple	---	---	
					White oak	74	54	
					Boxelder	---	---	
					Slippery elm	---	---	
					American sycamore	---	---	

See footnotes at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Management concerns				Potential productivity			Trees to plant
	Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Common trees	Site index	Volume*	
LaD---------- Latham (cool aspect)	Severe	Moderate	Slight	Moderate	White oak----------	64	47	Eastern white pine, shortleaf pine, white oak.
					Black oak----------	69	51	
					Virginia pine-------	72	112	
					Scarlet oak---------	74	56	
					Shortleaf pine------	75	120	
					Chestnut oak--------	60	43	
					Yellow poplar-------	105	115	
LaD---------- Latham (warm aspect)	Severe	Moderate	Moderate	Moderate	White oak----------	60	43	White oak, shortleaf pine.
					Black oak----------	70	54	
					Virginia pine-------	---	---	
					Scarlet oak---------	69	51	
					Shortleaf pine------	56	80	
					Pitch pine----------	55	---	
					Chestnut oak--------	---	---	
LeF**:								
Latham--------- (cool aspect)	Severe	Severe	Slight	Moderate	White oak----------	64	47	Eastern white pine, white oak, shortleaf pine.
					Black oak----------	69	51	
					Virginia pine-------	72	112	
					Scarlet oak---------	74	56	
					Shortleaf pine------	56	80	
					Pitch pine----------	55	---	
					Chestnut oak--------	60	43	
					Yellow poplar-------	105	115	
Gilpin--------- (cool aspect)	Severe	Severe	Slight	Moderate	Black oak----------	80	62	Eastern white pine, yellow poplar, shortleaf pine.
					Yellow poplar-------	90	90	
					White oak----------	75	57	
					Scarlet oak---------	76	58	
					Chestnut oak--------	80	62	
					Shortleaf pine------	70	110	
Alticrest------ (cool aspect)	Severe	Severe	Slight	Moderate	Black oak----------	70	52	Shortleaf pine, Virginia pine, loblolly pine, eastern white pine.
					Virginia pine-------	70	109	
					Shortleaf pine------	70	108	
					Chestnut oak--------	64	47	
					Hickory-------------	---	---	
LeF**:								
Latham--------- (warm aspect)	Severe	Severe	Moderate	Moderate	White oak----------	60	43	White oak, shortleaf pine.
					Black oak----------	72	54	
					Virginia pine-------	59	88	
					Chestnut oak--------	---	---	
					Shortleaf pine------	56	80	
					Pitch pine----------	55	---	
Gilpin--------- (warm aspect)	Moderate	Moderate	Slight	Moderate	Black oak----------	80	62	Shortleaf pine, white oak.
					Yellow poplar-------	90	90	
					White oak----------	75	57	
					Scarlet oak---------	76	58	
					Chestnut oak--------	80	62	
					Shortleaf pine------	60	88	

See footnotes at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Management concerns				Potential productivity			Trees to plant
	Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Common trees	Site index	Volume*	
LeF**:								
Alticrest (warm aspect)	Severe	Severe	Slight	Moderate	Black oak	58	41	Shortleaf pine, Virginia pine, white oak.
					Virginia pine	60	91	
					Shortleaf pine	60	88	
					Chestnut oak	54	38	
					Scarlet oak	---	---	
LgE**:								
Latham (cool aspect)	Severe	Moderate	Slight	Moderate	White oak	64	47	Eastern white pine, shortleaf pine, white oak.
					Black oak	69	51	
					Virginia pine	72	112	
					Scarlet oak	74	56	
					Shortleaf pine	75	120	
					Yellow poplar	105	115	
Gilpin (cool aspect)	Moderate	Moderate	Slight	Moderate	Black oak	80	62	Northern red oak, eastern white pine, shortleaf pine, yellow poplar, white oak.
					Yellow poplar	90	90	
					White oak	75	57	
					Scarlet oak	76	58	
					Chestnut oak	80	62	
					Shortleaf pine	70	110	
LgE**:								
Latham (warm aspect)	Severe	Moderate	Moderate	Moderate	White oak	60	43	White oak, shortleaf pine.
					Black oak	72	54	
					Virginia pine	59	88	
					Scarlet oak	69	51	
					Shortleaf pine	56	80	
					Pitch pine	55	---	
					Chestnut oak	---	---	
Gilpin (warm aspect)	Moderate	Moderate	Moderate	Moderate	Black oak	74	56	Shortleaf pine, white oak.
					White oak	64	44	
					Scarlet oak	72	54	
					Chestnut oak	68	50	
					Shortleaf pine	60	88	
					Virginia pine	---	---	
					Northern red oak	69	51	
LoD Lily	Moderate	Moderate	Slight	Moderate	Shortleaf pine	63	95	Shortleaf pine, eastern white pine, white oak, northern red oak.
					Virginia pine	72	112	
					Black oak	80	62	
					White oak	69	51	
					Chestnut oak	76	58	
					Southern red oak	65	47	
					Scarlet oak	73	55	
LyE**:								
Lily (cool aspect)	Moderate	Moderate	Slight	Moderate	Shortleaf pine	63	95	Shortleaf pine, white oak, eastern white pine, northern red oak.
					Virginia pine	72	112	
					Scarlet oak	73	55	
					White oak	69	51	
					Black oak	80	62	
					Chestnut oak	76	58	

See footnotes at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Management concerns				Potential productivity			Trees to plant
	Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Common trees	Site index	Volume*	
LyE**:								
Gilpin (cool aspect)	Moderate	Moderate	Slight	Moderate	Black oak	80	62	Northern red oak, eastern white pine, shortleaf pine, yellow poplar, white oak.
					Yellow poplar	95	90	
					White oak	75	57	
					Scarlet oak	76	58	
					Chestnut oak	80	62	
Rigley (cool aspect)	Moderate	Moderate	Slight	Moderate	Shortleaf pine	70	110	White oak, northern red oak, yellow poplar, eastern white pine, shortleaf pine.
					White oak	74	56	
					Black oak	80	62	
					Northern red oak	---	---	
					Yellow poplar	94	86	
					American beech	---	---	
					Hickory	---	---	
LyE**:								
Lily (warm aspect)	Moderate	Moderate	Slight	Moderate	Shortleaf pine	63	95	Shortleaf pine, white oak, eastern white pine, northern red oak.
					Virginia pine	72	112	
					Black oak	80	62	
					White oak	69	51	
					Chestnut oak	76	58	
					Scarlet oak	73	55	
Gilpin (warm aspect)	Moderate	Moderate	Moderate	Moderate	Black oak	74	56	Shortleaf pine, white oak.
					White oak	61	44	
					Scarlet oak	72	54	
					Chestnut oak	68	50	
					Shortleaf pine	60	88	
					Virginia pine	---	---	
					Northern red oak	69	51	
Rigley (warm aspect)	Moderate	Moderate	Moderate	Moderate	White oak	61	44	White oak, shortleaf pine.
					Black oak	74	56	
					Scarlet oak	64	47	
					American beech	---	---	
					Hickory	---	---	
					Shortleaf pine	---	---	
Ne Newark	Slight	Moderate	Moderate	Severe	Pin oak	100	98	Sweetgum, American sycamore, green ash.
					Sweetgum	85	93	
					Green ash	---	---	
Or Orrville	Slight	Moderate	Moderate	Severe	Yellow poplar	90	90	Eastern white pine, yellow poplar, green ash, white oak.
					Sugar maple	---	---	
					White oak	---	---	
					Green ash	---	---	
					Black cherry	---	---	
					Black willow	---	---	
					American sycamore	---	---	
					River birch	---	---	
					Red maple	---	---	

See footnotes at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Management concerns				Potential productivity			Trees to plant
	Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Common trees	Site index	Volume*	
RdB---------- Rowdy	Slight	Slight	Slight	Severe	Yellow poplar-------	100	107	Yellow poplar, black walnut, eastern white pine, shortleaf pine, white ash, white oak, northern red oak.
					American sycamore---	---	---	
					Black walnut--------	---	---	
					River birch---------	---	---	
					White oak-----------	---	---	
					American elm--------	---	---	
					Sweetgum------------	---	---	
					Boxelder------------	---	---	
RgA**:								
Rowdy----------	Slight	Slight	Slight	Severe	Yellow poplar-------	100	107	Yellow poplar, black walnut, eastern white pine, shortleaf pine, white ash, white oak, northern red oak.
					American sycamore---	---	---	
					Black walnut--------	---	---	
					River birch---------	---	---	
					White oak-----------	---	---	
					American elm--------	---	---	
					Sweetgum------------	---	---	
					Boxelder------------	---	---	
Grigsby--------	Slight	Slight	Moderate	Severe	Yellow poplar-------	110	124	Yellow poplar, black walnut, eastern white pine, shortleaf pine, white oak, northern red oak, white ash.
					Northern red oak----	85	67	
					White oak-----------	85	67	
					Black walnut--------	---	---	
					American sycamore---	---	---	
					Sweetgum------------	---	---	
					Red maple-----------	---	---	
					Hickory-------------	---	---	
SaF**:								
Shelocta------- (cool aspect)	Severe	Severe	Slight	Severe	White oak-----------	79	61	Shortleaf pine, white oak, eastern white pine, yellow poplar, black walnut, white ash, northern red oak.
					Shortleaf pine------	77	124	
					Black oak-----------	79	61	
					Yellow poplar-------	102	110	
					American beech------	---	---	
					Red maple-----------	---	---	
					Cucumbertree--------	---	---	
Gilpin--------- (cool aspect)	Severe	Severe	Slight	Moderate	Black oak-----------	80	62	Eastern white pine, shortleaf pine, yellow poplar, white oak.
					Yellow poplar-------	90	90	
					White oak-----------	75	57	
					Scarlet oak---------	76	58	
					Chestnut oak--------	80	62	
					Shortleaf pine------	70	110	
SaF**:								
Shelocta------- (warm aspect)	Severe	Severe	Moderate	Severe	White oak-----------	65	47	Eastern white pine, shortleaf pine, white oak.
					Yellow poplar-------	92	93	
					Black oak-----------	70	52	
					American beech------	---	---	
					Red maple-----------	81	---	
					Scarlet oak---------	68	50	
					Blackgum------------	---	---	

See footnotes at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Management concerns				Potential productivity			Trees to plant
	Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Common trees	Site index	Volume*	
SaF**:								
Gilpin (warm aspect)	Severe	Severe	Moderate	Moderate	Black oak	74	56	Shortleaf pine, white oak.
					White oak	61	44	
					Scarlet oak	72	54	
					Chestnut oak	68	50	
					Shortleaf pine	60	88	
SeE**:								
Shrouts	Moderate	Moderate	Moderate	Moderate	Virginia pine	60	91	Virginia pine, white oak, eastern redcedar.
					Scarlet oak	60	43	
					Black oak	60	43	
					Eastern redcedar	45	52	
					White oak	---	---	
Woolper	Moderate	Moderate	Moderate	Moderate	Black oak	75	57	Yellow poplar, white ash, white oak, northern red oak, eastern white pine.
					Chinkapin oak	71	43	
					White ash	---	---	
					Hickory	---	---	
					Sugar maple	---	---	
					White oak	---	---	
					Yellow buckeye	---	---	
					Black walnut	---	---	
WbD2, WbE2 Westbend	Moderate	Moderate	Moderate	Severe	Black oak	60	43	Eastern white pine, shortleaf pine, white oak.
					White oak	---	---	
					Scarlet oak	---	---	
					Virginia pine	---	---	

* Volume is the yield in cubic feet per acre per year calculated at the age of culmination of mean annual increment for fully stocked natural stands.

** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--RECREATIONAL DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the "Glossary." See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
AgA Allegheny	Severe: flooding.	Slight	Moderate: small stones.	Slight	Slight.
AgB Allegheny	Severe: flooding.	Slight	Moderate: slope, small stones.	Slight	Slight.
AgC2 Allegheny	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
AgD3 Allegheny	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
AoB*: Allegheny	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
Cotaco	Moderate: wetness.	Moderate: wetness.	Moderate: slope, small stones.	Severe: erodes easily.	Moderate: wetness.
ArF*: Alticrest	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Ramsey	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.
Rock outcrop.					
BeF*: Bethesda	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: droughty, slope.
Fairpoint	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope.	Severe: small stones, droughty, slope.
BsF*: Bledsoe	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
Berks	Severe: slope, small stones.	Severe: small stones, slope.	Severe: slope, small stones.	Severe: slope.	Severe: small stones, slope.
Rock outcrop.					
CkF*: Carpenter	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
CkF*:					
Bledsoe	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
Berks	Severe: slope, small stones.	Severe: small stones, slope.	Severe: slope, small stones.	Severe: slope.	Severe: small stones, slope.
CoA	Moderate: wetness.	Moderate: wetness.	Moderate: small stones, wetness.	Severe: erodes easily.	Moderate: wetness.
Cotaco					
CoB	Moderate: wetness.	Moderate: wetness.	Moderate: slope, small stones.	Severe: erodes easily.	Moderate: wetness.
Cotaco					
FaE2	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
Faywood					
GnC	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope, thin layer.
Gilpin					
GnD	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Gilpin					
GpE*:					
Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Shelocta	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
GrF*:					
Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Hazleton	Severe: slope.	Severe: slope.	Severe: small stones, slope.	Severe: slope.	Severe: slope.
Rock outcrop.					
Gs	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
Grigsby					
Gu*:					
Grigsby	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
Orrville	Severe: flooding, wetness.	Moderate: flooding, wetness.	Severe: wetness, flooding.	Moderate: wetness, flooding.	Severe: flooding.
Gy*:					
Grigsby	Severe: flooding.	Slight	Moderate: small stones, flooding.	Slight	Moderate: flooding.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Gy*:					
Skidmore	Severe: flooding, small stones.	Severe: small stones.	Severe: small stones.	Slight	Severe: small stones.
Morehead	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
HaF*:					
Helechawa	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Faywood	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
HeF*:					
Helechawa	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop.					
JaB--- Jessietown	Slight	Slight	Moderate: slope, depth to rock.	Severe: erodes easily.	Moderate: depth to rock.
JeD3--- Jessietown	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
JoF*:					
Jessietown	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
Muse	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope, erodes easily.	Severe: slope.
Rohan	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: slope, depth to rock.
KnA--- Knowlton	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
LaD--- Latham	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
LeF*:					
Latham	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Alticrest	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
LgE*:					
Latham	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
LoD	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Lily					
LyE*:					
Lily	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rigley	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Ne	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness, erodes easily.	Severe: wetness, flooding.
Newark					
Or	Severe: flooding, wetness.	Moderate: flooding, wetness.	Severe: wetness, flooding.	Moderate: wetness, flooding.	Severe: flooding.
Orrville					
Pt*.					
Pits, quarries					
RdB	Slight	Slight	Moderate: slope.	Slight	Slight.
Rowdy					
RgA*:					
Rowdy	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: flooding.
Grigsby	Severe: flooding.	Slight	Moderate: small stones, flooding.	Slight	Moderate: flooding.
SaF*:					
Shelocta	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
SeE*:					
Shrouts	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: slope.	Severe: slope.
Woolper	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
WbD2 Westbend	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
WbE2 Westbend	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--WILDLIFE HABITAT

(See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
AgA---- Allegheny	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
AgB---- Allegheny	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
AgC2---- Allegheny	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
AgD3---- Allegheny	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
AoB*:										
Allegheny----	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Cotaco----	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
ArF*:										
Alticrest----	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Ramsey----	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.
Rock outcrop.										
BeF*:										
Bethesda----	Very poor.	Very poor.	Poor	Poor	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.
Fairpoint----	Very poor.	Very poor.	Poor	Poor	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.
BsF*:										
Bledsoe----	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Berks----	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Rock outcrop.										
CkF*:										
Carpenter----	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Bledsoe----	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Berks----	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
CoA---- Cotaco	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
CoB---------- Cotaco	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
FaE2---------- Faywood	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
GnC---------- Gilpin	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
GnD---------- Gilpin	Poor	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
GpE*: Gilpin----------	Very poor.	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Shelocta----------	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
GrF*: Gilpin----------	Very poor.	Poor	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Hazleton----------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
Rock outcrop.										
Gs---------- Grigsby	Fair	Fair	Fair	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
Gu*: Grigsby----------	Fair	Fair	Fair	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
Orrville----------	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Gy*: Grigsby----------	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Skidmore----------	Fair	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
Morehead----------	Fair	Good	Good	Good	Good	Fair	Poor	Good	Good	Poor.
HaF*: Helechawa---------	Very poor.	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Faywood----------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
HeF*: Helechawa---------	Very poor.	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Rock outcrop.										

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
JaB---- Jessietown	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
JeD3---- Jessietown	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
JoF*:										
Jessietown----	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Muse----	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Rohan----	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.
KnA---- Knowlton	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
LaD---- Latham	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
LeF*:										
Latham----	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Gilpin----	Very poor.	Poor	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Alticrest----	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
LgE*:										
Latham----	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Gilpin----	Very poor.	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
LoD---- Lily	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
LyE*:										
Lily----	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Gilpin----	Very poor.	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Rigley----	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Ne---- Newark	Poor	Fair	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.
Or---- Orrville	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Pt*. Pits, quarries										

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
RdB---------- Rowdy	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
RgA*:										
Rowdy----------	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Grigsby----------	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
SaF*:										
Shelocta----------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Gilpin----------	Very poor.	Poor	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
SeE*:										
Shrouts----------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Woolper----------	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
WbD2, WbE2--------- Westbend	Very poor.	Fair	Good	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 10.--BUILDING SITE DEVELOPMENT

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

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
AgA, AgB Allegheny	Slight	Slight	Slight	Slight	Slight	Slight.
AgC2 Allegheny	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.
AgD3 Allegheny	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
AoB*: Allegheny	Slight	Slight	Slight	Moderate: slope.	Slight	Slight.
Cotaco	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness, slope.	Moderate: wetness.	Moderate: wetness.
ArF*: Alticrest	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
Ramsey	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.
Rock outcrop.						
BeF*: Bethesda	Severe: slope.	Severe: slope, unstable fill.	Severe: slope, unstable fill.	Severe: slope, unstable fill.	Severe: slope, unstable fill.	Severe: droughty, slope.
Fairpoint	Severe: slope.	Severe: slope, unstable fill.	Severe: slope, unstable fill.	Severe: slope, unstable fill.	Severe: slope, unstable fill.	Severe: small stones, droughty, slope.
BsF*: Bledsoe	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, low strength.	Severe: slope.
Berks	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, slope.
Rock outcrop.						
CkF*: Carpenter	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
CkF*:						
Bledsoe	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, low strength.	Severe: slope.
Berks	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, slope.
CoA Cotaco	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
CoB Cotaco	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness, slope.	Moderate: wetness.	Moderate: wetness.
FaE2 Faywood	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, low strength.	Severe: slope.
GnC Gilpin	Moderate: slope, depth to rock.	Moderate: slope.	Moderate: slope, depth to rock.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope, thin layer.
GnD Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
GpE*:						
Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Shelocta	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
GrF*:						
Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Hazleton	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop.						
Gs Grigsby	Moderate: flooding, wetness.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
Gu*:						
Grigsby	Moderate: flooding, wetness.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
Orrville	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, frost action.	Severe: flooding.
Gy*:						
Grigsby	Moderate: flooding, wetness.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Gy*:						
Skidmore	Moderate: depth to rock, wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: small stones.
Morehead	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness.	Severe: wetness.
HaF*:						
Helechawa	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Faywood	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, low strength.	Severe: slope.
HeF*:						
Helechawa	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop.						
JaB--- Jessietown	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: slope, depth to rock.	Severe: low strength.	Moderate: depth to rock.
JeD3--- Jessietown	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
JoF*:						
Jessietown	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Muse	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Rohan	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.
KnA--- Knowlton	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness.	Severe: wetness.
LaD--- Latham	Severe: wetness, slope, slippage.	Severe: shrink-swell, slope, slippage.	Severe: wetness, slope, slippage.	Severe: shrink-swell, slope, slippage.	Severe: shrink-swell, low strength, slope.	Severe: slope.
LeF*:						
Latham	Severe: wetness, slope, slippage.	Severe: shrink-swell, slope, slippage.	Severe: wetness, slope, slippage.	Severe: shrink-swell, slope, slippage.	Severe: shrink-swell, low strength, slope.	Severe: slope.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
LeF*:						
Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Alticrest	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
LgE*:						
Latham	Severe: wetness, slope, slippage.	Severe: shrink-swell, slope, slippage.	Severe: wetness, slope, slippage.	Severe: shrink-swell, slope, slippage.	Severe: shrink-swell, low strength, slope.	Severe: slope.
Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
LoD Lily	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
LyE*:						
Lily	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rigley	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Ne Newark	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.	Severe: wetness, flooding.
Or Orrville	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, frost action.	Severe: flooding.
Pt*. Pits, quarries						
RdB Rowdy	Slight	Slight	Slight	Moderate: slope.	Slight	Slight.
RgA*:						
Rowdy	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
Grigsby	Moderate: flooding, wetness.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
SaF*:						
Shelocta	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
SeE*:						
Shrouts	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Woolper	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
WbD2, WbE2 Westbend	Severe: slope, slippage.	Severe: slope, slippage.	Severe: slope, slippage.	Severe: slope, slippage.	Severe: low strength, slope, slippage.	Severe: slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--SANITARY FACILITIES

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

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
AgA Allegheny	Slight	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
AgB Allegheny	Slight	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
AgC2 Allegheny	Moderate: slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
AgD3 Allegheny	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
AoB*: Allegheny	Slight	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Cotaco	Severe: wetness.	Severe: seepage.	Severe: wetness.	Severe: seepage, wetness.	Poor: small stones.
ArF*: Alticrest	Severe: depth to rock, poor filter, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: depth to rock, slope.
Ramsey	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: depth to rock, slope.
Rock outcrop.					
BeF*: Bethesda	Severe: percs slowly, slope, unstable fill.	Severe: slope, unstable fill.	Severe: slope, unstable fill.	Severe: slope, unstable fill.	Poor: small stones, slope.
Fairpoint	Severe: percs slowly, slope, unstable fill.	Severe: slope, unstable fill.	Severe: slope, unstable fill.	Severe: slope, unstable fill.	Poor: small stones, slope.
BsF*: Bledsoe	Severe: percs slowly, slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: slope, too clayey, hard to pack.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
BsF*:					
Berks	Severe: slope, depth to rock.	Severe: slope, seepage, depth to rock.	Severe: slope, depth to rock, seepage.	Severe: slope, seepage, depth to rock.	Poor: slope, small stones, area reclaim.
Rock outcrop.					
CkF*:					
Carpenter	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: slope.
Bledsoe	Severe: percs slowly, slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: slope, too clayey, hard to pack.
Berks	Severe: slope, depth to rock.	Severe: slope, seepage, depth to rock.	Severe: slope, depth to rock, seepage.	Severe: slope, seepage, depth to rock.	Poor: slope, small stones, area reclaim.
CoA, CoB Cotaco	Severe: wetness.	Severe: seepage.	Severe: wetness.	Severe: seepage, wetness.	Poor: small stones.
FaE2 Faywood	Severe: slope, depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: slope, depth to rock, too clayey.	Severe: slope, depth to rock.	Poor: area reclaim, too clayey, hard to pack.
GnC Gilpin	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, thin layer.
GnD Gilpin	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Poor: slope, area reclaim, thin layer.
GpE*:					
Gilpin	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Poor: slope, area reclaim, thin layer.
Shelocta	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: slope.	Poor: small stones, slope.
GrF*:					
Gilpin	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Poor: slope, area reclaim, thin layer.
Hazleton	Severe: poor filter, slope.	Severe: slope, seepage.	Severe: slope, seepage, depth to rock.	Severe: slope, seepage.	Poor: slope, small stones.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
GrF*:					
Rock outcrop.					
Gs--Grigsby	Severe: flooding.	Severe: flooding, seepage.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage.	Good.
Gu*:					
Grigsby	Severe: flooding.	Severe: flooding, seepage.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage.	Good.
Orrville	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, wetness.	Poor: wetness.
Gy*:					
Grigsby	Severe: flooding.	Severe: flooding, seepage.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage.	Good.
Skidmore	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, depth to rock, seepage.	Severe: flooding, seepage, wetness.	Poor: seepage, small stones.
Morehead	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
HaF*:					
Helechawa	Severe: slope.	Severe: seepage, slope.	Severe: depth to rock, seepage, slope.	Severe: seepage, slope.	Poor: slope.
Faywood	Severe: slope, depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: slope, depth to rock, too clayey.	Severe: slope, depth to rock.	Poor: area reclaim, too clayey, hard to pack.
HeF*:					
Helechawa	Severe: slope.	Severe: seepage, slope.	Severe: depth to rock, seepage, slope.	Severe: seepage, slope.	Poor: slope.
Rock outcrop.					
JaB--Jessietown	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock.
JeD3--Jessietown	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
JoF*:					
Jessietown	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
Muse	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, wetness, slope.	Severe: slope.	Poor: too clayey, hard to pack, slope.
Rohan	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, small stones, slope.
KnA	Severe: wetness, percs slowly.	Moderate: seepage.	Severe: wetness.	Severe: wetness.	Poor: wetness.
LaD	Severe: thin layer, seepage, wetness.	Severe: seepage, slope, slippage.	Severe: seepage, wetness, slope.	Severe: slope, slippage.	Poor: area reclaim, too clayey, hard to pack.
LeF*:					
Latham	Severe: thin layer, seepage, wetness.	Severe: seepage, slope, slippage.	Severe: seepage, wetness, slope.	Severe: slope, slippage.	Poor: area reclaim, too clayey, hard to pack.
Gilpin	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Poor: slope, area reclaim, thin layer.
Alticrest	Severe: depth to rock, poor filter, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: depth to rock, slope.
LgE*:					
Latham	Severe: thin layer, seepage, wetness.	Severe: seepage, slope, slippage.	Severe: seepage, wetness, slope.	Severe: slope, slippage.	Poor: area reclaim, too clayey, hard to pack.
Gilpin	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Poor: slope, area reclaim, thin layer.
LoD	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: depth to rock, slope.
LyE*:					
Lily	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: depth to rock, slope.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
LyE*:					
Gilpin	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Poor: slope, area reclaim, thin layer.
Rigley	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: slope.
Ne	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
Newark					
Or	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, wetness.	Poor: wetness.
Orrville					
Pt*.					
Pits, quarries					
RdB	Slight	Severe: seepage.	Severe: seepage.	Slight	Fair: small stones.
Rowdy					
RgA*:					
Rowdy	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding, seepage.	Severe: flooding.	Fair: small stones.
Grigsby	Severe: flooding.	Severe: flooding, seepage.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage.	Good.
SaF*:					
Shelocta	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: slope.	Poor: small stones, slope.
Gilpin	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Poor: slope, area reclaim, thin layer.
SeE*:					
Shrouts	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: depth to rock, too clayey, hard to pack.
Woolper	Severe: slope, percs slowly.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: slope, too clayey, hard to pack.
WbD2, WbE2	Severe: percs slowly, slope, slippage.	Severe: slope, slippage.	Severe: depth to rock, slope, slippage.	Severe: slope, slippage.	Poor: slope.
Westbend					

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--CONSTRUCTION MATERIALS

(Some terms that describe restrictive soil features are defined in the "Glossary." See text for definitions of "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
AgA, AgB Allegheny	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.
AgC2 Allegheny	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim, slope.
AgD3 Allegheny	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
AoB*: Allegheny	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.
Cotaco	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
ArF*: Alticrest	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Ramsey	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
Rock outcrop.				
BeF*: Bethesda	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
Fairpoint	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
BsF*: Bledsoe	Poor: slope, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Berks	Poor: slope, area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
Rock outcrop.				

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
CkF*:				
Carpenter	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Bledsoe	Poor: slope, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Berks	Poor: slope, area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
CoA, CoB Cotaco	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
FaE2 Faywood	Poor: area reclaim, slope, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, thin layer, too clayey.
GnC Gilpin	Poor: thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
GnD Gilpin	Poor: thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
GpE*:				
Gilpin	Poor: thin layer, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
Shelocta	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
GrF*:				
Gilpin	Poor: thin layer, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
Hazleton	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
Rock outcrop.				
Gs Grigsby	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim.
Gu*:				
Grigsby	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim.
Orrville	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Gy*:				
Grigsby	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim.
Skidmore	Fair: area reclaim.	Improbable: small stones.	Probable	Poor: small stones, area reclaim.
Morehead	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
HaF*:				
Helechawa	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Faywood	Poor: area reclaim, slope, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, thin layer, too clayey.
HeF*:				
Helechawa	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Rock outcrop.				
JaB Jessietown	Poor: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: depth to rock, too clayey.
JeD3 Jessietown	Poor: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
JoF*:				
Jessietown	Poor: depth to rock, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Muse	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
Rohan	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
KnA Knowlton	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
LaD Latham	Poor: area reclaim, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
LeF*:				
Latham	Poor: area reclaim, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Gilpin	Poor: thin layer, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
Alticrest	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
LgE*:				
Latham	Poor: area reclaim, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
Gilpin	Poor: thin layer, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
LoD Lily	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
LyE*:				
Lily	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Gilpin	Poor: thin layer, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
Rigley	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Ne Newark	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Or Orrville	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.
Pt*. Pits, quarries				
RdB Rowdy	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.
RgA*:				
Rowdy	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.
Grigsby	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
SaF*:				
Shelocta	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Gilpin	Poor: thin layer, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
SeE*:				
Shrouts	Poor: depth to rock, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, slope.
Woolper	Poor: slope, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
WbD2 Westbend	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
WbE2 Westbend	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--WATER MANAGEMENT

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

Soil name and map symbol	Limitations for--		Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Terraces and diversions	Grassed waterways
AgA---------- Allegheny	Moderate: seepage.	Severe: piping.	Deep to water----	Favorable--------	Favorable.
AgB---------- Allegheny	Moderate: seepage, slope.	Severe: piping.	Deep to water----	Favorable--------	Favorable.
AgC2, AgD3-------- Allegheny	Severe: slope.	Severe: piping.	Deep to water----	Slope----------	Slope.
AoB*:					
Allegheny--------	Moderate: seepage, slope.	Severe: piping.	Deep to water----	Favorable--------	Favorable.
Cotaco----------	Moderate: seepage, slope.	Severe: piping, wetness.	Slope----------	Erodes easily, wetness.	Erodes easily, droughty.
ArF*:					
Alticrest--------	Severe: seepage, slope.	Severe: piping.	Deep to water----	Slope, depth to rock.	Slope, depth to rock.
Ramsey----------	Severe: depth to rock, slope.	Severe: piping.	Deep to water----	Slope, depth to rock.	Slope, droughty, depth to rock.
Rock outcrop.					
BeF*:					
Bethesda---------	Severe: slope.	Severe: seepage, piping.	Deep to water----	Slope, large stones, slippage.	Large stones, slope, droughty.
Fairpoint--------	Severe: slope.	Severe: piping.	Deep to water----	Slope, large stones, slippage.	Large stones, slope, droughty.
BsF*:					
Bledsoe----------	Severe: slope.	Moderate: hard to pack.	Deep to water----	Slope, erodes easily.	Slope, erodes easily.
Berks----------	Severe: seepage, slope.	Severe: seepage.	Deep to water----	Depth to rock, slope, large stones.	Droughty, depth to rock, slope.
Rock outcrop.					
CkF*:					
Carpenter--------	Severe: slope.	Severe: piping.	Deep to water----	Slope----------	Slope.
Bledsoe----------	Severe: slope.	Moderate: hard to pack.	Deep to water----	Slope, erodes easily.	Slope, erodes easily.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Terraces and diversions	Grassed waterways
CkF*:					
Berks	Severe: seepage, slope.	Severe: seepage.	Deep to water	Depth to rock, slope, large stones.	Droughty, depth to rock, slope.
CoA	Moderate: seepage.	Severe: piping, wetness.	Favorable	Erodes easily, wetness.	Erodes easily, droughty.
CoB	Moderate: seepage, slope.	Severe: piping, wetness.	Slope	Erodes easily, wetness.	Erodes easily, droughty.
FaE2	Severe: slope.	Severe: thin layer, hard to pack.	Deep to water	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
GnC, GnD	Severe: slope.	Severe: thin layer.	Deep to water	Slope, depth to rock, large stones.	Slope, depth to rock, large stones.
GpE*:					
Gilpin	Severe: slope.	Severe: thin layer.	Deep to water	Slope, depth to rock, large stones.	Slope, depth to rock, large stones.
Shelocta	Severe: seepage, slope.	Severe: piping.	Deep to water	Slope	Slope.
GrF*:					
Gilpin	Severe: slope.	Severe: thin layer.	Deep to water	Slope, depth to rock, large stones.	Slope, depth to rock, large stones.
Hazleton	Severe: seepage, slope.	Severe: seepage, large stones.	Deep to water	Slope, large stones, too sandy.	Large stones, slope, droughty.
Rock outcrop.					
Gs	Severe: seepage.	Severe: piping.	Deep to water	Favorable	Favorable.
Grigsby					
Gu*:					
Grigsby	Severe: seepage.	Severe: piping.	Deep to water	Favorable	Favorable.
Orrville	Moderate: seepage.	Severe: piping, wetness.	Flooding	Erodes easily, wetness.	Wetness, erodes easily.
Gy*:					
Grigsby	Severe: seepage.	Severe: piping.	Deep to water	Favorable	Favorable.
Skidmore	Severe: seepage.	Severe: seepage.	Deep to water	Large stones	Large stones, droughty.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Terraces and diversions	Grassed waterways
Gy*:					
Morehead	Moderate: seepage.	Severe: piping, wetness.	Favorable	Erodes easily, wetness.	Wetness, erodes easily.
HaF*:					
Helechawa	Severe: seepage, slope.	Severe: piping.	Deep to water	Slope, soil blowing.	Slope, droughty.
Faywood	Severe: slope.	Severe: thin layer, hard to pack.	Deep to water	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
HeF*:					
Helechawa	Severe: seepage, slope.	Severe: piping.	Deep to water	Slope, soil blowing.	Slope, droughty.
Rock outcrop.					
JaB--- Jessietown	Moderate: seepage, depth to rock, slope.	Severe: piping.	Deep to water	Depth to rock, erodes easily.	Erodes easily, depth to rock.
JeD3--- Jessietown	Severe: slope.	Severe: piping.	Deep to water	Slope, depth to rock.	Slope, depth to rock.
JoF*:					
Jessietown	Severe: slope.	Severe: piping.	Deep to water	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Muse	Severe: slope.	Moderate: hard to pack, thin layer.	Deep to water	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
Rohan	Severe: depth to rock, slope.	Severe: seepage.	Deep to water	Slope, depth to rock.	Slope, droughty.
KnA--- Knowlton	Slight	Severe: wetness.	Percs slowly	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
LaD--- Latham	Severe: slope.	Severe: thin layer.	Percs slowly, thin layer.	Slope, area reclaim, erodes easily.	Slope, erodes easily, area reclaim.
LeF*:					
Latham	Severe: slope.	Severe: thin layer.	Percs slowly, thin layer.	Slope, area reclaim, erodes easily.	Slope, erodes easily, area reclaim.
Gilpin	Severe: slope.	Severe: thin layer.	Deep to water	Slope, depth to rock, large stones.	Slope, depth to rock, large stones.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Terraces and diversions	Grassed waterways
LeF*:					
Alticrest	Severe: seepage, slope.	Severe: piping.	Deep to water	Slope, depth to rock.	Slope, depth to rock.
LgE*:					
Latham	Severe: slope.	Severe: thin layer.	Percs slowly, thin layer.	Slope, area reclaim, erodes easily.	Slope, erodes easily, area reclaim.
Gilpin	Severe: slope.	Severe: thin layer.	Deep to water	Slope, depth to rock, large stones.	Slope, depth to rock, large stones.
LoD	Severe:	Severe:	Deep to water	Slope,	Slope,
Lily	seepage.	piping.		depth to rock.	depth to rock.
LyE*:					
Lily	Severe: seepage, slope.	Severe: piping.	Deep to water	Slope, depth to rock.	Slope, depth to rock.
Gilpin	Severe: slope.	Severe: thin layer.	Deep to water	Slope, depth to rock, large stones.	Slope, depth to rock, large stones.
Rigley	Severe: seepage, slope.	Severe: piping.	Deep to water	Slope	Slope.
Ne	Moderate:	Severe:	Flooding	Erodes easily,	Wetness,
Newark	seepage.	piping, wetness.		wetness.	erodes easily.
Or	Moderate:	Severe:	Flooding	Erodes easily,	Wetness,
Orrville	seepage.	piping, wetness.		wetness.	erodes easily.
Pt*.					
Pits, quarries					
RdB	Moderate:	Severe:	Deep to water	Favorable	Favorable.
Rowdy	seepage.	piping.			
RgA*:					
Rowdy	Moderate: seepage.	Severe: piping.	Deep to water	Favorable	Favorable.
Grigsby	Severe: seepage.	Severe: piping.	Deep to water	Favorable	Favorable.
SaF*:					
Shelocta	Severe: seepage, slope.	Severe: piping.	Deep to water	Slope	Slope.
Gilpin	Severe: slope.	Severe: thin layer.	Deep to water	Slope, depth to rock, large stones.	Slope, depth to rock, large stones.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Terraces and diversions	Grassed waterways
SeE*:					
Shrouts	Severe: slope.	Severe: thin layer.	Deep to water	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Woolper	Severe: slope.	Severe: hard to pack.	Deep to water	Erodes easily, percs slowly, slope.	Slope, erodes easily, percs slowly.
WbD2, WbE2 Westbend	Severe: slope, slippage.	Moderate: thin layer, piping.	Deep to water, slippage.	Slope, erodes easily, slippage.	Slope, erodes easily.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--ENGINEERING INDEX PROPERTIES

(The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated)

Soil name and map symbol	Depth	USDA texture	Classification		Fragments	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	> 3 inches	4	10	40	200		
	In				Pct					Pct	
AgA, AgB, AgC2, AgD3--- Allegheny	0-6	Loam---	ML, CL	A-4	0	90-100	80-100	65-100	55-95	<35	NP-10
	6-60	Clay loam, loam, sandy clay loam.	ML, CL, SM, SC	A-4, A-6	0	90-100	80-100	65-95	35-80	<35	NP-15
AoB*: Allegheny---	0-6	Loam---	ML, CL	A-4	0	90-100	80-100	65-100	55-95	<35	NP-10
	6-60	Clay loam, loam, sandy clay loam.	ML, CL, SM, SC	A-4, A-6	0	90-100	80-100	65-95	35-80	<35	NP-15
Cotaco---	0-16	Silt loam---	ML, CL-ML, SM, SM-SC	A-4	0-5	80-100	75-95	55-85	35-80	<30	NP-7
	16-60	Gravelly sandy clay loam, clay loam, loam.	SC, SM, GC, CL	A-2, A-4, A-6, A-1-b	0-10	60-100	50-95	40-90	20-80	<35	NP-15
ArF*: Alticrest---	0-10	Sandy loam---	ML, CL-ML, SM, SM-SC	A-4, A-2	0-2	80-100	75-100	55-80	34-65	<20	NP-6
	10-38	Sandy loam, loam, fine sandy loam.	ML, CL-ML, SM, SM-SC	A-4, A-2	0-2	80-100	75-100	55-85	34-70	<23	NP-6
	38	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Ramsey---	0-3	Sandy loam---	SM, CL-ML, ML, SM-SC	A-4, A-2	0-10	85-100	75-95	60-75	30-70	<25	NP-7
	3-18	Loam, sandy loam, fine sandy loam.	SM, CL-ML, ML, SM-SC	A-4, A-2	0-10	85-100	75-95	60-77	30-70	<25	NP-7
	18	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
BeF*: Bethesda---	0-7	Gravelly loam---	ML, GM, GM-GC, CL-ML	A-4, A-6	0-15	65-90	55-80	50-80	35-75	25-40	4-14
	7-60	Very channery clay loam, very gravelly silty clay loam.	GM, GC, ML, CL	A-4, A-6, A-7, A-2	10-30	40-80	25-65	20-65	18-60	24-50	3-23
Fairpoint---	0-6	Channery silt loam.	CL, CL-ML, SC, GC	A-4, A-6, A-2	5-15	55-90	45-80	40-80	30-75	25-40	4-14
	6-60	Channery clay loam, very channery silty clay loam.	GC, CL, CL-ML, SC	A-4, A-6, A-7, A-2	15-30	55-75	25-65	20-65	15-60	25-50	4-24
BsF*: Bledsoe---	0-8	Silt loam---	CL, CL-ML	A-4, A-6	0-5	85-95	80-95	70-90	50-90	20-35	5-15
	8-55	Silty clay, silty clay loam, gravelly silty clay.	CH, CL	A-7, A-6	0-15	65-95	65-95	60-90	50-90	35-60	15-35
	55-60	Gravelly silty clay loam, silty clay, clay.	CH, CL, GC, SC	A-7, A-6	0-25	50-100	50-100	40-90	35-90	35-60	15-40

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	> 3 inches	4	10	40	200		
	In				Pct					Pct	
BsF*:											
Berks	0-11	Channery silt loam.	GM, ML, GC, SC	A-2, A-4	0-30	50-80	45-70	40-60	30-55	25-36	5-10
	11-38	Channery loam, very channery loam, channery silt loam.	GM, SM, GC, SC	A-1, A-2, A-4	0-30	40-80	35-70	25-60	20-45	25-36	5-10
	38	Weathered bedrock	---	---	---	---	---	---	---	---	---
Rock outcrop.											
CkF*:											
Carpenter	0-13	Silt loam	ML, CL-ML	A-4	0-5	80-95	80-95	55-85	55-85	<35	NP-10
	13-60	Gravelly silty clay loam, silty clay loam, clay loam.	CL, CL-ML, ML	A-4, A-6, A-7	0-10	60-95	60-90	55-80	55-80	25-45	5-20
Bledsoe	0-8	Silt loam	CL, CL-ML	A-4, A-6	0-5	85-95	80-95	70-90	50-90	20-35	5-15
	8-55	Silty clay, silty clay loam, gravelly silty clay.	CH, CL	A-7, A-6	0-15	65-95	65-95	60-90	50-90	35-60	15-35
	55-60	Gravelly silty clay loam, silty clay, clay.	CH, CL, GC, SC	A-7, A-6	0-25	50-100	50-100	40-90	35-90	35-60	15-40
Berks	0-11	Channery silt loam.	GM, ML, GC, SC	A-2, A-4	0-30	50-80	45-70	40-60	30-55	25-36	5-10
	11-38	Channery loam, very channery loam, channery silt loam.	GM, SM, GC, SC	A-1, A-2, A-4	0-30	40-80	35-70	25-60	20-45	25-36	5-10
	38	Weathered bedrock	---	---	---	---	---	---	---	---	---
CoA, CoB	0-16	Silt loam	ML, CL-ML, SM, SM-SC	A-4	0-5	80-100	75-95	55-85	35-80	<30	NP-7
Cotaco	16-60	Gravelly sandy clay loam, clay loam, loam.	SC, SM, GC, CL	A-2, A-4, A-6, A-1-b	0-10	60-100	50-95	40-90	20-80	<35	NP-15
FaE2	0-2	Silt loam	ML, CL, CL-ML	A-4	0-15	100	95-100	90-100	85-100	25-35	4-10
Faywood	2-38	Silty clay, clay, silty clay loam.	CH, CL	A-7	0-15	90-100	90-100	85-100	75-100	42-70	20-45
	38	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
GnC, GnD	0-7	Silt loam	CL, CL-ML	A-4, A-6	0-5	80-95	75-90	70-85	65-80	20-40	4-15
Gilpin	7-35	Channery loam, channery silt loam, silty clay loam.	GC, SC, CL, CL-ML	A-2, A-4, A-6	0-30	50-95	45-90	35-85	30-80	20-40	4-15
	35	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	> 3 inches	4	10	40	200		
	In				Pct					Pct	
GpE*:											
Gilpin	0-7	Silt loam	CL, CL-ML	A-4, A-6	0-5	80-95	75-90	70-85	65-80	20-40	4-15
	7-35	Channery loam, channery silt loam, silty clay loam.	GC, SC, CL, CL-ML	A-2, A-4, A-6	0-30	50-95	45-90	35-85	30-80	20-40	4-15
	35	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Shelocta	0-6	Gravelly silt loam.	ML, GM, SM	A-4	0-15	55-95	50-80	40-70	36-65	<35	NP-10
	6-45	Silty clay loam, silt loam, channery silty clay loam.	CL, CL-ML, GC, SC	A-6, A-4	0-15	55-95	50-95	45-95	40-90	25-40	4-15
	45-70	Channery silt loam, channery silty clay loam, very channery clay loam.	GM, GC, ML, CL	A-4, A-6, A-2, A-1-b	0-25	40-85	35-70	25-70	20-65	20-40	3-20
GrF*:											
Gilpin	0-7	Silt loam	CL, CL-ML	A-4, A-6	0-5	80-95	75-90	70-85	65-80	20-40	4-15
	7-35	Channery loam, channery silt loam, silty clay loam.	GC, SC, CL, CL-ML	A-2, A-4, A-6	0-30	50-95	45-90	35-85	30-80	20-40	4-15
	35	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Hazleton	0-2	Channery loam	ML, GM, SM	A-2, A-4	0-15	60-85	60-80	60-75	35-55	---	---
	2-56	Channery sandy loam, loam, very channery loam.	GM, SM, ML, SC	A-2, A-4, A-1	0-50	60-95	45-90	35-70	20-55	<30	NP-8
	56	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
Gs	0-8	Silt loam	ML, CL-ML, CL	A-4	0-5	80-100	80-100	70-100	50-80	<25	NP-10
Grigsby	8-60	Loam, fine sandy loam, silt loam.	ML, SM, SC, CL	A-2, A-4	0-5	80-100	80-100	70-100	30-70	<25	NP-10
Gu*:											
Grigsby	0-8	Fine sandy loam	SM, SM-SC	A-2, A-4	0-5	80-100	80-100	50-95	25-50	<20	NP-5
	8-60	Loam, fine sandy loam, silt loam.	ML, SM, SC, CL	A-2, A-4	0-5	80-100	80-100	70-100	30-70	<25	NP-10
Orrville	0-9	Silt loam	ML, CL-ML, CL	A-4	0	100	90-100	85-100	60-80	20-35	3-10
	9-42	Silt loam, loam, silty clay loam.	CL, CL-ML, ML	A-4, A-6	0-2	95-100	75-100	70-95	50-90	20-40	2-16
	42-60	Stratified gravelly loamy sand to silt loam.	ML, CL, SM, SC	A-4, A-2, A-1	0-2	95-100	65-100	40-85	15-75	15-35	NP-10

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	> 3 inches	4	10	40	200		
	In				Pct					Pct	
Gy*:											
Grigsby	0-8	Silt loam	ML, CL-ML, CL	A-4	0-5	80-100	80-100	70-100	50-80	<25	NP-10
	8-60	Loam, fine sandy loam, silt loam.	ML, SM, SC, CL	A-2, A-4	0-5	80-100	80-100	70-100	30-70	<25	NP-10
Skidmore	0-20	Gravelly loam	GM, SM, ML	A-4, A-2	0-10	60-90	40-85	40-75	25-60	<30	NP-7
	20-60	Gravelly fine sandy loam, very channery sandy loam, very gravelly loam.	GM, GP-GM	A-2, A-1	5-30	35-60	20-50	15-40	10-35	<30	NP-5
	60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Morehead	0-5	Silt loam	ML	A-4	0	95-100	95-100	90-100	80-100	25-35	2-10
	5-42	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	95-100	95-100	90-100	75-100	25-40	5-20
	42-60	Silt loam, loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6	0	90-100	85-100	70-100	60-95	20-40	2-20
HaF*:											
Helechawa	0-3	Sandy loam	SM, SM-SC, SC	A-2, A-4	0-10	85-100	85-100	70-90	25-45	<20	NP-10
	3-64	Sandy loam, fine sandy loam, gravelly loam.	SM, SM-SC, SC	A-2, A-4	0-5	85-100	85-100	70-90	25-45	<30	NP-10
Faywood	0-2	Silt loam	ML, CL, CL-ML	A-4	0-15	100	95-100	90-100	85-100	25-35	4-10
	2-38	Silty clay, clay, silty clay loam.	CH, CL	A-7	0-15	90-100	90-100	85-100	75-100	42-70	20-45
	38	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
HeF*:											
Helechawa	0-3	Sandy loam	SM, SM-SC, SC	A-2, A-4	0-10	85-100	85-100	70-90	25-45	<20	NP-10
	3-64	Sandy loam, fine sandy loam, gravelly loam.	SM, SM-SC, SC	A-2, A-4	0-5	85-100	85-100	70-90	25-45	<30	NP-10
Rock outcrop.											
JaB	0-11	Silt loam	ML, CL, CL-ML	A-4	0	95-100	95-100	85-100	70-90	25-35	5-10
Jessietown	11-34	Silty clay loam, silt loam.	ML, CL, CL-ML	A-4, A-6, A-7-6	0	95-100	85-100	80-100	70-95	25-45	3-20
	34-38	Weathered bedrock	---	---	---	---	---	---	---	---	---
	38	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
JeD3	0-11	Silty clay loam	CL	A-6, A-7-6	0	95-100	95-100	85-100	70-95	30-45	10-20
Jessietown	11-28	Silty clay loam, silt loam.	ML, CL, CL-ML	A-4, A-6, A-7-6	0	95-100	85-100	80-100	70-95	25-45	3-20
	28-32	Weathered bedrock	---	---	---	---	---	---	---	---	---
	32	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	> 3 inches	4	10	40	200		
	In				Pct					Pct	
JoF*:											
Jessietown	0-11	Silt loam	ML, CL, CL-ML	A-4	0	95-100	95-100	85-100	70-90	25-35	5-10
	11-34	Silty clay loam, silt loam.	ML, CL, CL-ML	A-4, A-6, A-7-6	0	95-100	85-100	80-100	70-95	25-45	3-20
	34-38	Weathered bedrock	---	---	---	---	---	---	---	---	---
	38	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Muse	0-24	Silt loam	ML, CL, CL-ML	A-4, A-6	0	80-100	70-100	60-100	55-95	20-40	2-20
	24-65	Silty clay loam, clay, shaly silty clay.	CL, CH	A-7, A-6	0	70-100	65-100	60-100	55-100	35-65	15-35
	65	Weathered bedrock	---	---	---	---	---	---	---	---	---
Rohan	0-4	Channery silt loam.	CL, ML, GC, GM-GC	A-4, A-6	0-10	55-80	50-75	45-70	35-65	25-40	3-15
	4-19	Extremely channery silty clay loam, very channery silty clay loam.	GC, GM, GM-GC	A-2, A-6, A-7, A-1-b	0-15	25-60	25-55	20-50	15-40	25-45	3-20
	19	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
KnA	0-6	Silt loam	CL, CL-ML	A-4, A-6	0	100	75-100	75-100	70-100	25-40	5-15
Knowlton	6-17	Loam, silt loam	CL	A-6, A-7	0	100	75-100	75-100	70-100	25-40	5-15
	17-46	Silt loam, silty clay loam, loam.	CL	A-6, A-7	0	100	75-100	75-100	75-100	35-50	20-30
	46-66	Silt loam, silty clay loam, clay loam.	CL, ML	A-6, A-7	0	100	75-100	75-100	70-95	35-50	10-25
LaD	0-17	Silt loam	CL-ML, CL, ML	A-4, A-6	0-5	85-100	75-100	70-100	65-90	20-35	5-12
Latham	17-34	Silty clay, silty clay loam, channery silty clay.	CH, CL	A-7	0-10	85-100	70-95	65-95	60-90	45-65	25-40
	34	Weathered bedrock	---	---	---	---	---	---	---	---	---
LeF*:											
Latham	0-17	Silt loam	CL-ML, CL, ML	A-4, A-6	0-5	85-100	75-100	70-100	65-90	20-35	5-12
	17-34	Silty clay, silty clay loam, channery silty clay.	CH, CL	A-7	0-10	85-100	70-95	65-95	60-90	45-65	25-40
	34	Weathered bedrock	---	---	---	---	---	---	---	---	---
Gilpin	0-7	Silt loam	CL, CL-ML	A-4, A-6	0-5	80-95	75-90	70-85	65-80	20-40	4-15
	7-35	Channery loam, channery silt loam, silty clay loam.	GC, SC, CL, CL-ML	A-2, A-4, A-6	0-30	50-95	45-90	35-85	30-80	20-40	4-15
	35	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	> 3 inches	4	10	40	200		
	In				Pct					Pct	
LeF*:											
Alticrest	0-10	Sandy loam	ML, CL-ML, SM, SM-SC	A-4, A-2	0-2	80-100	75-100	55-80	34-65	<20	NP-6
	10-38	Sandy loam, loam, fine sandy loam.	ML, CL-ML, SM, SM-SC	A-4, A-2	0-2	80-100	75-100	55-85	34-70	<23	NP-6
	38	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
LgE*:											
Latham	0-17	Silt loam	CL-ML, CL, ML	A-4, A-6	0-5	85-100	75-100	70-100	65-90	20-35	5-12
	17-34	Silty clay, silty clay loam, channery silty clay.	CH, CL	A-7	0-10	85-100	70-95	65-95	60-90	45-65	25-40
	34	Weathered bedrock	---	---	---	---	---	---	---	---	---
Gilpin	0-7	Silt loam	CL, CL-ML	A-4, A-6	0-5	80-95	75-90	70-85	65-80	20-40	4-15
	7-35	Channery loam, channery silt loam, silty clay loam.	GC, SC, CL, CL-ML	A-2, A-4, A-6	0-30	50-95	45-90	35-85	30-80	20-40	4-15
	35	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
LoD	0-5	Sandy loam	SM	A-4, A-2	0-5	90-100	85-100	55-80	25-50	<20	NP-4
Lily	5-24	Clay loam, sandy clay loam, loam.	SM, SC, ML, CL	A-4, A-6	0-5	90-100	85-100	75-100	40-80	<35	3-15
	24-32	Sandy clay loam, clay loam, gravelly sandy clay loam.	SM, SC, ML, CL	A-4, A-2, A-6, A-1-b	0-10	65-100	50-100	40-95	20-75	<35	3-15
	32	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
LyE*:											
Lily	0-5	Sandy loam	SM	A-4, A-2	0-5	90-100	85-100	55-80	25-50	<20	NP-4
	5-24	Clay loam, sandy clay loam, loam.	SM, SC, ML, CL	A-4, A-6	0-5	90-100	85-100	75-100	40-80	<35	3-15
	24-32	Sandy clay loam, clay loam, gravelly sandy clay loam.	SM, SC, ML, CL	A-4, A-2, A-6, A-1-b	0-10	65-100	50-100	40-95	20-75	<35	3-15
	32	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Gilpin	0-7	Silt loam	CL, CL-ML	A-4, A-6	0-5	80-95	75-90	70-85	65-80	20-40	4-15
	7-35	Channery loam, channery silt loam, silty clay loam.	GC, SC, CL, CL-ML	A-2, A-4, A-6	0-30	50-95	45-90	35-85	30-80	20-40	4-15
	35	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
LyE*:											
Rigley	0-7	Sandy loam	SM, ML, SM-SC, CL-ML	A-2, A-4	0-10	80-95	75-90	55-80	25-65	<30	NP-7
	7-62	Gravelly sandy loam, gravelly loam, sandy loam.	SM, ML, GM, GM-GC	A-2, A-4, A-1	0-10	65-95	60-90	40-75	20-60	<30	NP-7
Ne	0-8	Silt loam	ML, CL, CL-ML	A-4	0	95-100	90-100	80-100	55-95	<32	NP-10
Newark	8-60	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6, A-7	0	95-100	90-100	85-100	70-100	22-42	3-20
Or	0-9	Silt loam	ML, CL-ML, CL	A-4	0	100	90-100	85-100	60-80	20-35	3-10
Orrville	9-42	Silt loam, loam, silty clay loam.	CL, CL-ML, ML	A-4, A-6	0-2	95-100	75-100	70-95	50-90	20-40	2-16
	42-60	Stratified gravelly loamy sand to silt loam.	ML, CL, SM, SC	A-4, A-2, A-1	0-2	95-100	65-100	40-85	15-75	15-35	NP-10
Pt*.											
Pits, quarries											
RdB	0-10	Silt loam	ML, SC, CL, SM	A-4	0	80-100	80-100	70-100	40-75	<30	NP-10
Rowdy	10-65	Loam, clay loam, gravelly sandy loam.	ML, GM-GC, SM-SC, CL	A-4, A-2, A-6, A-1-b	0-25	30-100	30-100	25-100	20-75	<30	NP-15
RgA*:											
Rowdy	0-10	Loam	ML, SC, CL, SM	A-4	0	80-100	80-100	70-100	40-75	<30	NP-10
	10-65	Loam, clay loam, gravelly sandy loam.	ML, GM-GC, SM-SC, CL	A-4, A-2, A-6, A-1-b	0-25	30-100	30-100	25-100	20-75	<30	NP-15
Grigsby	0-8	Fine sandy loam	SM, SM-SC	A-2, A-4	0-5	80-100	80-100	50-95	25-50	<20	NP-5
	8-60	Loam, fine sandy loam, silt loam.	ML, SM, SC, CL	A-2, A-4	0-5	80-100	80-100	70-100	30-70	<25	NP-10
SaF*:											
Shelocta	0-6	Gravelly silt loam.	ML, GM, SM	A-4	0-15	55-95	50-80	40-70	36-65	<35	NP-10
	6-45	Silty clay loam, silt loam, channery silty clay loam.	CL, CL-ML, GC, SC	A-6, A-4	0-15	55-95	50-95	45-95	40-90	25-40	4-15
	45-70	Channery silt loam, channery silty clay loam, very channery clay loam.	GM, GC, ML, CL	A-4, A-6, A-2, A-1-b	0-25	40-85	35-70	25-70	20-65	20-40	3-20

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	> 3 inches	4	10	40	200		
	In				Pct					Pct	
SaF*:											
Gilpin	0-7	Silt loam	CL, CL-ML	A-4, A-6	0-5	80-95	75-90	70-85	65-80	20-40	4-15
	7-35	Channery loam, channery silt loam, silty clay loam.	GC, SC, CL, CL-ML	A-2, A-4, A-6	0-30	50-95	45-90	35-85	30-80	20-40	4-15
	35	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
SeE*:											
Shrouts	0-9	Silt loam	ML, CL-ML	A-4, A-6	0	100	90-100	85-100	80-100	24-40	4-12
	9-25	Clay, silty clay	CH, CL	A-7	0-10	90-100	90-100	85-100	80-100	45-65	20-40
	25	Weathered bedrock	---	---	---	---	---	---	---	---	---
Woolper	0-14	Silty clay loam	CL	A-6, A-7	0-10	95-100	90-100	85-100	75-100	34-42	15-22
	14-65	Silty clay, silty clay loam, clay.	CL, CH	A-7, A-6	0-10	95-100	90-100	85-100	75-100	35-65	15-40
WbD2, WbE2	0-2	Silt loam	ML, CL-ML	A-4	0	95-100	90-100	80-95	75-90	<25	3-7
Westbend	2-7	Silt loam, silty clay loam, loam.	CL-ML, CL	A-4, A-6	0	95-100	90-100	80-95	75-90	20-40	7-20
	7-45	Silty clay loam, silt loam, channery silty clay loam.	CL	A-4, A-6	5-15	80-95	65-95	65-90	65-90	25-40	9-20
	45	Weathered bedrock	---	---	---	---	---	---	---	---	---

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

(The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated)

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	g/cc	In/hr	In/in	pH				Pct
AgA, AgB, AgC2, AgD3---------- Allegheny	0-6	15-27	1.20-1.40	0.6-2.0	0.12-0.22	3.6-5.5	Low----------	0.32	4	1-4
	6-60	18-35	1.20-1.50	0.6-2.0	0.13-0.18	3.6-5.5	Low----------	0.28		
AoB*:										
Allegheny-------	0-6	15-27	1.20-1.40	0.6-2.0	0.12-0.22	3.6-5.5	Low----------	0.32	4	2-4
	6-60	18-35	1.20-1.50	0.6-2.0	0.13-0.18	3.6-5.5	Low----------	0.28		
Cotaco----------	0-16	7-27	1.20-1.40	0.6-6.0	0.12-0.20	3.6-5.5	Low----------	0.37	3	2-4
	16-60	18-35	1.20-1.50	0.6-2.0	0.07-0.15	3.6-5.5	Low----------	0.28		
ArF*:										
Alticrest-------	0-10	8-18	1.40-1.55	2.0-6.0	0.12-0.18	4.5-5.5	Low----------	0.24	2	1-2
	10-38	8-18	1.40-1.55	2.0-6.0	0.10-0.16	4.5-5.5	Low----------	0.20		
	38	---	---	---	---	---	----------	----		
Ramsey----------	0-3	8-25	1.25-1.50	6.0-20	0.09-0.12	4.5-5.5	Low----------	0.20	1	1-2
	3-18	8-25	1.20-1.40	6.0-20	0.09-0.12	4.5-5.5	Low----------	0.17		
	18	---	---	---	---	---	----------	----		
Rock outcrop.										
BeF*:										
Bethesda--------	0-7	18-27	1.40-1.55	0.6-2.0	0.10-0.16	3.6-5.5	Low----------	0.28	5	<.5
	7-60	18-35	1.60-1.90	0.2-0.6	0.04-0.10	3.6-5.5	Low----------	0.32		
Fairpoint-------	0-6	18-27	1.40-1.55	0.6-2.0	0.09-0.18	5.6-7.3	Low----------	0.28	5	<.5
	6-60	18-35	1.60-1.80	0.2-0.6	0.03-0.10	5.6-7.3	Moderate-----	0.28		
BsF*:										
Bledsoe---------	0-8	15-30	1.20-1.50	0.6-2.0	0.16-0.21	5.6-7.8	Low----------	0.37	4	2-5
	8-55	35-50	1.30-1.60	0.2-0.6	0.12-0.19	5.6-7.8	Moderate-----	0.32		
	55-60	30-60	1.35-1.60	0.06-0.6	0.12-0.19	5.6-7.8	Moderate-----	0.32		
Berks-----------	0-11	5-23	1.20-1.50	0.6-6.0	0.08-0.12	3.6-6.5	Low----------	0.17	3	.5-3
	11-38	5-32	1.20-1.60	0.6-6.0	0.04-0.10	3.6-6.5	Low----------	0.17		
	38	---	---	---	---	---	----------	----		
Rock outcrop.										
CkF*:										
Carpenter-------	0-13	10-27	1.20-1.40	2.0-6.0	0.16-0.22	4.5-6.5	Low----------	0.32	4	2-5
	13-60	18-35	1.20-1.50	0.6-2.0	0.10-0.20	4.5-6.5	Low----------	0.28		
Bledsoe---------	0-8	15-30	1.20-1.50	0.6-2.0	0.16-0.21	5.6-7.8	Low----------	0.37	4	2-5
	8-55	35-50	1.30-1.60	0.2-0.6	0.12-0.19	5.6-7.8	Moderate-----	0.32		
	55-60	30-60	1.35-1.60	0.06-0.6	0.12-0.19	5.6-7.8	Moderate-----	0.32		
Berks-----------	0-11	5-23	1.20-1.50	0.6-6.0	0.08-0.12	3.6-6.5	Low----------	0.17	3	.5-2
	11-38	5-32	1.20-1.60	0.6-6.0	0.04-0.10	3.6-6.5	Low----------	0.17		
	38	---	---	---	---	---	----------	----		
CoA, CoB--------- Cotaco	0-16	7-27	1.20-1.40	0.6-6.0	0.12-0.20	3.6-5.5	Low----------	0.37	3	2-4
	16-60	18-35	1.20-1.50	0.6-2.0	0.07-0.15	3.6-5.5	Low----------	0.28		

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	g/cc	In/hr	In/in	pH				Pct
FaE2----------	0-2	15-27	1.30-1.40	0.6-2.0	0.18-0.22	5.1-7.8	Low----------	0.37	3	.5-2
Faywood	2-38	35-60	1.35-1.45	0.06-0.6	0.12-0.17	5.1-7.8	Moderate-----	0.28		
	38	---	---	---	---	---	----------	----		
GnC, GnD---------	0-7	15-27	1.20-1.40	0.6-2.0	0.12-0.18	3.6-5.5	Low----------	0.32	3	2-4
Gilpin	7-35	18-35	1.20-1.50	0.6-2.0	0.12-0.16	3.6-5.5	Low----------	0.24		
	35	---	---	---	---	---	----------	----		
GpE*:										
Gilpin----------	0-7	15-27	1.20-1.40	0.6-2.0	0.12-0.18	3.6-5.5	Low----------	0.32	3	2-4
	7-35	18-35	1.20-1.50	0.6-2.0	0.12-0.16	3.6-5.5	Low----------	0.24		
	35	---	---	---	---	---	----------	----		
Shelocta--------	0-6	10-25	1.15-1.30	0.6-2.0	0.10-0.18	3.6-5.5	Low----------	0.28	4	2-4
	6-45	18-34	1.30-1.55	0.6-2.0	0.10-0.20	3.6-5.5	Low----------	0.28		
	45-70	15-34	1.30-1.55	0.6-6.0	0.08-0.16	3.6-5.5	Low----------	0.17		
GrF*:										
Gilpin----------	0-7	15-27	1.20-1.40	0.6-2.0	0.12-0.18	3.6-5.5	Low----------	0.32	3	2-4
	7-35	18-35	1.20-1.50	0.6-2.0	0.12-0.16	3.6-5.5	Low----------	0.24		
	35	---	---	---	---	---	----------	----		
Hazleton--------	0-2	7-18	1.20-1.40	2.0-6.0	0.10-0.14	3.6-5.5	Low----------	0.17	3	2-4
	2-56	7-18	1.20-1.40	2.0-20	0.08-0.12	3.6-5.5	Low----------	0.15		
	56	---	---	---	---	---	----------	----		
Rock outcrop.										
Gs----------	0-8	5-25	1.20-1.40	0.6-6.0	0.10-0.20	5.6-7.3	Low----------	0.32	5	2-4
Grigsby	8-60	5-18	1.20-1.50	0.6-6.0	0.10-0.20	5.1-7.3	Low----------	0.28		
Gu*:										
Grigsby---------	0-8	5-10	1.20-1.50	2.0-6.0	0.08-0.14	5.6-7.3	Low----------	0.28	5	2-4
	8-60	5-18	1.20-1.50	0.6-6.0	0.10-0.20	5.1-7.3	Low----------	0.28		
Orrville--------	0-9	12-27	1.25-1.45	0.6-2.0	0.18-0.22	5.1-7.3	Low----------	0.37	5	2-4
	9-42	18-30	1.30-1.50	0.6-2.0	0.15-0.19	5.1-6.5	Low----------	0.37		
	42-60	10-25	1.20-1.40	0.6-6.0	0.08-0.15	5.1-7.3	Low----------	0.37		
Gy*:										
Grigsby---------	0-8	5-25	1.20-1.40	0.6-6.0	0.10-0.20	5.6-7.3	Low----------	0.32	5	2-4
	8-60	5-18	1.20-1.50	0.6-6.0	0.10-0.20	5.1-7.3	Low----------	0.28		
Skidmore--------	0-20	7-18	1.20-1.40	2.0-6.0	0.07-0.13	5.6-7.8	Low----------	0.17	5	2-4
	20-60	7-18	1.30-1.60	2.0-6.0	0.04-0.10	5.6-7.8	Low----------	0.17		
	60	---	---	---	---	---	----------	----		
Morehead--------	0-5	12-27	1.20-1.50	0.6-2.0	0.19-0.23	4.5-5.5	Low----------	0.37	4	2-4
	5-42	18-35	1.20-1.50	0.6-2.0	0.18-0.22	4.5-5.5	Low----------	0.43		
	42-60	7-40	1.20-1.50	0.6-2.0	0.15-0.22	4.5-5.5	Low----------	0.43		
HaF*:										
Helechawa-------	0-3	4-15	1.10-1.40	2.0-6.0	0.10-0.18	3.6-6.5	Low----------	0.15	4	2-5
	3-64	7-18	1.35-1.70	2.0-6.0	0.08-0.14	3.6-5.5	Low----------	----		
Faywood---------	0-2	15-27	1.30-1.40	0.6-2.0	0.18-0.22	5.1-7.8	Low----------	0.37	3	1-2
	2-38	35-60	1.35-1.45	0.06-0.6	0.12-0.17	5.1-7.8	Moderate-----	0.28		
	38	---	---	---	---	---	----------	----		

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	g/cc	In/hr	In/in	pH				Pct
HeF*:										
Helechawa	0-3	4-15	1.10-1.40	2.0-6.0	0.10-0.18	3.6-6.5	Low	0.15	4	2-5
	3-64	7-18	1.35-1.70	2.0-6.0	0.08-0.14	3.6-5.5	Low	----		
Rock outcrop.										
JaB	0-11	12-27	1.20-1.40	0.6-2.0	0.19-0.23	3.6-5.5	Low	0.37	3	.5-2
Jessietown	11-34	12-34	1.20-1.50	0.6-2.0	0.18-0.23	3.6-5.5	Low	0.28		
	34-38	---	---	---	---	---		----		
	38	---	---	---	---	---		----		
JeD3	0-11	28-34	1.20-1.50	0.6-2.0	0.18-0.22	3.6-5.5	Low	0.32	3	.5-2
Jessietown	11-28	12-34	1.20-1.50	0.6-2.0	0.18-0.23	3.6-5.5	Low	0.28		
	28-32	---	---	---	---	---		----		
	32	---	---	---	---	---		----		
JoF*:										
Jessietown	0-11	12-27	1.20-1.40	0.6-2.0	0.19-0.23	3.6-5.5	Low	0.37	3	.5-2
	11-34	12-34	1.20-1.50	0.6-2.0	0.18-0.23	3.6-5.5	Low	0.28		
	34-38	---	---	---	---	---		----		
	38	---	---	---	---	---		----		
Muse	0-24	7-27	1.20-1.40	0.6-2.0	0.16-0.22	4.5-5.5	Low	0.37	3	2-4
	24-65	28-60	1.20-1.65	0.06-0.2	0.10-0.16	4.5-5.5	Moderate	0.28		
	65	---	---	---	---	---		----		
Rohan	0-4	15-34	1.20-1.50	0.6-2.0	0.10-0.16	4.5-6.0	Low	0.28	2	.5-2
	4-19	15-34	1.20-1.60	0.2-2.0	0.04-0.10	3.6-5.5	Low	0.17		
	19	---	---	---	---	---		----		
KnA	0-6	10-26	1.30-1.45	0.6-2.0	0.20-0.24	5.1-7.3	Low	0.43	5	1-2
Knowlton	6-17	10-26	1.30-1.45	0.6-2.0	0.20-0.24	4.5-6.0	Low	0.43		
	17-46	18-34	1.40-1.60	0.06-0.2	0.18-0.20	4.5-6.0	Moderate	0.43		
	46-66	5-34	1.40-1.60	0.06-0.2	0.19-0.21	4.5-6.0	Low	0.43		
LaD	0-17	20-27	1.30-1.50	0.6-2.0	0.16-0.20	3.6-6.5	Low	0.43	3	1-2
Latham	17-34	35-55	1.40-1.70	0.06-0.2	0.11-0.15	3.6-5.0	High	0.32		
	34	---	---	---	---	---		----		
LeF*:										
Latham	0-17	20-27	1.30-1.50	0.6-2.0	0.16-0.20	3.6-6.5	Low	0.43	3	1-2
	17-34	35-55	1.40-1.70	0.06-0.2	0.11-0.15	3.6-5.0	High	0.32		
	34	---	---	---	---	---		----		
Gilpin	0-7	15-27	1.20-1.40	0.6-2.0	0.12-0.18	3.6-5.5	Low	0.32	3	2-4
	7-35	18-35	1.20-1.50	0.6-2.0	0.12-0.16	3.6-5.5	Low	0.24		
	35	---	---	---	---	---		----		
Alticrest	0-10	8-18	1.40-1.55	2.0-6.0	0.12-0.18	4.5-5.5	Low	0.24	2	1-2
	10-38	8-18	1.40-1.55	2.0-6.0	0.10-0.16	4.5-5.5	Low	0.20		
	38	---	---	---	---	---		----		
LgE*:										
Latham	0-17	20-27	1.30-1.50	0.6-2.0	0.16-0.20	3.6-6.5	Low	0.43	3	1-2
	17-34	35-55	1.40-1.70	0.06-0.2	0.11-0.15	3.6-5.0	High	0.32		
	34	---	---	---	---	---		----		

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	g/cc	In/hr	In/in	pH				Pct
LgE*:										
Gilpin	0-7	15-27	1.20-1.40	0.6-2.0	0.12-0.18	3.6-5.5	Low	0.32	3	2-4
	7-35	18-35	1.20-1.50	0.6-2.0	0.12-0.16	3.6-5.5	Low	0.24		
	35	---	---	---	---	---	---	---		
LoD	0-5	5-20	1.20-1.40	2.0-6.0	0.09-0.16	3.6-5.5	Low	0.28	2	2-4
Lily	5-24	18-35	1.25-1.35	2.0-6.0	0.12-0.18	3.6-5.5	Low	0.28		
	24-32	20-35	1.25-1.35	2.0-6.0	0.08-0.17	3.6-5.5	Low	0.17		
	32	---	---	---	---	---	---	---		
LyE*:										
Lily	0-5	5-20	1.20-1.40	2.0-6.0	0.09-0.16	3.6-5.5	Low	0.28	2	2-4
	5-24	18-35	1.25-1.35	2.0-6.0	0.12-0.18	3.6-5.5	Low	0.28		
	24-32	20-35	1.25-1.35	2.0-6.0	0.08-0.17	3.6-5.5	Low	0.17		
	32	---	---	---	---	---	---	---		
Gilpin	0-7	15-27	1.20-1.40	0.6-2.0	0.12-0.18	3.6-5.5	Low	0.32	3	2-4
	7-35	18-35	1.20-1.50	0.6-2.0	0.12-0.16	3.6-5.5	Low	0.24		
	35	---	---	---	---	---	---	---		
Rigley	0-7	7-18	1.20-1.40	2.0-6.0	0.09-0.15	4.5-7.3	Low	0.24	4	2-4
	7-62	7-18	1.30-1.60	2.0-6.0	0.09-0.15	3.6-5.5	Low	0.17		
Ne	0-8	7-27	1.20-1.40	0.6-2.0	0.15-0.23	5.6-7.8	Low	0.43	5	2-4
Newark	8-60	18-35	1.20-1.45	0.6-2.0	0.18-0.23	5.6-7.8	Low	0.43		
Or	0-9	12-27	1.25-1.45	0.6-2.0	0.18-0.22	5.1-7.3	Low	0.37	5	2-4
Orrville	9-42	18-30	1.30-1.50	0.6-2.0	0.15-0.19	5.1-6.5	Low	0.37		
	42-60	10-25	1.20-1.40	0.6-6.0	0.08-0.15	5.1-7.3	Low	0.37		
Pt*.										
Pits, quarries										
RdB	0-10	10-25	1.20-1.40	0.6-2.0	0.11-0.21	4.5-7.3	Low	0.32	5	2-4
Rowdy	10-65	10-30	1.20-1.50	0.6-6.0	0.07-0.18	4.5-6.0	Low	0.28		
RgA*:										
Rowdy	0-10	10-25	1.20-1.40	0.6-2.0	0.11-0.21	4.5-7.3	Low	0.32	5	2-4
	10-65	10-30	1.20-1.50	0.6-6.0	0.07-0.18	4.5-6.0	Low	0.28		
Grigsby	0-8	5-10	1.20-1.50	2.0-6.0	0.08-0.14	5.6-7.3	Low	0.28	5	2-4
	8-60	5-18	1.20-1.50	0.6-6.0	0.10-0.20	5.1-7.3	Low	0.28		
SaF*:										
Shelocta	0-6	10-25	1.15-1.30	0.6-2.0	0.10-0.18	3.6-5.5	Low	0.28	4	2-4
	6-45	18-34	1.30-1.55	0.6-2.0	0.10-0.20	3.6-5.5	Low	0.28		
	45-70	15-34	1.30-1.55	0.6-6.0	0.08-0.16	3.6-5.5	Low	0.17		
Gilpin	0-7	15-27	1.20-1.40	0.6-2.0	0.12-0.18	3.6-5.5	Low	0.32	3	2-4
	7-35	18-35	1.20-1.50	0.6-2.0	0.12-0.16	3.6-5.5	Low	0.24		
	35	---	---	---	---	---	---	---		
SeE*:										
Shrouts	0-9	12-35	1.40-1.55	0.06-0.2	0.15-0.20	5.1-8.4	Low	0.43	2	5-4
	9-25	40-65	1.40-1.65	0.06-0.2	0.13-0.17	5.1-8.4	Moderate	0.37		
	25	---	---	---	---	---	---	---		
Woolper	0-14	27-35	1.30-1.50	0.6-2.0	0.18-0.22	6.1-7.8	Low	0.37	3	4-6
	14-65	36-50	1.30-1.55	0.2-2.0	0.13-0.19	6.1-7.8	Moderate	0.28		

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	g/cc	In/hr	In/in	pH				Pct
WbD2, WbE2------- Westbend	0-2	10-18	1.35-1.50	0.6-2.0	0.22-0.24	3.6-6.5	Low----------	0.37	4	1-2
	2-7	18-34	1.35-1.55	0.6-2.0	0.17-0.20	4.5-7.3	Low----------	0.37		
	7-45	22-34	1.50-1.65	0.2-0.6	0.17-0.20	4.5-7.3	Low----------	0.37		
	45	---	---	---	---	---	----------	----		

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--SOIL AND WATER FEATURES

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

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					Ft			In			
AgA, AgB---------- Allegheny	B	None--------	---	---	>6.0	---	---	>60	---	Low-------	High.
AgC2, AgD3-------- Allegheny	B	None--------	---	---	>6.0	---	---	>60	---	Low-------	High.
AoB*:											
Allegheny--------	B	None--------	---	---	>6.0	---	---	>60	---	Low-------	High.
Cotaco-----------	C	None--------	---	---	1.5-2.5	Apparent	Nov-May	>60	---	Moderate	High.
ArF*:											
Alticrest--------	B	None--------	---	---	>6.0	---	---	20-40	Hard	Low-------	High.
Ramsey-----------	D	None--------	---	---	>6.0	---	---	10-20	Hard	Low-------	Moderate.
Rock outcrop.											
BeF*:											
Bethesda---------	C	None--------	---	---	>6.0	---	---	>60	---	Moderate	High.
Fairpoint--------	C	None--------	---	---	>6.0	---	---	>60	---	High------	Moderate.
BsF*:											
Bledsoe----------	C	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
Berks------------	C	None--------	---	---	>6.0	---	---	20-40	Soft	Low-------	High.
Rock outcrop.											
CkF*:											
Carpenter--------	B	None--------	---	---	>6.0	---	---	>40	Soft	Low-------	Moderate.
Bledsoe----------	C	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
Berks------------	C	None--------	---	---	>6.0	---	---	20-40	Soft	Low-------	High.
CoA, CoB---------- Cotaco	C	None--------	---	---	1.5-2.5	Apparent	Nov-May	>60	---	Moderate	High.
FaE2-------------- Faywood	C	None--------	---	---	>6.0	---	---	20-40	Hard	High------	Moderate.
GnC, GnD---------- Gilpin	C	None--------	---	---	>6.0	---	---	20-40	Soft	Low-------	High.
GpE*:											
Gilpin-----------	C	None--------	---	---	>6.0	---	---	20-40	Soft	Low-------	High.
Shelocta---------	B	None--------	---	---	>6.0	---	---	>48	Hard	Low-------	High.
GrF*:											
Gilpin-----------	C	None--------	---	---	>6.0	---	---	20-40	Soft	Low-------	High.
Hazleton---------	B	None--------	---	---	>6.0	---	---	>40	Hard	Low-------	High.

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					Ft			In			
GrF*:											
Rock outcrop.											
Gs---------- Grigsby	B	Frequent----	Very brief to brief.	Dec-May	3.5-6.0	Apparent	Jan-Apr	>60	---	Low------	Low.
Gu*:											
Grigsby----------	B	Frequent----	Very brief to brief.	Dec-May	3.5-6.0	Apparent	Jan-Apr	>60	---	Low------	Low.
Orrville---------	C	Frequent----	Very brief to brief.	Nov-May	1.0-2.5	Apparent	Nov-Jun	>60	---	High-----	Moderate.
Gy*:											
Grigsby----------	B	Occasional	Very brief to brief.	Dec-May	3.5-6.0	Apparent	Jan-Apr	>60	---	Low------	Low.
Skidmore---------	B	Occasional	Very brief	Dec-May	3.5-6.0	Apparent	Dec-Mar	>40	Hard	Low------	Moderate.
Morehead---------	C	Rare--------	---	---	0.5-2.5	Apparent	Dec-Apr	>60	---	Moderate	High.
HaF*:											
Helechawa--------	B	None--------	---	---	>6.0	---	---	>40	Hard	Low------	High.
Faywood----------	C	None--------	---	---	>6.0	---	---	20-40	Hard	High-----	Moderate.
HeF*:											
Helechawa--------	B	None--------	---	---	>6.0	---	---	>40	Hard	Low------	High.
Rock outcrop.											
JaB, JeD3--------- Jessietown	B	None--------	---	---	>6.0	---	---	20-40	Hard	Moderate	High.
JoF*:											
Jessietown-------	B	None--------	---	---	>6.0	---	---	20-40	Hard	Moderate	High.
Muse-------------	C	None--------	---	---	>4.0	Apparent	Jan-Apr	>40	Soft	High-----	High.
Rohan------------	D	None--------	---	---	>6.0	---	---	10-20	Hard	High-----	High.
KnA--------------- Knowlton	C	Rare--------	---	---	0-1.0	Apparent	Dec-Apr	>60	---	High-----	High.
LaD--------------- Latham	D	None--------	---	---	1.5-3.0	Perched	Jan-Apr	20-40	Soft	High-----	High.
LeF*:											
Latham-----------	D	None--------	---	---	1.5-3.0	Perched	Jan-Apr	20-40	Soft	High-----	High.
Gilpin-----------	C	None--------	---	---	>6.0	---	---	20-40	Soft	Low------	High.
Alticrest--------	B	None--------	---	---	>6.0	---	---	20-40	Hard	Low------	High.
LgE*:											
Latham-----------	D	None--------	---	---	1.5-3.0	Perched	Jan-Apr	20-40	Soft	High-----	High.
Gilpin-----------	C	None--------	---	---	>6.0	---	---	20-40	Soft	Low------	High.
LoD--------------- Lily	B	None--------	---	---	>6.0	---	---	20-40	Hard	Moderate	High.

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					Ft			In			
LyE*:											
Lily	B	None	---	---	>6.0	---	---	20-40	Hard	Moderate	High.
Gilpin	C	None	---	---	>6.0	---	---	20-40	Soft	Low	High.
Rigley	B	None	---	---	>6.0	---	---	>60	---	Low	High.
Ne	C	Frequent	Brief to long.	Jan-Apr	0.5-1.5	Apparent	Dec-May	>60	---	High	Low.
Newark											
Or	C	Occasional	Very brief to brief.	Jan-Apr	1.0-2.5	Apparent	Nov-Jun	>60	---	High	Moderate.
Orrville											
Pt*.											
Pits, quarries											
RdB	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
Rowdy											
RgA*:											
Rowdy	B	Occasional	Brief	Jan-Apr	>6.0	---	---	>60	---	Moderate	Moderate.
Grigsby	B	Occasional	Very brief to brief.	Dec-May	3.5-6.0	Apparent	Jan-Apr	>60	---	Low	Low.
SaF*:											
Shelocta	B	None	---	---	>6.0	---	---	>48	Hard	Low	High.
Gilpin	C	None	---	---	>6.0	---	---	20-40	Soft	Low	High.
SeE*:											
Shrouts	D	None	---	---	>6.0	---	---	20-40	Soft	High	Low.
Woolper	C	None	---	---	>6.0	---	---	>60	---	Moderate	Low.
WbD2, WbE2	B	None	---	---	>6.0	---	---	40-60	Soft	High	High.
Westbend											

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--PHYSICAL ANALYSIS OF SELECTED SOILS

(Dashes indicate that the material was not detected. The pedons are typical of their respective series in the survey area. For the location of the pedons, see the section "Soil Series and Their Morphology")

Soil name, report number, horizon, and depth in inches	Total			Size class and particle diameter (mm)							Textural class*
				Sand					Sand coarser than very fine sand (2-0.1)	Very fine sand plus silt (0.1-0.002)	
	Sand (2-0.05 mm)	Silt (0.05-0.002 mm)	Clay (<0.002 mm)	Very coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			
	Pct <2 mm										
Helechawa loamy sand: (86KY-237-1)											
A----- 0 to 3	83.4	7.0	9.6	1.6	8.4	15.3	44.8	13.3	70.1	20.3	ls
AB---- 3 to 12	79.5	10.3	10.2	0.3	3.0	10.9	48.8	16.5	63.0	26.8	sl/ls
Bw1---12 to 27	68.8	20.3	10.9	0.6	2.8	9.2	41.6	14.6	54.2	34.9	sl
Bw2---27 to 45	70.0	19.2	10.8	0.7	3.4	8.8	42.8	14.3	55.7	33.5	sl
Bw3---45 to 64	72.7	9.2	18.1	1.3	3.8	9.0	44.1	14.7	58.0	23.9	sl
Knowlton silt loam: (S86KY-197-2)											
Ap---- 0 to 6	30.1	59.3	10.6	0.8	3.8	6.5	11.6	7.4	22.7	66.7	sil
BE---- 6 to 17	30.1	52.9	17.0	0.5	2.8	4.8	11.7	10.3	19.8	63.2	sil
Btg1--17 to 27	21.9	58.5	19.6	0.4	2.0	3.3	8.5	7.7	14.2	66.2	sil
Btg2--27 to 46	20.6	54.8	24.6	0.1	1.7	2.9	7.8	8.1	12.5	62.9	sil
Btg3--46 to 66	12.0	59.4	28.6	0.2	0.9	1.6	4.5	4.8	7.2	64.2	sicl
Westbend silt loam: (87KY-197-1)											
A----- 0 to 2	8.9	73.9	17.2	3.2	2.9	1.1	0.1	0.7	8.2	74.6	sil
BA---- 2 to 7	4.5	74.6	20.9	1.4	1.4	0.7	0.5	0.5	4.0	75.1	sil
Bt1--- 7 to 19	1.8	68.0	30.2	0.3	0.7	0.2	0.3	0.3	1.5	68.3	sicl
Bt2---19 to 26	2.0	68.6	29.9	0.4	0.3	0.1	0.3	0.9	1.1	68.9	sicl
Bt3---26 to 33	1.0	61.7	37.3	0.2	0.3	0.1	0.2	0.2	0.8	61.9	sicl
BC----33 to 37	1.1	63.0	36.0	0.3	0.2	0.1	0.2	0.3	0.8	63.3	sicl
C-----37 to 45	14.7	53.6	32.4	8.0	3.0	0.9	1.2	1.6	13.1	55.2	sicl
Cr----45 to 55	0.9	67.7	31.4	0.3	0.1	---	0.2	0.3	0.6	68.6	sicl

* The letters ls mean loamy sand; sl, sandy loam; sil, silt loam; and sicl, silty clay loam.

TABLE 18.--CHEMICAL ANALYSIS OF SELECTED SOILS

(Dashes indicate that the material was not detected. The pedons are typical of their respective series in the survey area. For the location of the pedons, see the section "Soil Series and Their Morphology")

Soil name, report number, horizon, and depth in inches	pH		Extractable cations					Cation-exchange capacity				Base saturation		Organic matter	Calcium carbonate equivalent	Phosphorus	Potassium
	H_2O 1:1	KCl 1N 1:1	Ca	Mg	K	Na	Total (TEC)	Ammonium acetate	Sum of cations	Extractable acidity	Hydrogen plus aluminum	Ammonium acetate	Sum of cations				
			Milliequivalents per 100 grams of soil									Pct	Pct	Pct	Pct	Ppm	Ppm
Helechewa loamy sand: (86KY-237-1)																	
A---- 0 to 3	4.81	---	1.12	0.33	0.18	0.08	1.71	10.20	12.42	10.71	---	16.8	13.8	9.25	0	49	43
AB--- 3 to 12	4.76	---	0.31	0.04	0.04	0.09	0.48	3.44	8.24	7.74	---	14.0	5.8	1.24	0	9	29
Bw1--12 to 27	4.77	---	0.13	0.03	0.04	0.10	0.30	2.76	9.64	9.34	---	10.9	3.1	0.32	0	9	33
Bw2--27 to 45	4.93	---	0.19	0.11	0.06	0.08	0.44	2.80	6.38	5.94	---	15.7	6.9	0.24	0	9	48
Bw3--45 to 64	4.86	---	0.20	0.38	0.07	0.11	0.76	3.67	9.50	8.74	---	20.7	8.0	0.21	0	7	64
Knowlton silt loam: (S86KY-197-2)																	
Ap--- 0 to 6	5.04	---	1.37	0.08	0.07	0.14	1.66	4.40	8.5	6.80	---	37.7	19.5	1.56	0	11	55
BE--- 6 to 17	4.79	---	0.93	0.03	0.06	0.20	1.22	4.84	6.8	5.57	---	25.2	17.9	0.48	0	7	47
Btg1-17 to 27	4.56	---	0.55	0.08	0.08	0.22	0.93	4.58	9.6	8.68	---	20.3	9.7	0.29	0	5	68
Btg2-27 to 46	4.52	---	0.57	0.07	0.09	0.24	0.97	6.59	11.5	10.57	---	14.7	8.4	0.37	0	6	64
Btg3-46 to 66	4.59	---	0.49	0.11	0.14	0.10	0.84	8.55	13.6	12.74	---	9.8	6.2	0.36	0	4	115
Westbend silt loam: (87KY-197-1)																	
A---- 0 to 2	4.64	---	0.67	0.37	0.24	0.15	1.43	11.64	17.63	16.20	---	12.3	8.1	6.48	0.02	8	197
BA--- 2 to 7	4.69	---	0.12	0.38	0.20	0.15	0.85	8.23	8.95	8.10	---	10.3	9.5	1.31	0.03	5	188
Bt1-- 7 to 19	5.05	---	0.13	1.70	0.28	0.14	2.25	10.81	10.25	8.00	---	20.8	22.0	0.74	0.01	3	274
Bt2--19 to 26	5.07	---	0.11	2.48	0.27	0.16	3.02	8.69	11.22	8.20	---	34.7	26.9	0.41	0.02	3	270
Bt3--26 to 33	5.10	---	0.12	3.69	0.32	0.24	4.38	7.03	10.41	5.80	---	62.3	42.1	0.46	0.02	3	338
BC---33 to 37	5.02	---	0.20	4.06	0.32	0.27	4.85	7.91	10.35	5.50	---	61.3	46.8	0.34	0.02	3	346
C----37 to 45	6.02	---	0.59	4.49	0.30	0.37	5.75	8.17	9.25	3.50	---	62.7	62.1	0.41	0.07	2	323
Cr---45 to 55	6.36	---	0.64	4.65	0.29	0.55	6.13	8.23	8.53	2.40	---	74.5	71.8	0.45	0.02	3	342

TABLE 19.--SAND MINERALOGY OF SELECTED SOILS

(Dashes indicate that the mineral was not detected. The pedons are typical of their respective series in the survey area. For the location of the pedons, see the section "Soil Series and Their Morphology")

Soil name, report number, horizon, and depth in inches	Percent resistant minerals		Percent weatherable minerals			
	Quartz	Total resistant minerals	Vermiculite	Kaolinite	Potassium feldspar	Mica
Knowlton silt loam: (S86KY-197-1)						
BE------ 6 to 17	86	86	---	4	5	5
Btg1---- 17 to 27	89	89	---	---	4	7
Btg2---- 27 to 46	84	84	---	3	4	9
Westbend silt loam: (87KY-197-1)						
Bt1----- 7 to 19	69	69	---	---	22	9
Bt2----- 19 to 26	60	60	4	12	14	10
Bt3----- 26 to 33	62	62	---	---	17	13

TABLE 20.--ENGINEERING INDEX TEST DATA

(The pedon is typical of the series in the survey area. For the location of the pedon, see the section "Soil Series and Their Morphology")

Soil name, report number, horizon, and depth in inches	Classification		Grain-size distribution											Liquid limit	Plasticity index	Moisture density		Specific gravity
			Percentage passing sieve--								Percentage smaller than--							
	AASHTO	Unified	3 in.	2 in.	3/4 inch	3/8 inch	No. 4	No. 10	No. 40	No. 200	.02 mm	.005 mm	.002 mm			Maximum dry density	Optimum moisture	
														Pct		Lb/cu ft	Pct	
Knowlton silt loam: (87KY-187-1)																		
BE, Btg1-- 6 to 27	A-4	CL-ML	100	100	100	100	100	100	100	89	64	25	15	23	5	112.0	15.0	2.71
Btg2-- 27 to 46	A-4	CL	100	100	100	100	100	100	100	79	63	34	23	29	8	109.0	18.0	2.71

TABLE 21.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Allegheny	Fine-loamy, mixed, mesic Typic Hapludults
Alticrest	Coarse-loamy, siliceous, mesic Typic Dystrochrepts
Berks	Loamy-skeletal, mixed, mesic Typic Dystrochrepts
Bethesda	Loamy-skeletal, mixed, acid, mesic Typic Udorthents
Bledsoe	Fine, mixed, mesic Typic Hapludalfs
Carpenter	Fine-loamy, mixed, mesic Ultic Hapludalfs
Cotaco	Fine-loamy, mixed, mesic Aquic Hapludults
Fairpoint	Loamy-skeletal, mixed, nonacid, mesic Typic Udorthents
Faywood	Fine, mixed, mesic Typic Hapludalfs
Gilpin	Fine-loamy, mixed, mesic Typic Hapludults
Grigsby	Coarse-loamy, mixed, mesic Dystric Fluventic Eutrochrepts
Hazleton	Loamy-skeletal, mixed, mesic Typic Dystrochrepts
Helechawa	Coarse-loamy, siliceous, mesic Typic Dystrochrepts
Jessietown	Fine-silty, mixed, mesic Typic Hapludults
Knowlton	Fine-silty, mixed, mesic Typic Ochraquults
Latham	Clayey, mixed, mesic Aquic Hapludults
Lily	Fine-loamy, siliceous, mesic Typic Hapludults
Morehead	Fine-silty, mixed, mesic Aquic Hapludults
Muse	Clayey, mixed, mesic Typic Hapludults
Newark	Fine-silty, mixed, nonacid, mesic Aeric Fluvaquents
Orrville	Fine-loamy, mixed, nonacid, mesic Aeric Fluvaquents
Ramsey	Loamy, siliceous, mesic Lithic Dystrochrepts
Rigley	Coarse-loamy, mixed, mesic Typic Hapludults
Rohan	Loamy-skeletal, mixed, mesic Lithic Dystrochrepts
Rowdy	Fine-loamy, mixed, mesic Fluventic Dystrochrepts
Shelocta	Fine-loamy, mixed, mesic Typic Hapludults
Shrouts	Fine, mixed, mesic Typic Hapludalfs
Skidmore	Loamy-skeletal, mixed, mesic Dystric Fluventic Eutrochrepts
Westbend	Fine-silty, mixed, mesic Typic Hapludalfs
Woolper	Fine, mixed, mesic Typic Argiudolls

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