USDA United States Department of Agriculture

Natural Resources Conservation Service

In cooperation with Kentucky Natural Resources and Environmental Protection Cabinet and Kentucky Agricultural Experiment Station

Soil Survey of Breathitt County, Kentucky

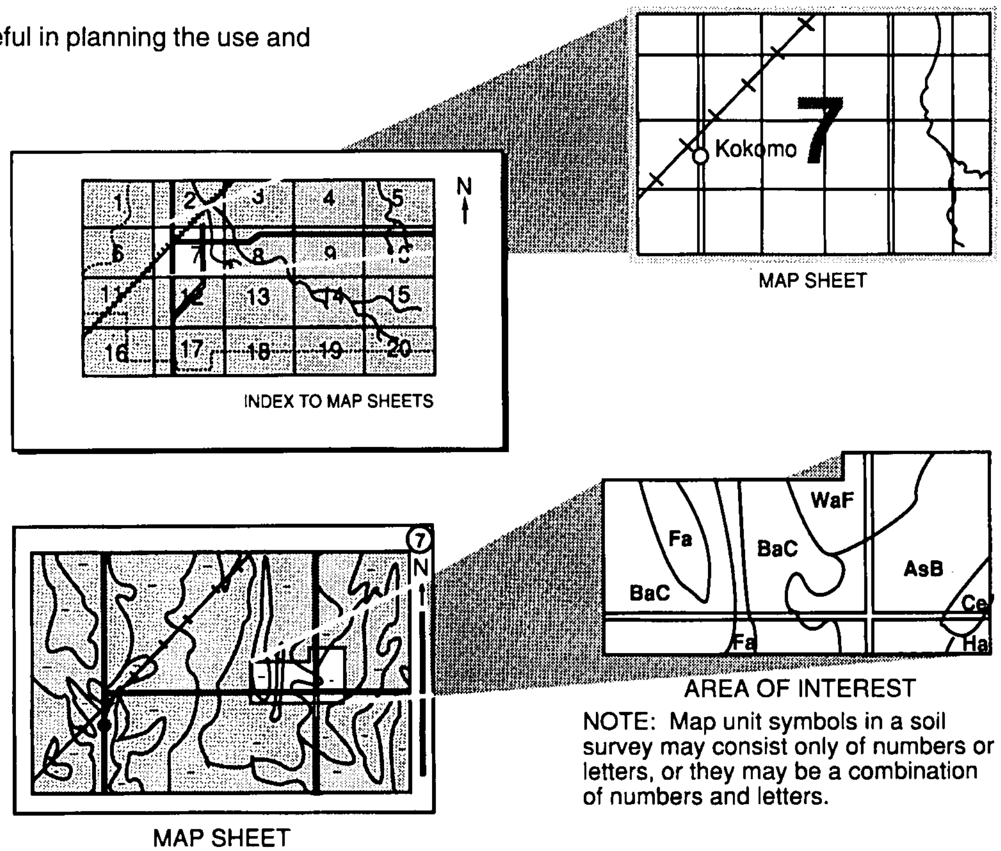
How to Use This Soil Survey

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

To find information about your area of interest, locate that area on the **Index to Map Sheets**, 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 units symbols that are in that area. Turn to the **Contents**, which lists the map units by symbol and name and shows the page where each map unit is described.

The **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.



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

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

Major fieldwork for this soil survey was completed in 1991. Soil names and descriptions were approved in 1991. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1991. The extent of the areas surface mined for coal, however, is based on aerial photographs taken in 1983-85. This survey was made cooperatively by the Natural Resources Conservation Service, the Kentucky Agricultural Experiment Station, and the Kentucky Natural Resources and Environmental Protection Cabinet. The survey is part of the technical assistance furnished to the Breathitt 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 Natural Resources Conservation Service are offered on a nondiscriminatory basis, without regard to race, color, national origin, religion, sex, age, marital status, or handicap.

Cover: Swinging bridge crossing a stream to a homesite. Along the stream is an area of the Grigsby-Rowdy complex, frequently flooded.

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Issued 1998

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Foreword

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

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

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

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

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

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State Conservationist
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Soil Survey of
Breathitt County, Kentucky

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

BREATHITT COUNTY is in the Appalachian Plateau of eastern Kentucky (fig. 1). It has an area of 495 square miles, or 316,896 acres. The 1990 census lists the population of the county as 15,703, a decrease of 1,301 from the 1980 census. The county is bounded on the north and east by Wolfe, Magoffin, and Knott Counties; on the south by Perry County; and on the west by Owsley and Lee Counties.

The topography of Breathitt County is hilly and mountainous and is characteristic of the Mountains and Eastern Coal Fields Physiographic Region (*4*). Most of the population is settled along narrow, tributary streams of the North and Middle Forks of the Kentucky River. Elevation of the valley floor is about 700 feet, but the ridges increase in elevation from about 1,200 feet in the northern part of the county to about 1,600 feet in the southern part.

The economy of the county is based on coal mining and farming. The farming areas of the county are restricted to flood plains. Several large coal mines are active in the county; large areas, mostly in the southeastern part of the county, have been strip mined.

This soil survey updates the survey of eastern Kentucky published in 1965 (*15*). It provides updated series names and descriptions, larger maps that show the soils in greater detail, and additional information.

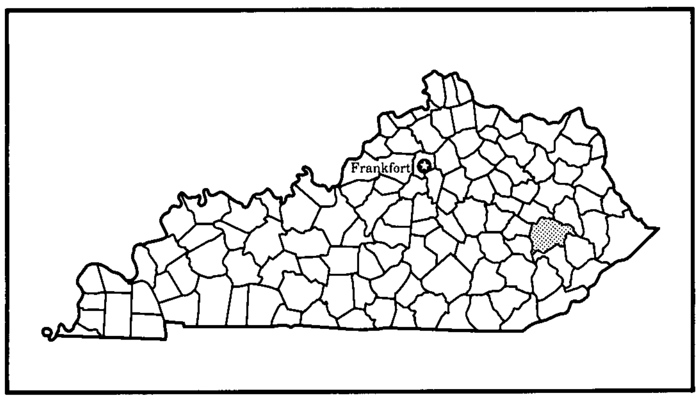

Figure 1.—Location of Breathitt County in Kentucky.

General Nature of the Survey Area

This section gives general information about Breathitt County. It discusses history and settlement; geology, relief, and drainage; natural resources; farming; and the climate of the area.

History and Settlement

Breathitt County was 89th in order of formation of Kentucky Counties. Formed in 1839 from parts of Clay, Perry, and Estill Counties, it was named for John Breathitt, former Governor of Kentucky (*14*).

Figure 2.—This area was strip mined for coal and then was reclaimed. It is on Fairpoint and Bethesda soils, benched, 2 to 70 percent slopes.

The area was isolated within the Appalachian Plateau, and so attracted the sturdiest pioneer families, mostly from Virginia and North Carolina. However, the remoteness of the area has profoundly affected development in the county (*1*).

The mountainous topography of the survey area was a major problem in the development of the county. Settlement was restricted to the flood plains of the North and Middle Forks of the Kentucky River and along the narrow valleys of tributary streams. The steep hills or mountains adjoining the valleys isolated the communities from each other and restricted contact with trade centers. The cost to construct a farm-to-market road system was prohibitive. Consequently, farm produce was carried on log rafts on streams during periods of high water to market centers.

In 1929, Kentucky Highway 15, which bisected Breathitt County from north to south, was constructed from Winchester, Kentucky, to Wise, Virginia. Kentucky Highway 15, after redesign and relocation in 1961-63, became the first modern highway through the county.

The first railroad was built into Breathitt County in 1890, and later was continued further south. The railroad transported to market the natural resources of the county, mainly coal and lumber.

Robinson Lumber Company, an industry giant, purchased a large tract of land in the southeastern section of Breathitt County and operated a band sawmill in Quicksand for about 17 years. When the virgin timber was cut and marketed, the company donated the land to the University of Kentucky. Thus, the University of Kentucky Robinson Experiment Station was established. Robinson Forest, located in Breathitt and Knott Counties, is one of the largest pristine areas in eastern Kentucky.

Geology, Relief, and Drainage

The upland soils of Breathitt County are underlain by interbedded sandstone, siltstone, shale, and limestone of the Pennsylvanian system. Soils on flood plains and terraces formed in quaternary alluvial sediments (*16*).

The most extensive geology is the level-bedded, sedimentary rocks of the Breathitt Formation. These materials are of the Lower and Middle Pennsylvanian system. They have several seams of coal varying in thickness from a few inches to more than 100 inches.

Rock strata consist of sandstone, siltstone, shale, and coal. Sandstone generally is fine to coarse grained and micaceous. It is light to medium-dark gray and weathers to yellowish gray. It is thinly laminated and locally massive. Siltstone generally is medium dark gray and weathers to yellowish gray. It is micaceous in many places and is interlaminated with fine grained sandstone or claystone. Shale generally is medium dark gray and weathers to yellowish gray or olive gray. Siderite nodules are common, and many areas have silty limestone concretions. The coal in Breathitt County is largely banded, attrital coal that has several partings of shale, clay, or flint. Cutshin, Dekalb, Gilpin, Hazelton, Latham, Kimper, and Marrowbone soils are the major soils that formed in material weathered from the Breathitt Formation.

The topography of Breathitt County is very steep and mountainous and comprises large areas of rock bluffs and ledges and small areas of rubbleland. It has dominantly long, very narrow ridgetops and highly dissected mountain slopes and deep coves. Elevation ranges from about 700 to 1,600 feet across the county.

The county is dissected by a dendritic pattern of streams that empty into the North and Middle Forks of the Kentucky River. The major streams are Frozen Creek, Lost Creek, Quicksand Creek, South Fork of Quicksand Creek, and Troublesome Creek.

Natural Resources

Coal is the most profitable mineral resource in Breathitt County. It has been commercially mined in the county since the late 19th century. Numerous bituminous coal seams ranging from a few inches to several feet in thickness occur in the sedimentary rock of the Pennsylvanian System. Most coal seams currently being mined are about 2 to 5 feet thick.

Several mining methods have been used to extract the coal, including contour stripping, auger mining, mountaintop removal, and deep mining. Before mining began, the land generally was used as woodland. After mining, most areas have been reclaimed to grasses, legumes, shrubs, and trees (fig. 2). Nearly level areas have been seeded dominantly to grasses and legumes. Generally, steep outslopes have been seeded or planted to several varieties of trees in combination with grasses and legumes.

Petroleum and natural gas wells are scattered throughout the county. Oil and gas deposits were discovered mainly in the Silurian-aged bedrock, which lies below the Pennsylvanian bedrock.

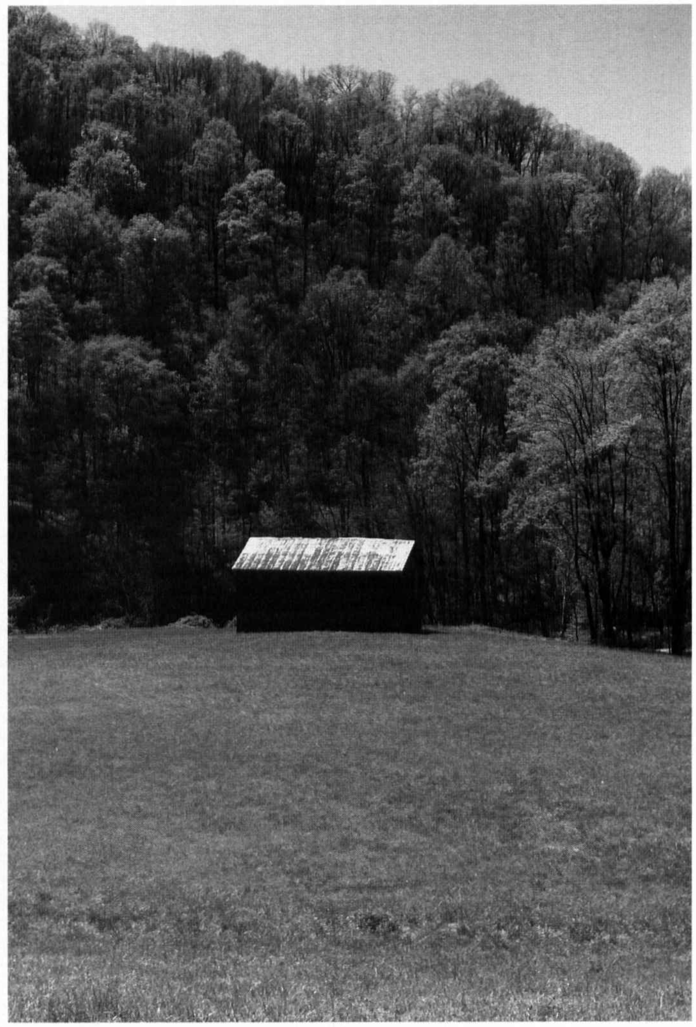

Figure 3.—The bottomland in the foreground along the Middle Fork of the Kentucky River is used as hayland. The soils on the bottomland are the Nolin-Grigsby complex, occasionally flooded. In the background, most undisturbed mountain slopes are woodland. Second-growth timber is generally the oak-hickory forest type.

Farming

Breathitt County is dominantly forested. The agricultural land is confined to the narrow flood plains of the Middle and North Forks of the Kentucky River and to tributary streams (fig. 3). According to the 1990-91 Kentucky Agricultural Statistic Report, the county had 296 farms with a combined acreage of 43,737 acres. Farms covered about 14 percent of the land in the county. Although cash receipts vary yearly, in 1990 receipts amounted to $2,460,000 from crops and to $500,000 from livestock.

Corn and tobacco were the main crops in 1990. Burley tobacco was the chief cash crop. Corn was grown for feed and as a cash crop. About 800 acres of corn and 595 acres of burley tobacco were harvested during this period.

Figure 4.—Farmstead and pastureland in an area of Nolin-Grigsby complex, occasionally flooded.

Hay crops and pasture, which are grown for feed, are produced in mixtures of grasses and legumes (fig. 4). The principal hay crops are red clover, timothy, orchardgrass, and Kentucky 31 fescue. The most common pasture plants are Kentucky 31 fescue and orchardgrass. Red clover and white clover are commonly the dominant legumes in pasture mixtures.

According to the 1990-91 Kentucky Agricultural Statistics, 1,100 head of cattle and 900 head of hogs were in Breathitt County.

Climate

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

Winters are cold and snowy at higher elevations in Breathitt County. In valleys, winters also are frequently cold, but intermittent thaws preclude a long-lasting snow cover. Summers are fairly warm on mountain slopes and very warm with occasional very hot days in valleys. Rainfall is evenly distributed during the year, but is appreciably heavier on the windward, west-facing slopes than in valleys. Normal annual precipitation is adequate for all crops, although summer temperature and growing season length, particularly at higher elevations, may be inadequate.

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

Table 1 gives data on temperature and precipitation for the survey area as recorded at Jackson, Kentucky, in the period 1951-90. 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 on January 22, 1984, is -18 degrees. In summer, the average temperature is 74 degrees and the average daily maximum temperature is 89 degrees. The highest recorded temperature, which occurred on August 17, 1988, is 102 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 inches. Of this, 20 inches, or 50 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 24 inches. The heaviest 1-day rainfall during the period of record was 4.09 inches on August 24, 1965. Thunderstorms occur on about 55 days each year, and most occur in summer.

The average seasonal snowfall is about 16 inches. The greatest snow depth at any one time during the period of record was 15 inches. On the average, 13 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 64 percent of the time possible in summer and 44 percent in winter. The prevailing wind is from the south. Average windspeed is highest, 8 miles per hour, in spring.

Winters are cold and showy at higher elevations in Breathitt County. In valleys, it is also frequently cold, but intermittent thaws preclude a long-lasting snow cover. Summers are fairly warm on mountain slopes and very warm with occasional very hot days in the valleys. Rainfall is evenly distributed during the year, but it is appreciably heavier on the windward, west-facing slopes than in the valleys. Normal annual precipitation in adequate for all crops, although summer temperature and growing season length, particularly at higher elevations, may be inadequate.

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

How This Survey Was Made

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

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

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

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

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

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

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

Detailed Soil Map Units

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

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

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

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

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

Soils are rated as to their suitability. They are divided into three groups: well suited, suited, and poorly suited.

Soils that are well suited have favorable properties for the specified use and limitations are easy to overcome. Good performance and low maintenance can be expected.

Soils that are suited have moderately favorable properties for the selected use. One or more properties make these soils less desirable than well suited soils.

Soils that are poorly suited have one or more properties unfavorable for the selected use. Overcoming the limitations require special designs, extra maintenance, or costly operation.

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

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Allegheny loam, 6 to 12 percent slopes, is a phase of the Allegheny series.

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

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Cloverlick-Shelocta-Cutshin complex, 20 to 70 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Fairpoint and Bethesda soils, 0 to 20 percent slopes, is an undifferentiated group in this survey area.

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

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 or miscellaneous areas.

AlB—Allegheny loam, 2 to 6 percent slopes

This very deep, well drained, gently sloping soil is on stream terraces along the major waterways. Mapped areas of this soil are long and narrow to broad and range from about 10 to 20 acres.

Typically, the surface layer is dark yellowish brown loam about 6 inches thick. The subsoil extends to a depth of about 65 inches. The upper part to a depth of about 40 inches is yellowish brown loam. The lower part is strong brown, mottled loam.

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

Included with this soil in mapping are spots where most of the topsoil has been removed by erosion. Also included are small areas of Rowdy soils and small areas of soils that have more silt in the subsoil. Also included are small wet spots and areas that are less than 60 inches to bedrock. Some low areas may be subject to rare or occasional flooding for brief periods of time. Included soils make up about 10 to 15 percent of this map unit and are generally less than 2 acres.

This soil is used extensively for row crops, hay, and pasture. Many areas are used for home sites and urban development.

This soil is well suited to all commonly grown row crops and small grains. Conservation practices that help to control erosion, build tilth, and improve fertility are needed. Conservation tillage, crop residue management, use of cover crops, grasses and legumes included in the cropping sequence, and application of lime and fertilizer help to maintain desirable soil structure, soil fertility, and organic matter content.

This soil also is suited to most pasture and hayland. All the commonly grown grasses and legumes grow well on this soil. Management concerns include proper stocking rates, a well planned clipping and harvesting schedule, weed control, use of lime and fertilizer, and rotational grazing. Renovation of pastures should be frequent enough to maintain desired plants.

This soil is well suited to woodland, but only a small acreage is wooded. Native trees include yellow-poplar, upland oaks, maples, and pines. Some trees preferred for planting are eastern white pine, yellow-poplar, shortleaf pine, and white oak. The main management concern is plant competition. When openings are made in the canopy, uncontrolled, invading brushy plants can delay natural regeneration.

This soil is well suited to most urban uses. Seepage and steepness of slope are limitations for some sanitary facilities. Proper design and installation and good site preparation can help to overcome some of these limitations.

The capability subclass is IIe.

AlC—Allegheny loam, 6 to 12 percent slopes

This very deep, well drained, sloping soil is on stream terraces and foot slopes along the major waterways. Areas of this soil are long and narrow or broad and range from about 10 to 30 acres.

Typically, the surface layer is dark yellowish brown loam about 6 inches thick. The subsoil extends to a depth of about 65 inches. The upper part to a depth of about 40 inches is yellowish brown loam. The lower part is strong brown, mottled loam.

Permeability is moderate. The available water capacity is high. Natural fertility is medium and content of organic matter is moderate. The soil has good tilth and can be worked throughout a wide range of moisture content. The root zone is very deep and depth to bedrock is more than 60 inches.

Included with this soil in mapping are spots where most of the surface soil has been removed by erosion. Also included are small areas of soils on higher elevations that have a red subsoil and areas that are less than 60 inches to bedrock. Also included are small areas of Rowdy soils and soils that have more silt in the subsoil. Included soils make up about 10 to 15 percent of this map unit and are generally less than 5 acres in size.

This soil is used extensively for row crops, hay, and pasture. Many areas are used for home sites and urban development.

This soil is suited to most row crops grown in the area. Steepness of slope is the main limitation. Conservation practices that help to control erosion, build tilth, and improve fertility are needed. Conservation tillage, crop residue management, use of cover crops, grasses and legumes included in the cropping sequence, and application of lime and fertilizer help to maintain desirable soil structure, soil fertility, and organic matter content.

This soil is well suited to pasture and hayland. All the commonly grown grasses and legumes grow well on this soil. Management concerns include proper stocking rates, a well planned clipping and harvesting schedule, weed control, use of lime and fertilizer, and rotational grazing. Pasture renovation should be frequent enough to maintain desired plants.

This soil is well suited to woodland, but most areas have been cleared and are used for home sites and cultivated crops. Common native trees include yellow-poplar, upland oaks, maples, and pines. Some trees preferred for planting are eastern white pine, yellow-poplar, shortleaf pine, and white oak. The main management concern on woodland is plant competition. When openings are made in the canopy, uncontrolled, invading brushy plants can delay natural regeneration.

This soil is suited to most urban uses. Seepage and steepness of slope are limitations for some sanitary facilities. Proper design, installation, and site preparation can help to overcome some of these limitations.

The capability subclass is IIIe.

AlD3—Allegheny loam, 12 to 20 percent slopes, severely eroded

This very deep, well drained, moderately steep soil is on stream terraces and foot slopes along the major tributary streams. Erosion has removed more than 75 percent of the original surface layer. Most areas have rills or shallow gullies. Mapped areas range from about 10 to 50 acres in size.

Typically, the surface layer is brown loam about 4 inches thick. The subsoil extends to a depth of about 65 inches. The upper part, to a depth of about 40 inches, is yellowish brown loam. The lower part is strong brown, mottled loam.

Permeability is moderate. The available water capacity is high. Natural fertility and content of organic matter are low. The root zone is very deep and depth to bedrock is more than 60 inches.

Included in mapping are areas similar to the Allegheny soil but that are less than 60 inches to bedrock. Also included are soils that formed partly in colluvium, residuum, or both, and soils that have a red subsoil. Also included in this delineation along the Middle and North Forks of the Kentucky River are small areas of Shelocta soil. The included soils are commonly small but make up as much as 25 percent of some delineations.

This soil is used mostly for pasture and hayland. Some areas are idle and are reverting to brush and woodland.

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

This soil is suited to pasture and hayland. Most of the commonly grown grasses and legumes grow well on this soil. Management concerns include applications of lime and fertilizer, proper stocking rates, rotational grazing, a well planned clipping and harvesting schedule, and control of undesirable vegetation. Use of farm equipment is somewhat restricted by steepness of slope.

This soil is well suited to woodland. Native tree species are shortleaf pine, yellow-poplar, Virginia pine, and sugar maple. Some preferred trees for planting are eastern white pine, yellow-poplar, shortleaf pine, and white oak. Management concerns on woodland on this soil are plant competition, erosion hazard, and the equipment limitation. When openings are made in the canopy, uncontrolled, invading brushy plants can delay natural regeneration.

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

The capability subclass is VIe.

CsE—Cloverlick-Shelocta-Cutshin complex, 20 to 70 percent slopes

The soils in this complex consist of deep and very deep, well drained, steep and very steep soils formed mainly in colluvium on side slopes. They occur on the higher mountains in the southern part of the county. These mountains crest at an elevation of 1,300 to 1,600 feet. The soils in this complex occupy the cool slopes that are inclined toward the north and east. The shape of the slopes are commonly linear, concave, and broken by narrow, discontinuous, horizontal benches. Delineations range from about 50 to 500 acres or more.

Cloverlick and similar soils make up about 44 percent of this complex, Shelocta and similar soils about 38 percent, and Cutshin and similar soils about 12 percent. Contrasting soils included in this complex make up about 6 percent.

The Cloverlick soil is on linear slopes and on the head slopes of coves throughout the delineation. The Shelocta soil is on concave side slopes. The Cutshin soil is mainly on benches and on the lower slopes of coves. The soils in this unit occur as areas so closely intermingled that they could not be separated at the scale selected for mapping.

Typically, the Cloverlick soil has a very dark grayish brown silt loam surface layer about 6 inches thick. A subsurface layer from 6 to 10 inches is dark yellowish brown silt loam. The subsoil extends to a depth of about 60 inches. The upper part, to a depth of about 19 inches, is strong brown loam. The middle part, to a depth of about 41 inches, is yellowish brown very flaggy and very channery loam. The lower part is mottled brownish yellow, strong brown, and light yellowish brown extremely flaggy loam. Similar soils have an eroded surface layer.

Typically, the Shelocta soil has a brown channery loam surface layer about 7 inches thick. The subsoil extends to a depth of about 60 inches. The upper part, to a depth of about 47 inches, is strong brown channery silt loam. The lower part is strong brown channery silty clay loam. Similar soils have a loam or clay loam or a dark surface layer.

Typically, the Cutshin soil has a dark brown loam surface layer about 18 inches thick. The subsoil extends to a depth of about 60 inches. The upper part, to a depth of about 35 inches, is brown clay loam. The lower part is dark yellowish brown clay loam and channery clay loam. Similar soils have a dark surface layer that is less than 8 inches thick; some contain either less clay or less sand in the subsoil.

The Shelocta soil is medium in natural fertility. The Cutshin and Cloverlick soils are high in natural fertility. The organic matter content is low or moderate in the Shelocta soil and moderate or high in the Cutshin and Cloverlick soils. Permeability is moderate. The available water capacity is high, except for the Cloverlick soil, which is moderate. The root zone and depth to bedrock are more than 40 inches.

Contrasting inclusions in this map unit are areas of Dekalb, Gilpin, Hazleton, Latham, and Marrowbone soils and a few small areas of rock outcrop. Dekalb and Marrowbone soils are commonly found on nose slopes or points. Gilpin soils can be found throughout the complex. Latham soils are on narrow benches. Hazleton soils are in small areas of included warm slopes and in areas that were once cleared for farming. The included soils and rock outcrop make up about 6 percent of the complex.

Most areas are used as woodland.

This complex is poorly suited to production of row crops, hay, or pasture because of steepness of slope and a very severe erosion hazard. Grasses and legumes are difficult to establish and maintain because of limitations on the use of farm machinery.

This complex is well suited to growing trees. Productivity is high. Native trees include yellow-poplar, red and sugar maples, black oak, white oak, Eastern hemlock, and various hickories. Also included are numerous minor species. Many old fields have reverted to almost pure stands of yellow-poplar. Common understory plants include flowering dogwood, redbud, hydrangea, and greenbrier. Some trees preferred for planting are yellow-poplar, white ash, northern red oak, and eastern white pine.

Management concerns of woodland on this complex are the hazard of erosion, the equipment limitation, and plant competition. Careful use of wheeled and tracked equipment can reduce disturbing the surface layer. When openings are made in the canopy, uncontrolled, invading brushy plants can delay natural regeneration. Woodland wildlife habitat potential is good, but can be improved and maintained by providing food, cover, and places to nest or den.

This complex is poorly suited to urban uses. Steepness of slope is a limitation.

The capability subclass is VIIe.

DmE—Dekalb-Marrowbone-Latham complex, very rocky, 6 to 70 percent slopes

This complex consists of moderately deep, well drained and moderately well drained soils that formed in material weathered from acid sandstone, siltstone, and shale. These soils are on the upper one-third of steep hillsides throughout the survey area. The landscapes generally are ridges, nose slopes, saddles, and adjoining steep side slopes. The slopes are mostly convex and range from 6 to 70 percent. Areas are mostly narrow and elongated and range from 20 to several hundred acres in size.

Dekalb soils make up about 35 percent of this complex, Marrowbone soils about 25 percent, and Latham soils about 13 percent. Included soils and rock outcrop make up about 27 percent. The soils in this unit occur as areas so closely intermingled that they could not be separated at the scale selected for mapping.

Typically, the surface layer of the Dekalb soil is very dark grayish brown channery loam about 2 inches thick. The subsoil extends to a depth of about 26 inches. It is yellowish brown very channery loam. Sandstone bedrock is at a depth of about 26 inches.

Permeability of the Dekalb soil is rapid. The available water capacity is low. The root zone is moderately deep, but penetration may be restricted by rock fragments. Natural fertility is low and the content of organic matter is moderate or low. The depth to bedrock is 20 to 40 inches.

Typically, the surface layer of the Marrowbone soil is dark yellowish brown loam about 4 inches thick. The subsoil, to a depth of about 24 inches, is yellowish brown loam and channery loam. Sandstone bedrock is about 24 inches.

Permeability in the Marrowbone soil is moderately rapid. The available water capacity is low. The root zone is moderately deep and is easily penetrated by roots. Natural fertility is low and the content of organic matter is moderate or low. The depth to bedrock is 20 to 40 inches.

Typically, the surface layer of the Latham soil is dark grayish brown silt loam about 4 inches thick. The subsoil extends to a depth of about 30 inches. The upper part, to a depth of about 7 inches, is yellowish brown silt loam. The lower part is strong brown silty clay that is mottled below a depth of 14 inches. Soft, weathered shale is at a depth of about 30 inches and extends to a depth of about 36 inches. Siltstone bedrock is at a depth of about 36 inches.

Permeability of the Latham soil is slow. The available water capacity is moderate. The root zone is moderately deep. Natural fertility is low and content of organic matter is low or moderate. The depth to bedrock ranges from 20 to 40 inches. A seasonal high water table is perched at a depth of 18 to 36 inches.

Included with these soils in mapping are small areas of Gilpin and Hazelton soils and shallow soils that have a very channery subsoil. Also included are deep, well drained, loamy soils at the head of draws.

Most areas of these soils are woodland.

The soils in this complex are poorly suited to production of row crops, hay, or pasture because of steepness of slope, rockiness, and a severe erosion hazard. Grasses and legumes are difficult to establish and maintain because of limitations on the use of farm machinery.

These soils are suited to growing trees. Productivity is low. Native trees include scarlet oak, black oak, white oak, Virginia pine, and hickory. Common understory plants include flowering dogwood, redbud, red maple, greenbrier, and blueberry. Some trees preferred for planting are Eastern white pine, yellow-poplar, shortleaf pine, and white oak.

Management concerns of woodland are the hazard of erosion, the equipment limitation, and plant competition. Careful use of wheeled and tracked equipment can reduce disturbing the surface layer. When openings are made in the canopy, uncontrolled, invading brushy plants can delay natural regeneration. Woodland wildlife habitat potential is good, but can be improved and maintained by providing food, cover, and places to nest or den.

The soils in this complex are poorly suited to urban uses. Steepness of slope and rockiness are limitations.

This capability subclass is VIIe.

FbD—Fairpoint and Bethesda soils, 0 to 20 percent slopes

This unit consists of very deep, well drained, nearly level to moderately steep soils formed in disturbed soil and bedrock material as a result of strip mining for coal (fig. 5). This unit commonly occurs where the tops of hills have been removed to gain access to the underlying coal beds. Mining has taken place throughout the county, but extensively in the southeastern part. Most areas range in size from 10 to 200 acres or more.

In a typical area about 50 percent of the map unit is Fairpoint soil and 35 percent is Bethesda soil. Minor soils make up the rest. Individual areas of each soil are large enough to be mapped separately. Because of the present and predicted uses, however, the soils were mapped as one unit. Some areas contain only one of the soils, but many areas contain both.

Typically, the surface layer of the Fairpoint soil is dark brown channery loam about 5 inches thick. The substratum extends to a depth of about 60 inches. The upper part to a depth of about 38 inches is dark yellowish brown and yellowish brown very channery loam. The lower part is dark yellowish brown very channery loam.

The Fairpoint soil is medium in natural fertility. It is low in organic matter content. Permeability is moderately slow. The available water capacity is low or moderate. The root zone is very deep, but root penetration may be restricted by compact layers and rock fragments. The depth to bedrock is more than 60 inches.

Typically, the surface layer of the Bethesda soil is yellowish brown channery loam about 4 inches thick. The substratum extends to a depth of about 65 inches. The upper part, to a depth of about 21 inches, is pale yellow very channery loam. The lower part is light yellowish brown and yellowish brown very channery and extremely flaggy loam.

The Bethesda soil is low in natural fertility. It is low in organic matter content. Permeability is moderately slow. The available water capacity is low or moderate. The root zone is very deep, but root penetration may be restricted by compact layers and rock fragments. The depth to bedrock is more than 60 inches.

Included with this unit in mapping are small areas of Dekalb, Gilpin, Cloverlick, Hazleton, Kimper, Marrowbone, and Shelocta soils. Also included are soils that have a sandy loam texture in the subsoil, soils that have a pH of less than 3.5, and soils that are calcareous. The included soils commonly make up about 15 percent of the mapped areas.

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

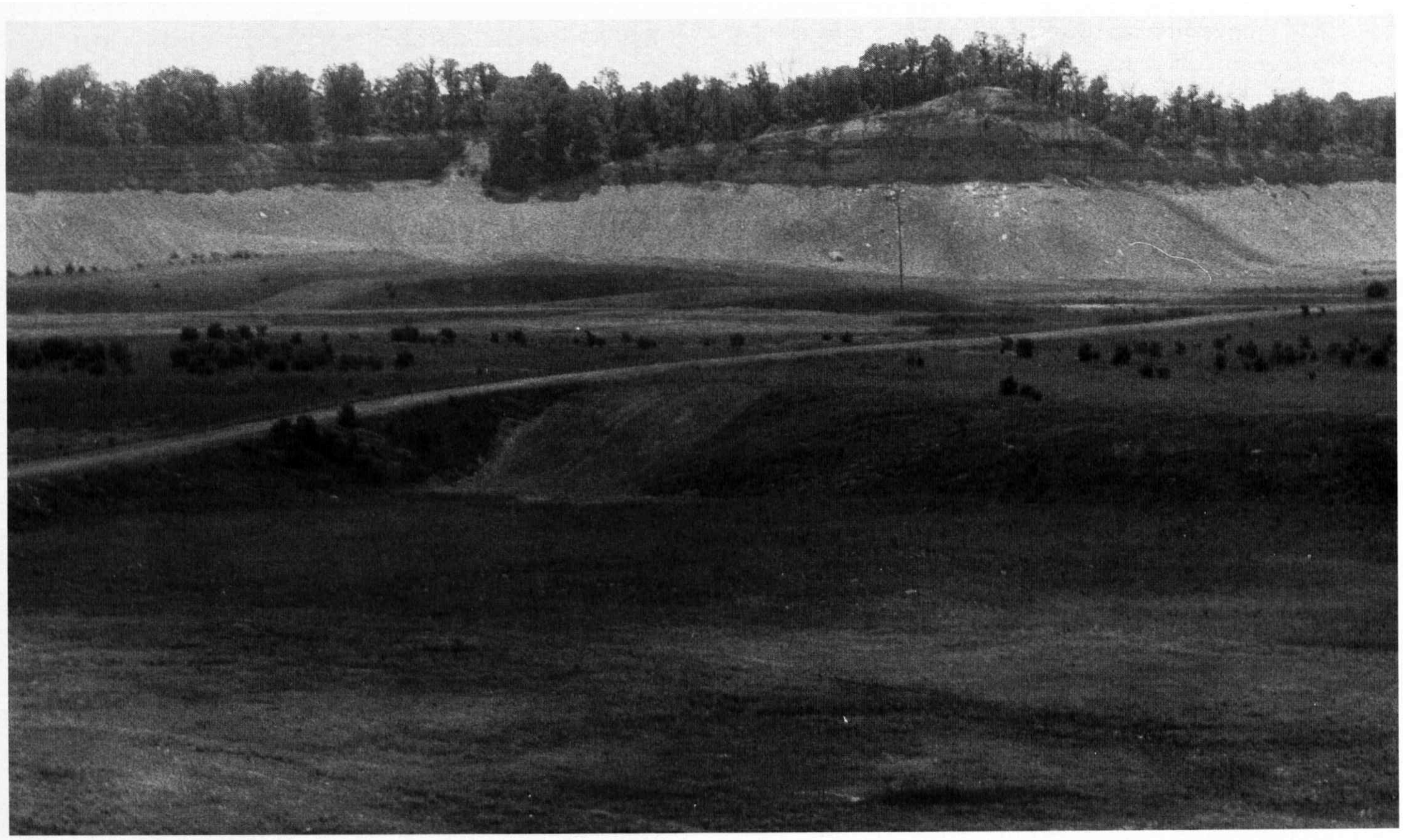

Figure 5.—This reclaimed strip mined area is in an area of Fairpoint and Bethesda soils, 0 to 20 percent slopes. The undisturbed woodland in the background in Robinson Forest is in an area of Dekalb-Marrow-Latham complex, very rocky, 6 to 70 percent slopes.

The soils in this map unit are poorly suited to cultivated crops because of steepness of slope and stoniness. In most areas, it is moderately suited to pasture and hay; however, grasses and legumes are difficult to establish. Rock fragments and large stones restrict the use of equipment, and differential settlement is a hazard in places.

This map unit is suited to woodland. Some trees preferred for planting are eastern white pine, shortleaf pine, black locust, and white oak. The main management concerns for woodland are the erosion hazard and the equipment limitation.

This map unit is poorly suited to most urban uses because of steepness of slope, differential settlement, unstable out slopes, and stoniness.

The capability subclass for both Fairpoint and Bethesda soils is VIs.

FbE—Fairpoint and Bethesda soils, benched, 2 to 70 percent slopes

This map unit consists of very deep, well drained, gently sloping to very steep soils formed in disturbed soil and bedrock material as a result of coal strip mining. Mapped areas are narrow benches where the side slopes have been contour mined or are small, irregularly shaped areas that have been disturbed to gain access to coal beds. Most mining has been in the southern part of the county, but some mining has occurred throughout. Benched strip mined areas usually range from about 2 to 2,000 acres or more and contain both reclaimed and nonreclaimed areas. Nonreclaimed areas often include a vertical bluff, locally known as a highwall, that ranges from about 10 to 50 feet high.

In a typical area about 50 percent of the map unit is Fairpoint soil and about 35 percent is Bethesda soil. Minor soils make up the rest. Individual areas of each soil are large enough to be mapped separately. Because of the present and predicted uses, however, the soils were mapped as one unit. Some areas contain only one of the soils, but many areas contain both.

Typically, the surface layer of the Fairpoint soil is dark brown channery loam about 5 inches thick. The substratum extends to a depth of about 60 inches. The upper part to a depth of about 38 inches is dark yellowish brown and yellowish brown very channery loam. The lower part is dark yellowish brown very channery loam.

The Fairpoint soil is medium in natural fertility. It is low in organic matter content. Permeability is moderately slow. The available water capacity is low or moderate. The root zone is very deep, but penetration may be restricted by compact layers and rock fragments. The depth to bedrock is more than 60 inches.

Typically, the surface layer of the Bethesda soil is yellowish brown channery loam about 4 inches thick. The substratum extends to a depth of about 65 inches. The upper part, to a depth of about 21 inches, is pale yellow very channery loam. The lower part is light yellowish brown and yellowish brown very channery and extremely flaggy loam.

The Bethesda soil is low in natural fertility. It is low in organic matter content. Permeability is moderately slow. The available water capacity is low or moderate. The root zone is very deep, but root penetration may be restricted by compact layers and rock fragments. The depth to bedrock is more than 60 inches.

Included with this unit in mapping are small areas of Dekalb, Gilpin, Cloverlick, Kimper, Hazleton, Shelocta, and Marrowbone soils. Also included are soils that have a sandy loam texture in the subsoil, soils that have pH of less than 3.5, and soils that are calcareous. The included soils commonly make up about 15 percent of mapped areas.

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

The soils in this map unit are poorly suited to cultivated crops, hay, and pasture. Steepness of slope, differential settling, unstable outslopes, and stoniness are limitations.

This map unit is suited to woodland. Some trees preferred for planting are eastern white pine, shortleaf pine, black locust, and white oak. The main management concerns for woodland are the erosion hazard and the equipment limitation.

This map unit is poorly suited to most urban uses because of steepness of slope, differential settlement, unstable outslopes, and stoniness.

The capability subclass for Fairpoint and Bethesda soils is VIIe.

Gr—Grigsby-Rowdy complex, frequently flooded

This complex consists of very deep, well drained, nearly level to gently sloping soils formed in alluvium on narrow flood plains and on low terraces along tributary streams of rivers. The Grigsby soil is on flood plains and the Rowdy soil is on low stream terraces slightly higher in elevation than the Grigsby soil. Mapped areas range from about 20 to 100 acres.

The Grigsby soil makes up about 65 percent of this complex and the Rowdy soil about 25 percent. Included soils make up the rest. The soils in this unit occur as areas so closely intermingled that they could not be separated at the scale selected for mapping.

Typically, the surface layer of the Grigsby soil is dark yellowish brown loam about 10 inches thick. The subsoil to a depth of about 45 inches and the substratum to a depth of about 60 inches are both yellowish brown loam.

This soil is high in natural fertility. It is moderate or low in content of organic matter. Permeability is moderate or moderately rapid. The available water capacity is high. This soil has good tilth and can be worked throughout a wide range of moisture content. The root zone is very deep. Depth to bedrock is more than 60 inches. A seasonal high water table is at a depth of 42 to 72 inches. This soil is subject to frequent flooding.

Typically, the surface layer of the Rowdy soil is brown loam about 6 inches thick. The subsurface layer, to a depth of about 16 inches, is dark yellowish brown silt loam. The subsoil, to a depth of about 43 inches, is yellowish brown silt loam in the upper part and yellowish brown loam in the lower part. The substratum to a depth of about 60 inches is mottled yellowish brown loam.

The Rowdy soil is medium in natural fertility. It is moderate or low in organic matter content. Permeability is moderate. The available water capacity is high. The soil has good tilth and can be worked throughout a wide range of moisture content. The root zone is very deep. Depth to bedrock is more than 60 inches. This soil is occasionally flooded during winter and early spring.

Included with this complex in mapping are areas of Allegheny soils on older, higher terraces. Also included are wet spots, gravelly and sandy soils associated with the confluence of waterways, and soils that are less than 60 inches to bedrock. In places areas have been filled to provide construction sites, parking areas, and other areas. These included soils make up about 10 percent of this complex, but individual areas are commonly small.

Most areas of this complex are used for production of row crops, hay, and pasture.

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

These soils are well suited to pasture and hayland. Management concerns include proper stocking rates, weed control, rotational grazing, pasture renovation, a well planned clipping and harvesting schedule, and application of lime and fertilizer.

This complex is well suited to woodland. Native species include yellow-poplar, American sycamore, black walnut, river birch, and sweetgum. Some trees preferred for planting are yellow-poplar, black walnut, eastern white

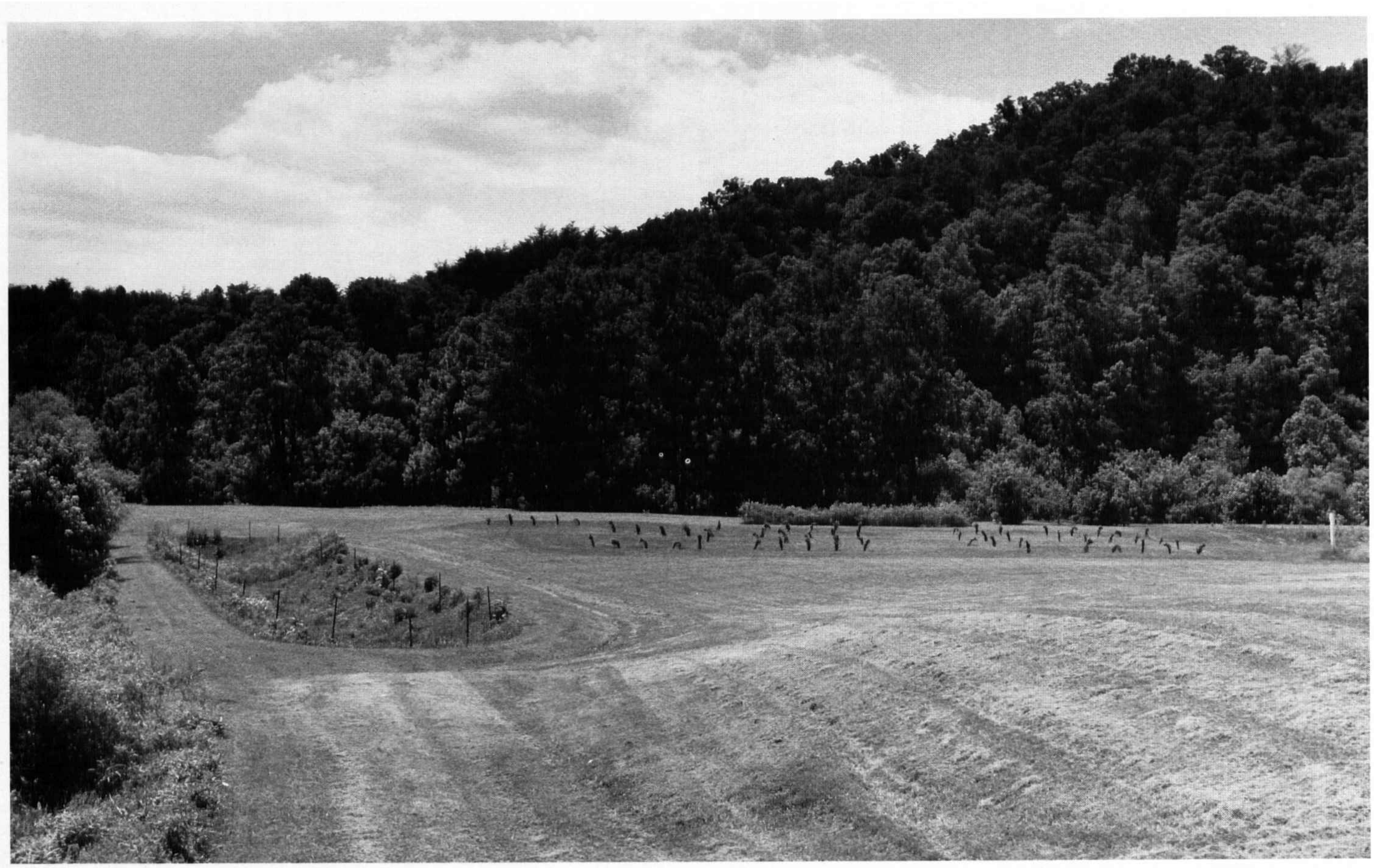

Figure 6.—Plant Materials Center at Quicksand. The performance test sites for conservation planting are in an area of Nolin-Grigsby complex, occasionally flooded.

pine, and white oak. The main concern for management of woodland on this complex is plant competition.

This complex is poorly suited to most urban uses. Flooding is a limitation for most building site developments and sanitary facilities. Seepage also is a limitation for some sanitary facilities.

The capability subclass is IIw.

Ng—Nolin-Grigsby complex, occasionally flooded

This complex consists of very deep, well drained soils formed in alluvium on flood plains along the narrow, elongated valleys of the Middle and North Forks of the Kentucky River. Slopes range from 0 to 4 percent. Mapped areas are about 5 to 100 acres in size (fig. 6).

The Nolin soil makes up about 50 percent of the complex and the Grigsby soil about 35 percent. Included soils make up the rest. The soils in this unit occur as areas so closely intermingled that they could not be separated at the scale selected for mapping.

Typically, the surface layer of the Nolin soil is brown silt loam about 10 inches thick. The subsoil extends to a depth of about 41 inches. The upper part, to a depth of about 29 inches, is dark yellowish brown silt loam, and the lower part is brown silt loam. The substratum to a depth of about 60 inches is dark yellowish brown silt loam.

The Nolin soil is high in natural fertility. It is moderate in organic matter content. Permeability is moderate. Available water capacity is high. This soil has good tilth and can be worked throughout a wide range of moisture content. The root zone is very deep and is easily penetrated by plants. This soil is occasionally flooded, mostly during late winter and early spring, but is not usually flooded during the growing season. In some months a seasonal high water table is at a depth of 36 to 72 inches. The depth to bedrock is more than 60 inches.

Typically, the surface layer of the Grigsby soil is dark yellowish brown loam about 10 inches thick. The subsoil to a depth of about 45 inches is yellowish brown loam. The substratum to a depth of about 60 inches is yellowish brown loam.

The Grigsby soil is high in natural fertility. It is moderate or low in content of organic matter. Permeability is moderate or moderately rapid. The available water capacity is high. This soil has good tilth and can be worked throughout a wide range of moisture content. The root zone is very deep. Depth to bedrock is more than 60 inches. A seasonal high water table is at a depth of 42 to 72 inches. This soil is subject to occasional flooding.

Included with this complex in mapping are areas of short, steep slopes that range to as much as 50 percent. Also included are small areas of Allegheny soils on terraces and areas of soils that have a thick, dark surface layer. Gravelly soils on alluvial fans at the mouths of drainageways also are included. Some areas have been filled to facilitate construction of buildings, parking areas, and other areas. Wet spots occur infrequently and the soils on lower elevations may be subject to frequent flooding.

This complex is well suited to most of the commonly grown row and specialty crops. Management and conservation practices are needed that maintain soil fertility, tilth, and organic matter content and provide surface and subsurface drainage in places.

This complex is suited to most of the commonly grown pasture and hay crops (fig. 7). Flooding in late winter or early spring may damage some hay crops. Management concerns include maintaining desired species, controlling weeds, using proper stocking rates and rotational grazing, and applying lime and fertilizer.

This complex is well suited to woodland. Native species include yellow-poplar, river birch, American sycamore, black walnut, and sweetgum. Some trees preferred for planting are yellow-poplar, black walnut, eastern white pine, white ash, and shortleaf pine. The main management concern of woodland on this complex is plant competition.

This complex is poorly suited to most urban uses. Flooding is a limitation for most building site developments and sanitary facilities.

The capability subclass is IIw.

SgE—Shelocta-Gilpin-Hazleton complex, 20 to 70 percent slopes

This complex consists of very deep to moderately deep, well drained, steep and very steep soils formed in colluvium and residuum on side slopes. It occurs both on the higher mountains in the southern part of the county that crest at an elevation of about 1,600 feet and on the lower mountains in the northern part that crest at about 1,300 feet. This complex occupies the warm slopes that are inclined toward the south and west. The shape of the

Figure 7.—Bottomland along the Middle Fork of the Kentucky River. Hayland is on Nolin-Grigsby complex, occasionally flooded.

slopes are commonly linear and broken by narrow, discontinuous, horizontal benches and rock outcrops. Stones and boulders are randomly scattered over the surface with the highest concentration occurring near drainageways. Delineations range from about 50 to 500 acres.

Shelocta and similar soils make up about 45 percent of this complex; Gilpin and similar soils about 20 percent; and Hazleton and similar soils about 20 percent. Contrasting soils and rock outcrop included in this complex make up about 15 percent. The Shelocta soil is dominant throughout the complex. The Gilpin soil is commonly found on the steeper part of side slopes, and the Hazleton soil is mainly on the middle to lower parts of linear side slopes. The soils in this unit occur as areas so closely intermingled that they could not be separated at the scale selected for mapping.

Typically, the Shelocta soil has a brown channery loam surface layer about 7 inches thick. The subsoil extends to a depth of about 60 inches. The upper part, to a depth of about 47 inches, is strong brown channery silt loam, and the lower part is strong brown channery silty clay loam. Similar soils have a loam or clay loam textured subsoil. Other soils have a thick, dark surface layer.

Typically, the Gilpin soil has a dark yellowish brown silt loam surface layer about 4 inches thick. The subsoil extends to a depth of about 33 inches. The upper part, to a depth of about 9 inches, is yellowish brown silt loam, and the lower part is strong brown silty clay loam. Soft, weathered shale is at a depth of about 33 inches.

Typically, the Hazleton soil is dark brown channery loam. The subsurface layer, to a depth of about 11 inches, is dark yellowish brown channery loam. The subsoil extends to a depth of about 53 inches. The upper part, to a depth of 19 inches, is yellowish brown channery loam, and the lower part is yellowish brown very channery loam. The substratum to a depth of 60 inches is yellowish brown very channery loam.

These soils are low in natural fertility. It is low or moderate in organic matter content. The available water capacity is high in the Shelocta soil and moderate in the Hazleton and Gilpin soils. Permeability is moderate in the Shelocta and Gilpin soils and moderately rapid in the Hazleton soil. The root zone and depth to bedrock is more than 40 inches in the Shelocta and Hazleton soils and 20 to 40 inches in the Gilpin soil.

Contrasting inclusions in this map unit include soils on narrow alluvial flood plains and soils that are less than 20 inches deep over bedrock. Dekalb, Latham, and Marrowbone soils are commonly found on nose slopes or crests. Cutshin soils and soils that have a thick, dark surface layer over a very channery subsoil also are included. Rock outcrop occurs in discontinuous, narrow bands. Stones and boulders are in some areas. Included soils and rock outcrop make up about 15 percent of this complex.

Most areas of this complex are used for woodland.

This complex is poorly suited to production of row crops, hay, or pasture because of steepness of slope and a very severe hazard of erosion. Grasses and legumes are difficult to establish and maintain because of limitations on the use of farm machinery.

This complex is suited to growing trees. Native trees include black oak, white oak, yellow-poplar, American beech, and red maple. Common understory plants include flowering dogwood, redbud, hydrangea, and greenbrier. Some trees preferred for planting are white oak, eastern white pine, and shortleaf pine.

Management concerns of woodland on this complex are the hazard of erosion, the equipment limitation, and plant competition. Careful use of wheeled and tracked equipment can reduce the disturbance of the surface layer. When openings are made in the canopy, uncontrolled, invading brushy plants can delay natural regeneration. Woodland wildlife habitat potential is good, but can be improved and maintained by providing food, cover, and places to nest or den.

The soils in this complex are poorly suited to urban uses. Steepness of slope is a limitation.

The capability subclass is VIIe.

SkE—Shelocta-Gilpin-Kimper complex, 20 to 70 percent slopes

This complex consists of very deep to moderately deep, well drained, steep and very steep soils formed in colluvium and residuum on side slopes. They are mainly in the northern part of the county where the mountains crest at an elevation of about 1,300 feet. The soils in this complex occupy the cool slopes inclined to the north and east. The shape of the slopes is commonly linear, concave, and broken by narrow, discontinuous, horizontal benches. Delineations range from about 50 to 500 acres.

Shelocta and similar soils make up about 40 percent of this complex; Gilpin and similar soils make up about 25 percent; and Kimper and similar soils make up about 15 percent. Other included soils and rock outcrop make up about 20 percent. The Shelocta soil is dominant throughout. The Gilpin soil is commonly on short, steep, convex slopes. The Kimper soil is mainly at or near the heads of coves. The soils in this unit occur as areas so closely intermingled that they could not be separated at the scale selected for mapping.

Typically, the Shelocta soil has a brown channery loam surface layer about 7 inches thick. The subsoil extends to a depth of about 60 inches. The upper part, to a depth of about 47 inches, is strong brown channery silt loam and the lower part is strong brown silty clay loam. Similar soils have a loam or clay loam subsoil.

Typically, the Gilpin soil has a dark yellowish brown silt loam surface layer about 4 inches thick. The subsoil extends to a depth of about 33 inches. The upper part, to a depth of about 9 inches, is yellowish brown silt loam, and the lower part is strong brown silty clay loam. Weathered shale is at a depth of about 33 inches.

Typically, the Kimper soil has a very dark grayish brown loam surface layer about 5 inches thick. The subsurface layer, to a depth of about 9 inches, is dark brown loam. The subsoil extends to a depth of about 65 inches. It is brown silt loam in the upper part, to a depth of about 22 inches, and yellowish brown silt loam and channery silt loam in the lower part.

The Shelocta and Gilpin soils are medium and the Kimper soil is high in natural fertility. The available water capacity is high in the Shelocta and Kimper soils and moderate in the Gilpin soil. Permeability is moderate in the Shelocta and Gilpin soils and moderate or moderately rapid in the Kimper soil. The organic matter content is low or moderate in the Shelocta and Gilpin soils and moderate or high in the Kimper soil. The root zone and depth to bedrock is more than 40 inches in the Shelocta and Kimper soils and 20 to 40 inches in the Gilpin soil.

Contrasting inclusions in this map unit include narrow alluvial flood plains and terraces, soils that have more than 35 percent rock fragments in the subsoil, and soils that are less than 20 inches to bedrock. A few spots of rock outcrop are included. Dekalb, Marrowbone, and Latham soils are included on nose slopes or points. Small areas of the Allegheny soil are included along the North and Middle Forks of the Kentucky River. Included soils and rock outcrop make up about 20 percent of this complex.

Most areas of this complex are woodland.

Because of steepness of slope and a very severe erosion hazard, this complex is poorly suited to production of row crops, hay, or pasture. Grasses and legumes are difficult to establish and maintain because of limitations on the use of farm machinery.

The soils in this complex are suited to woodland. Native trees include black oak, white oak, yellow-poplar, American beech, blackgum, and red maple. Common understory plants include flowering dogwood, redbud, hydrangea, spicebush, and greenbrier. Some trees preferred for planting are northern red oak, yellow-poplar, shortleaf pine, eastern white pine, black walnut, and white ash.

Management concerns of woodland on this complex are the hazard of erosion, the equipment limitation, and plant competition. Careful use of wheeled and tracked equipment can reduce the disturbance of the surface layer. When openings are made in the canopy, uncontrolled invading brushy plants can delay natural regeneration. Woodland wildlife habitat potential is good, but can be improved and maintained by providing food, cover, and places to nest or den.

The soils in this complex are poorly suited to urban uses. Steepness of slope is a limitation.

The capability subclass for the Shelocta, Gilpin, and Kimper soils 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. Because the supply of high-quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation's prime farmland.

About 13,562 acres, or about 4 percent of Breathitt County, meets the requirements for prime farmland. Areas are restricted to the flood plains of the Middle and North Forks of the Kentucky River and their tributary streams. The main crops grown on the prime farmland soils are tobacco, corn, hay, or pasture plants (fig. 8). In many places the prime farmland has been converted to urban and industrial uses.

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

A recent trend in land use in some parts of the survey area has been the loss of some prime farmland to industrial and urban uses. The loss of prime farmland to

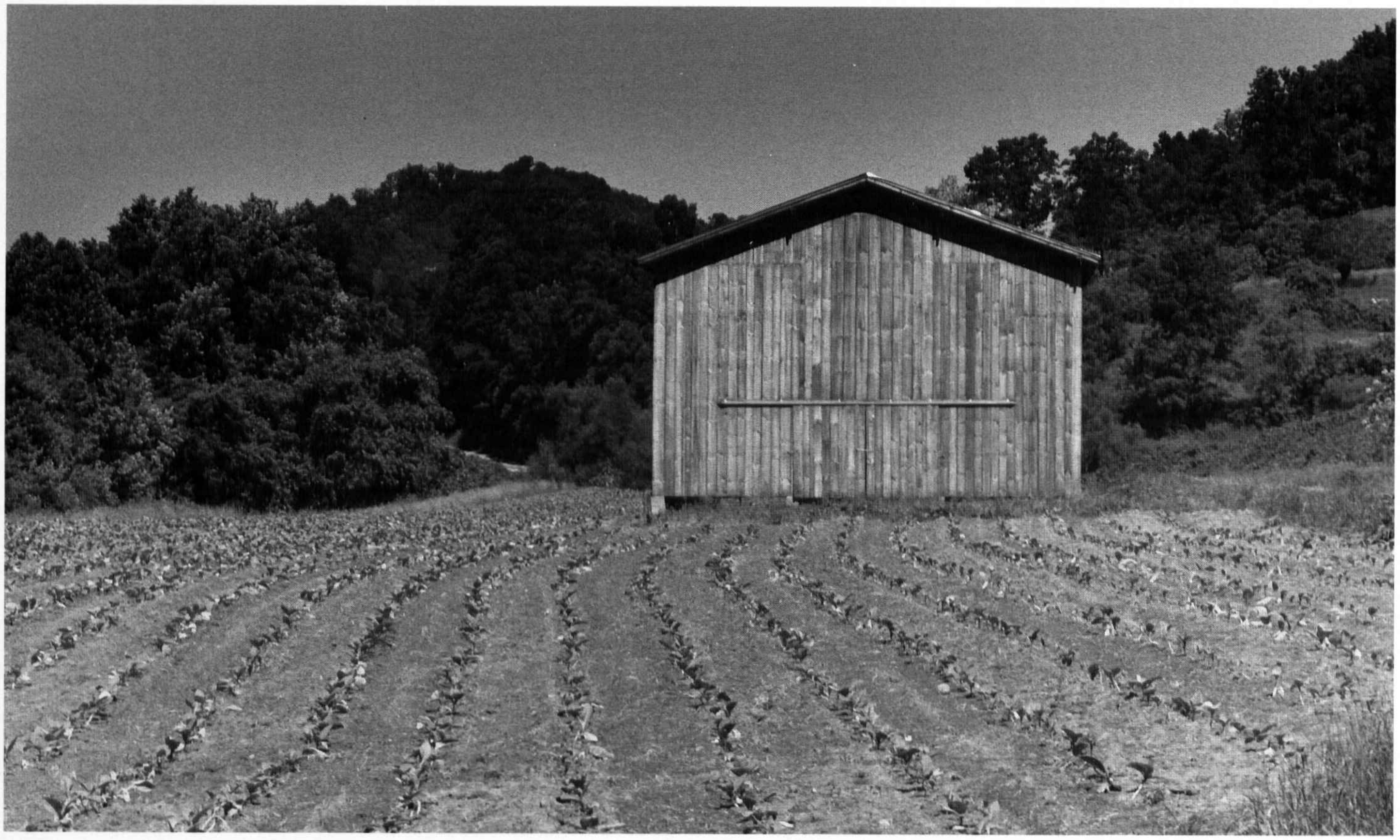

Figure 8.—Burley tobacco growing in an area of Nolin-Grigsby complex, occasionally flooded. These soils are prime farmland and are suited to most agricultural crops grown in the area.

other uses puts pressure on marginal lands, which generally are more erodible, droughty, and less productive and cannot be easily cultivated.

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

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

AlB Allegheny loam, 2 to 6 percent slopes
Gr Grigsby-Rowdy complex, frequently flooded (where protected from flooding or not frequently flooded during the growing season)
Ng Nolin-Grigsby complex, 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 to prevent soil-related failures in land uses (*12, 15*).

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

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

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

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

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

Crops and Pasture

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

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

Soil erosion is a primary management concern of soils used for cultivated crops and forages in Breathitt County. Controlling erosion maintains yield potential, reduces sedimentation of lakes and streams, and improves water quality. Soils that have slopes of more than 2 percent are susceptible to excessive erosion. Because erosion is so damaging, a resource management plan should be developed that keeps the loss of soil at acceptable levels. Some practices that help to prevent excessive soil erosion are contour farming, conservation tillage, stripcropping, growing grasses and legumes in rotation, managing crop residue, cover crops, grassed waterways, diversions, and terraces. A good cropping sequence provides sufficient organic residue to the soil for maintenance of soil organic matter.

Soil fertility is inherently medium or low in most soils in Breathitt County. Nolin and Grigsby soils are high in natural fertility, Allegheny and Rowdy soils are medium, and Bethesda soils are low. Most of the soils in the area require application of fertilizer and lime for adequate crop yields. Addition of lime and fertilizer should be based on the results of soil tests, the need of the crop, and on the expected level of yields. The Cooperative Extension Service can help determine the kinds and amounts of fertilizer and lime to apply.

Soil tilth is an important factor in seed germination and in infiltration of water into the soil. Soils having good tilth are friable, granular, and porous, and permit adequate movement of air and water. Penetration of roots and emergence of shoots occur more easily in soils that have these characteristics. Most soils used for crops in Breathitt County have a granular and porous loam surface layer; however, in areas that have been continually row cropped, the soil structure has been damaged and the organic matter has been depleted. When soil structure is broken down, the ability to provide proper amounts of air and water to plants is hindered. In these areas, tillage for seedbed preparation should be kept to a minimum because it tends to break down soil structure. Adding organic matter helps to maintain soil structure.

Many soils in Breathitt County have a light-colored surface layer that is naturally low in organic matter content. Organic matter must be maintained to achieve optimum production. This can be accomplished by controlling erosion, adding farm manure, managing crop residue, growing cover crops and high residue producing crops, and adding grasses and legumes to the cropping sequences.

Corn and tobacco are the principal row crops grown in the county. Wheat generally is used as a cover crop. Specialty crops, such as vegetables, orchards, and nursery stock, are minor crops in the county. The latest information and recommendations for growing specialty crops can be obtained from local offices of the Kentucky Cooperative Extension Service and the Natural Resources Conservation Service.

Good pasture management is needed to provide quality forage for livestock and adequate ground cover to prevent excessive erosion. Some of the more commonly used grasses and legumes are Kentucky bluegrass, tall fescue, orchardgrass, timothy, red clover, alfalfa, ladino clover, and annual lespedeza. Some severely eroded soils need plant mixtures that are hardy and drought tolerant to provide forage for grazing and to maintain a good ground cover.

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 Natural Resources Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

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

In the capability system, soils are generally grouped at three levels—capability class, subclass, and unit. Only class and subclass are used in this survey (*20*).

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

Class I soils have few limitations that restrict their use.

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

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

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

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

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

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

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

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

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

Capability units are soil groups within a subclass. The soils in a capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-4 and IIIe-6.

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, Natural Resources Conservation Service, helped to prepare this section.

Breathitt County is in the mixed mesophytic forest region of the eastern deciduous forest (*6*). Steep mountain slopes make up about 90 percent of the survey area and, except for areas recently surface mined for coal, are forested. Maple, beech, yellow-poplar, oak, and hickory are the dominant tree species.

Much of the forest land is owned by large corporations, which are primarily interested in the coal resources. Some of the forest land is in small private holdings. Robinson Forest, located in the southeastern part of Breathitt County, is used as a forest research and training facility by the University of Kentucky (UK). Forest management and water quality research are among the UK faculty and student projects at Robinson Forest.

Currently, two sawmills operate in the survey area. Tree products include rough-sawed boards and finished lumber. Mine props and fuel wood are cut by some landowners. Markets are insufficient for much of the low-quality hardwood.

Forest Species

Prior to settlement, forest in the county was mixed, mesophytic deciduous forest (*6*). At present, in the mixed mesophytic forest association on north- and east-facing slopes and coves, several species generally are in a stand of trees. The most common species are sugar maple, yellow-poplar, black locust, yellow buckeye, and basswood. Other species are northern red oak, red maple, white oak, chestnut oak, cucumbertree, American beech, eastern hemlock, black cherry, birch, magnolia, and hickory. The mixed, mesophytic forest covers almost all the Cloverlick-Shelocta-Cutshin and Shelocta-Gilpin-Kimper map units.

Oak-hickory forests are in the drier areas, such as the south- and west-facing sides and the tops of mountains. The most common species are chestnut oak, scarlet oak, white oak, red maple, blackgum, and hickory. The oak-hickory forest type generally occurs on the Shelocta-Gilpin-Hazelton map unit. Oak-pine forests also are in the drier areas. Pitch pine, Virginia pine, and shortleaf pine are mixed with the oaks. The oak-pine forest type generally occurs on the Dekalb-Marrowbone-Latham map unit.

Soil and Tree Relationships

A knowledge of soils helps to provide a basic understanding of the distribution of tree species on the landscape and of tree growth. Some of these relationships are readily recognized. For example, yellow-poplar grows well on deep or very deep, moist soils and scarlet oak or pine is common where the rooting depth is restricted or the moisture supply is limited. The soil serves as a reservoir for moisture, provides an anchor for roots, and supplies most of the available nutrients. Soil properties that directly or indirectly affect these growth requirements include organic matter content, reaction, fertility, drainage, texture, structure, depth, and landscape position. Elevation and aspect are of particular importance in mountainous areas.

The available water capacity is primarily influenced by texture, organic matter content, rooting depth, and content of rock fragments. In Breathitt County, available water capacity is a limitation affecting tree growth only in the shallow soils because of the fairly even and abundant summer rainfall. Changing the physical limitations of the soils is difficult, but timber stand improvement and thinning are useful management tools.

All the soils in the survey area, except for the shallowest, provide an adequate anchor for tree roots. The susceptibility to windthrow, or the uprooting of trees by the wind, is not a major management concern on most soils.

The available supply of nutrients affects tree growth. Mineral horizons in the soil are important. Mineralization of the humus releases nitrogen and other nutrients to plants. Calcium, magnesium, and potassium are held within the humus. Very small amounts of these nutrients are made available by the weathering of clay and silt particles. Most of the soils on uplands have been leached and have only small amounts of nutrients below the surface layer. Where the surface layer is thin, as in Shelocta and Gilpin soils, careful management is needed during site preparation to ensure that the surface layer is not removed or regraded.

The living plant community is part of the nutrient reservoir. The decomposition of leaves, stems, and other organic material recycles the nutrients that have accumulated in the forest ecosystem. Fire, excessive trampling by livestock, and erosion can result in the loss of these nutrients. Forest management should include prevention of wildfires and protection from overgrazing.

Aspect and landscape position influence the amount of available sunlight, air drainage, soil temperature, and moisture retention. North- and east-facing slopes, which are cool slopes, are better suited to tree growth than south- and west-facing slopes, which are warm slopes. Differences in site index values can be as much as 10 feet. Most of the soils on cool slopes have an A horizon that is thicker and has more humus and clay than that of the soils on warm slopes. Soils on cool slopes include Cloverlick, Cutshin, Shelocta, and Kimper soils. These soils have a slightly higher capacity to hold water and a much higher capacity to hold nutrients than the soils on warm slopes. The mean annual soil temperature is about 2 degrees F lower on cool slopes. The difference in temperature is more prevalent during the dormant season. Because less sunlight falls on the canopy in areas of cool slopes, the air temperature in the canopy and the transpiration rate are lower and less water is needed.

In places soils on the lower slopes receive additional water because of internal waterflow. On very steep uplands, much water moves during periods of saturation as lateral flow within the subsoil.

Soil and air temperatures are lower on the upper slopes than on the lower slopes. The temperature decrease is about 1 degree F per 550-foot change in elevation. The soils at the base of warm slopes and the soils on the adjacent cool slopes are similar, probably because of the shading effect of the ridge and possibly because of air drainage. These similar soils are mapped together.

Nutrients, water, and landscape position largely determine which tree species grows on a particular soil. For example, sugar maple-basswood forest is on soils that have the highest fertility levels and a high moisture content (*10,17*). Beech grows on soils that have a high moisture content and intermediate fertility levels. Chestnut oak-red maple forest is on soils that have low fertility levels and a low moisture content. Scarlet oak-pine forest is on soils that have very low fertility levels and a very low moisture content.

Management and Productivity

Table 7 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed.

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

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

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

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

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

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index* and as a *volume* number. The site index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. The site indicies in table 7 are based on regional studies (*5,7,8,9,11,13,18,19*). Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

The *volume*, a number, is the yield likely to be produced by the most important trees. This number, expressed as cubic feet per acre per year, indicates the amount of fiber produced in a fully stocked, even-aged, unmanaged stand.

The first species listed under *common trees* for a soil is the indicator species for that soil. It generally is the most common and most productive species on the soil.

Trees to plant are those that are suitable for commercial wood production.

Recreation

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

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

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

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

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

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the 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

Ray Toor, biologist, Natural Resources Conservation Service, helped to prepare this section.

Breathitt County has valuable fish and wildlife resources. Streams and rivers provide fish habitat. Habitat for wildlife is found throughout the survey area in the forested areas interspersed with openland.

The major game species of wildlife in the survey area include white-tailed deer, gray squirrel, cottontail rabbit, bobwhite quail, mourning dove, ruffed grouse, raccoon, and gray and red fox. Eastern wild turkey is being reintroduced into the country.

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

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

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

Elements of Wildlife Habitat

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, 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, beggarweed, aster, and thistle.

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, blackberry, and blueberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are Russian-olive, autumn-olive, and crabapple.

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

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

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

Habitat for Various Kinds of Wildlife

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, and red fox.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, 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. Ratings are given for building site development, sanitary facilities, construction materials, and water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

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

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

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

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, 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 or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and depth to the water table.

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

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or stabilized soil material; and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock, 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, and depth to a high water table affect the traffic-supporting capacity.

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

Sanitary Facilities

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

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

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

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

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

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

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

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

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

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

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

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

Construction Materials

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

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

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

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

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

Sand and *gravel* are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. In table 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 or stones, have slopes of more than 15 percent, or have a seasonal high water table at or near the surface.

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

Water Management

Table 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 embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

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

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

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

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

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

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; and susceptibility to flooding. 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. Availability of drainage outlets is not considered in the ratings.

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

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

Soil Properties

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

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

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

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

Engineering Index Properties

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

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

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

Classification of the soils is determined according to the Unified soil classification system (*3*) and the system adopted by the American Association of State Highway and Transportation Officials (*2*).

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

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

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

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

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

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

Physical and Chemical Properties

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

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

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

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

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of 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 and septic tank absorption fields.

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

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

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

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

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

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

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

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In 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 based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

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

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

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

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions (the chance of flooding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs, on the average, once or less in 2 years (the chance of flooding is 5 to 50 percent in any year); and *frequent* that it occurs, on the average, more than once in 2 years (the chance of flooding is more than 50 percent in any year). *Common* is used when the occasional and frequent classes are grouped for certain purposes. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, *long* if 7 days to 1 month, and *very long* if more than 1 month. Probable dates are expressed in months. About two-thirds to three-fourths of all flooding occurs during the stated period.

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

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

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The estimates are based mainly on observations of the water table at selected sites and on the evidence of a saturated zone, namely grayish colors or mottles (redoximorphic features) in the soil. Indicated in 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 high. A water table that is seasonally high for less than 1 month is not indicated in table 16.

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

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

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

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

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

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

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*21,23*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 17 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

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

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

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

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

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

SERIES. The series consists of soils within a family that have horizons similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The Gilpin series is an example of a fine-loamy, mixed, mesic Typic Hapludults.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. Characteristics of the soil and the material in which it formed are identified for each series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the "Soil Survey Manual" (*22*). Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" (*21*) and in "Keys to Soil Taxonomy" (*23*). Unless otherwise indicated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

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

Allegheny Series

The Allegheny series consists of very deep, well drained soils formed in old alluvium derived mainly from uplands underlain by sandstone, siltstone, and shale. Permeability is moderate. These gently sloping to moderately steep soils are on stream terraces, foot slopes, and fans. Slopes range from 2 to 20 percent. Allegheny soils are fine-loamy, mixed, mesic Typic Hapludults.

Allegheny soils and Rowdy soils are on similar landscapes. Rowdy soils are in low positions on terraces. They do not have an argillic horizon.

Typical pedon of Allegheny loam, in an area of Allegheny loam, 6 to 12 percent slopes; Jackson Topographic Quadrangle, latitude 37 degrees 34 minutes

43 seconds N., longitude 83 degrees 24 minutes 31 seconds W.; north of Jackson on Kentucky Highway 3193 to the Wolverine community north of Chaney cemetery, in pasture:

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

Bt1—6 to 10 inches; yellowish brown (10YR 5/6) loam; weak medium and fine subangular blocky structure; friable; common fine roots; few wormholes and root channels; few thin clay films on faces of peds; about 2 percent rounded and thin flat sandstone pebbles; strongly acid; clear smooth boundary.

Bt2—10 to 18 inches; yellowish brown (10YR 5/6) loam; moderate medium subangular blocky structure; firm; few fine roots; few old root channels, few wormholes; common thin strong brown (7.5YR 5/6) clay films on faces of peds; few brown concretions mostly less than 5 mm in size and 2 percent subrounded pebbles; strongly acid; clear smooth boundary.

Bt3—18 to 40 inches; yellowish brown (10YR 5/6) loam; weak coarse prismatic parting to moderate medium subangular blocky structure; firm; few fine roots; few tubular pores; few old root channels; many distinct strong brown (7.5YR 5/6) clay films; few small, brown concretions; about 2 percent sandstone pebbles; few black organic stains; strongly acid; clear wavy boundary.

BC—40 to 65 inches; strong brown (7.5YR 5/6) loam; common medium distinct yellowish brown (10YR 5/6) and light brownish gray (2.5Y 6/2) mottles; very weak prismatic structure; firm; few old root channels; few wormholes; common thin clay films in wormholes and cracks; few black concretions; strongly acid.

The thickness of the solum ranges from 30 to 72 inches or more. The depth to bedrock is more than 60 inches. The content of pebbles ranges from 0 to 15 percent in the solum and from as much as 35 percent in the C horizon. Reaction ranges from extremely acid to strongly acid throughout, unless limed.

The Ap horizon has hue of 7.5YR, 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 4.

The B and BC horizons have hue of 7.5YR, 10YR, or 2.5Y, value of 4 or 5, and chroma of 3 to 8. Texture is clay loam, sandy clay loam, loam, silt loam, and silty clay loam. Some pedons have mottles in shades of brown, red, or yellow and have shades of gray or olive below the upper 24 inches of the argillic horizon.

The C horizon has colors similar to those of the B horizon and in some pedons are mottled in shades of brown, gray, yellow, or olive. Texture is loam, fine sandy loam, sandy clay loam, clay loam, or their gravelly analog.

Bethesda Series

The Bethesda series consists of very deep, well drained soils that formed in spoil material from surface mining of coal. Permeability is moderately slow. These soils are on ridgetops, benches, and side slopes of mined areas scattered throughout the county. Slopes range from 0 to 70 percent. Bethesda soils are loamy-skeletal, mixed, acid, mesic Typic Udorthents.

Bethesda and Fairpoint soils are intermingled on mined landscapes. Fairpoint soils are less acid than Bethesda soils. Cloverlick, Cutshin, Dekalb, Gilpin, Hazleton, Kimper, Latham, Marrowbone, and Shelocta soils are on adjacent, undisturbed landscapes. Cutshin and Kimper soils are on cool slopes, have a thick, dark surface layer, and are in a fine-loamy family. Dekalb, Latham, and Marrowbone soils are on ridges and nose slopes and are 20 to 40 inches to bedrock. Latham soils are in a clayey family and Marrowbone soils are in a coarse-loamy family. Gilpin soils are 20 to 40 inches to bedrock and are in a fine-loamy family. Cloverlick and Hazleton soils have a cambic horizon and Cloverlick soils have a dark surface layer. Shelocta soils are more than 40 inches to bedrock and are in a fine-loamy family.

Typical pedon of Bethesda channery loam, in an area of Fairpoint and Bethesda soils, benched, 2 to 70 percent slopes; Guage Topographic Quadrangle, latitude 37 degrees 36 minutes 26 seconds N., longitude 83 degrees 08 minutes 40 seconds W.; about 2.5 miles east of the community of Guage to the confluence of Little Caney Creek and Allen Patton Branch on Kentucky Highway 30; about 2 miles east to a ridge dividing the watersheds of Big Laurel Branch and Deep Ford Branch, on a reclaimed mine site in fescue and lespedeza:

Ap—0 to 4 inches; yellowish brown (10YR 5/4) channery loam; massive; very friable; many fine roots; about 15 percent sandstone channers; very strongly acid; clear wavy boundary.

C1—4 to 21 inches; pale yellow (2.5Y 7/4) very channery loam; massive; friable; few fine roots; about 25 percent sandstone channers and 20 percent sandstone flagstones; strongly acid; clear smooth boundary.

C2—21 to 27 inches; light yellowish brown (10YR 6/4) very channery loam; massive; friable; few fine roots; about 40 percent sandstone channers; strongly acid; clear smooth boundary.

C3—27 to 52 inches; yellowish brown (10YR 5/4) very channery loam; massive; friable; few fine roots; about 40 percent soft, weathered sandstone channers; very strongly acid; clear smooth boundary.

C4—52 to 65 inches; yellowish brown (10YR 5/4) extremely flaggy loam; massive; friable; few very fine roots; about 60 percent sandstone flagstones and 8 percent sandstone channers; very strongly acid.

The depth to bedrock is more than 60 inches. Rock fragments make up 35 to 80 percent of the volume below the surface layer. Size of fragments range mostly from 0.08 inch to 12 inches across, but stones and boulders are included. Reaction ranges from extremely acid to strongly acid, unless limed.

The Ap horizon has hue of 7.5YR, 10YR, 2.5Y, or 5Y, value of 3 to 6, and chroma of 1 to 8, or it is neutral and has value of 2 to 6.

The C horizon has color ranges similar to those of the A horizon. Texture of the fine earth is loam, silt loam, silty clay loam, or clay loam.

Cloverlick Series

The Cloverlick series consists of deep and very deep, well drained soils formed in loamy colluvium derived from sandstone, siltstone, and shale. Permeability is moderate. These steep and very steep soils are on side slopes, benches, and coves. Slopes range from 20 to 70 percent. Cloverlick soils are loamy-skeletal, mixed, mesic Umbric Dystrochrepts.

Cloverlick soils are on the same landscape as Cutshin, Gilpin, Hazleton, Kimper, and Shelocta soils. Cutshin soils are in a fine-loamy family and have a thicker surface layer than Cloverlick soils. Gilpin soils are in a fine-loamy family and are 20 to 40 inches to bedrock. Hazleton soils do not have a dark surface layer. Kimper soils are in a fine-loamy family. Shelocta soils are in a fine-loamy family and have an argillic horizon.

Typical pedon of Cloverlick silt loam, in an area of Cloverlick-Shelocta-Cutshin complex, 20 to 70 percent slopes; Canoe Topographic Quadrangle, latitude 37 degrees 22 minutes 53 seconds N., longitude 83 degrees 24 minutes 08 seconds W.; in Sizemore Fork, 400 feet west of Kentucky Highway 1570, southwest of Wolf Coal, in woodland:

Oi—1 inch to 0; recent forest litter.

A—0 to 6 inches; very dark grayish brown (10YR 3/2) silt loam; moderate medium granular structure; very friable; many fine and medium roots; about 5 percent sandstone fragments; slightly acid; clear smooth boundary.

BA—6 to 10 inches; dark yellowish brown (10YR 4/4) silt loam; weak fine subangular blocky structure; very friable; common fine, medium, and coarse roots; about 5 percent sandstone channers; strongly acid; clear smooth boundary.

Bw1—10 to 19 inches; strong brown (7.5YR 5/6) loam; moderate medium subangular blocky structure; friable; few fine and medium roots; common distinct brown (7.5YR 5/4) coatings on faces of peds; about 5 percent sandstone channers; strongly acid; clear smooth boundary.

Bw2—19 to 31 inches; yellowish brown (10YR 5/6) very flaggy loam; moderate medium subangular blocky structure; friable; few fine roots; few thin brown (10YR 5/3) coatings on faces of peds and on some coarse fragments; about 35 percent sandstone flagstones and 20 percent sandstone channers; very strongly acid; clear smooth boundary.

Bw3—31 to 41 inches; yellowish brown (10YR 5/4) very channery loam; many medium distinct strong brown (7.5YR 5/6) mottles; weak coarse subangular blocky structure; friable; few fine roots; about 50 percent sandstone channers; very strongly acid; clear smooth boundary.

BC—41 to 60 inches; mottled brownish yellow (10YR 6/6), strong brown (7.5YR 5/6), and light yellowish brown (2.5Y 6/3) extremely flaggy loam; weak medium subangular blocky structure; friable; few very fine roots; about 60 percent sandstone flagstones and 15 percent sandstone channers; extremely acid.

The thickness of the solum and depth to bedrock range from 40 to more than 60 inches. Sandstone fragments range from 5 to 15 percent in the A horizon, 15 to 70 percent in the Bw horizon, and 35 to 90 percent in the BC and C horizons. Reaction ranges from extremely acid to slightly acid in the A horizon and from extremely acid to strongly acid in the BA, BW, and C horizons.

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

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

The BC and C horizons have hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 to 6. Texture of the fine earth is sandy loam, loam, silt loam, clay loam, or silty clay loam.

Cutshin Series

The Cutshin series consists of deep and very deep, well drained soils formed in loamy colluvium derived from sandstone, siltstone, and shale. Permeability is moderate. These steep and very steep soils are on side slopes, benches, and coves, mostly on cool slopes. Slopes range from 20 to 70 percent. Cutshin soils are fine-loamy, mixed, mesic Typic Haplumbrepts.

Cutshin soil is on the same landscape as Cloverlick, Gilpin, Hazleton, Kimper, and Shelocta soils. Cloverlick and Hazleton soils are in a loamy skeletal-family and their surface layers are not as thick as that of Cutshin soils.

Gilpin soils are 20 to 40 inches deep to bedrock. Kimper soils have a dark surface layer that is not as thick as that of Cutshin soils. Shelocta soils do not have a dark surface layer but have an argillic horizon.

Typical pedon of Cutshin loam, in an area of Cloverlick-Shelocta-Cutshin complex, 20 to 70 percent slopes; Noble Topographic Quadrangle, latitude 37 degrees 28 minutes 09 seconds N., longitude 83 degrees 08 minutes 27 seconds W.; south of Jackson on Kentucky Highway 15, about 9.6 miles to the community of Lost Creek; east on Kentucky Highway 476, about 10.6 miles to the confluence of Troublesome and Buckhorn Creeks; east on Buckhorn Creek and Clemons Fork, about 4 miles, to the mouth of Bordenhouse Branch; east on Robinson Forest access road to ridgetop and into the head of Toms Branch, in woodland:

Oi—1 inch to 0; recent forest litter.

A—0 to 12 inches; dark brown (10YR 3/3) loam; moderate medium granular structure; very friable; many fine and medium and common coarse roots; about 5 percent sandstone fragments; slightly acid; diffuse wavy boundary.

AB—12 to 18 inches; dark brown (10YR 3/3) loam; moderate medium granular parting to weak fine subangular blocky structure; very friable; many medium and few fine and coarse roots; common earthworm holes and casts; about 5 percent sandstone fragments; medium acid; gradual wavy boundary.

Bw1—18 to 35 inches; brown (10YR 4/3) clay loam; moderate medium subangular blocky structure; friable; few medium roots; many earthworm holes and casts; about 10 percent sandstone channers; medium acid; gradual smooth boundary.

Bw2—35 to 54 inches; dark yellowish brown (10YR 4/4) clay loam; few medium distinct light brownish gray (2.5Y 6/2) mottles; moderate medium subangular blocky structure; friable; few medium roots; about 7 percent sandstone channers; strongly acid; gradual wavy boundary.

Bw3—54 to 60 inches; dark yellowish brown (10YR 4/4) channery clay loam; common medium distinct light brownish gray (2.5Y 6/2) mottles; moderate coarse subangular blocky parting to weak medium angular blocky structure; friable; about 20 percent sandstone channers; strongly acid.

The thickness of the solum and depth to bedrock range from 40 to more than 80 inches. Sandstone fragments mostly 10 mm to 15 inches across range from 5 to 35 percent in individual horizons. Reaction is extremely acid to neutral in the A horizon and very strongly acid to medium acid in the Bw horizon.

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

The Bw horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 to 6, and in some pedons is mottled in shades of brown and gray in the lower part. Texture of the fine earth is loam, sandy loam, clay loam, or sandy clay loam.

Dekalb Series

The Dekalb series consists of moderately deep, well drained soils formed in loamy sandstone residuum derived mainly from sandstone. Permeability is rapid. These sloping to very steep soils are mainly on the upper third of side slopes, but are also in convex areas of lower slopes. Slopes range from 6 to 70 percent. Dekalb soils are loamy-skeletal, mixed, mesic Typic Dystrochrepts.

Dekalb soils are on the same landscapes as Latham and Marrowbone soils. Latham soils are in a clayey family and have an argillic horizon. Marrowbone soils are in a coarse-loamy family.

Typical pedon of Dekalb channery loam, in an area of Dekalb-Marrowbone-Latham complex, very rocky, 6 to 70 percent slopes; Tallega Topographic Quadrangle, latitude 37 degrees 34 minutes 55 seconds N., longitude 83 degrees 30 minutes 27 seconds W.; on upper side slope west of Keen Fork Road, about 2.3 miles north of the community of Oakdale, on Kentucky Highway 52 West, in woodland:

Oi—4 to 3 inches; recent forest litter.

Oe—3 inches to 0; dark brown (10YR 3/3) partly decomposed organic duff.

A—0 to 2 inches; very dark grayish brown (10YR 3/2) channery loam; moderate fine and medium granular structure; very friable; many tree roots; about 15 percent thin flat siltstone fragments; very strongly acid; clear smooth boundary.

Bw1—2 to 16 inches; yellowish brown (10YR 5/6) very channery loam; moderate fine and medium subangular blocky structure; friable; common fine and medium roots; few fine tubular pores; few wormholes and old root channels; about 35 percent thin, flat siltstone fragments; strongly acid; clear wavy boundary.

Bw2—16 to 26 inches; yellowish brown (10YR 5/6) very channery loam; moderate medium and coarse subangular blocky structure; friable; common fine roots; common fine tubular pores; few old root channels; about 40 percent sandstone and siltstone fragments, mostly thin, flat fragments but also a few large sandstone boulders; strongly acid; abrupt smooth boundary.

R—26 inches; hard sandstone bedrock.

The thickness of the solum and depth to bedrock range from 20 to 40 inches. Rock fragments range from 10 to 60 percent in individual horizons of the solum and from 50 to 90 percent or more in the C horizon. Reaction is extremely acid to strongly acid throughout.

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

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

The C horizon, if it occurs, has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 4 to 6. Texture of the fine earth is sandy loam or loamy sand.

Fairpoint Series

The Fairpoint series consists of very deep, well drained soils that formed in spoil material from surface mining of coal. Permeability is moderately slow. These soils are on ridgetops, benches, and side slopes. Slopes range from 0 to 70 percent. Fairpoint soils are loamy-skeletal, mixed, nonacid, mesic Typic Udorthents.

Fairpoint soils are intermingled with Bethesda soils on mined landscapes. Bethesda soils are more acid than Fairpoint soils. Cloverlick, Cutshin, Dekalb, Gilpin, Hazleton, Kimper, Latham, Marrowbone, and Shelocta soils are on adjacent, undisturbed landscapes. Cutshin and Kimper soils are on cool slopes, have a thick, dark surface layer, and are in a fine-loamy family. Dekalb, Latham, and Marrowbone soils are on ridges and points and are 20 to 40 inches to bedrock. Latham soils are in a clayey family and Marrowbone soils are in a coarse-loamy family. Gilpin soils are 20 to 40 inches to bedrock and are in a fine-loamy family. Cloverlick and Hazelton soils have a cambic horizon and Cloverlick soils have a dark surface layer. Shelocta soils are more than 40 inches to bedrock and are in a fine-loamy family.

Typical pedon of Fairpoint channery loam, in an area of Fairpoint and Bethesda soils, benched, 2 to 70 percent slopes; Tiptop Topographic Quadrangle, latitude 37 degrees 33 minutes 22 seconds N., longitude 83 degrees 01 minute 18 seconds W.; east of Evanston on Kentucky Highway 542 to the Magoffin County line; northeast on coal haul road, about 0.4 mile to intersection, to site on left near gas well, in a reclaimed mine site with fescue and lespedeza:

Oi—2 inches to 1 inch; recent forest litter.

Oe—1 inch to 0; dark brown (10YR 3/3) partly decomposed organic matter.

Ap—0 to 5 inches; dark brown (10YR 4/3) channery loam; moderate medium granular structure; massive in places; friable; common fine, medium, and coarse roots; about 25 percent angular sandstone and siltstone fragments; slightly acid; clear smooth boundary.

C1—5 to 38 inches; dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/6) very channery loam; massive; friable; common medium roots; about 35 percent random oriented sandstone and siltstone fragments; slightly acid; gradual wavy boundary.

C2—38 to 60 inches; dark yellowish brown (10YR 4/4) very channery loam; massive; friable; about 50 percent random oriented sandstone and siltstone fragments, mostly channer size; slightly acid.

The depth to bedrock is more than 5 feet. Rock fragments range from 20 to 80 percent, but average about 45 percent. They are mainly 0.08 inch to 6 inches in diameter, but stones and boulders are included. Reaction ranges from medium acid to neutral.

The Ap horizon has hue of 7.5YR, 10YR, or 2.5Y, value of 3 to 6, and chroma of 1 to 6, or it is neutral and has value of 3 to 6.

The C horizon has hue of 7.5YR, 10YR, 2.5Y, or 5Y, value of 3 to 6, and chroma of 1 to 6, or it is neutral and has value of 3 to 6. Texture of the fine earth is clay loam, silty clay loam, silt loam, or loam.

Gilpin Series

The Gilpin series consists of moderately deep, well drained soils formed in loamy residuum, colluvium, or both derived from sandstone, siltstone, and shale. Permeability is moderate. These steep and very steep soils are mainly on side slopes but may extend to ridgetops. Slopes range from 20 to 70 percent. Gilpin soils are fine-loamy, mixed, mesic Typic Hapludults.

Gilpin soils are on landscapes with Cloverlick, Cutshin, Hazleton, Kimper, and Shelocta soils. Cloverlick soils are deeper than 40 inches to bedrock, do not have an argillic horizon, and are in a loamy-skeletal family. Cutshin soils are deeper than 40 inches to bedrock, have a thick, dark surface layer, and do not have an argillic horizon. Hazleton soils are deeper than 40 inches to bedrock, are in a loamy-skeletal family, and do not have an argillic horizon. Kimper soils are deeper than 40 inches to bedrock, have a dark surface layer, and do not have an argillic horizon. Shelocta soils are deeper than 40 inches to bedrock.

Typical pedon of Gilpin silt loam, in an area of Shelocta-Gilpin-Hazleton complex, 20 to 70 percent slopes; Gauge Topographic Quadrangle, latitude 37 degrees 33 minutes 03 seconds N., longitude 83 degrees 08 minutes 00 seconds W.; about 16 miles east of the community of Quicksand between Kentucky Highways 1098 and 542; about 0.7 mile south of the confluence of Quicksand Creek and Spring Fork, in woodland:

A—0 to 4 inches; dark yellowish brown (10YR 4/4) silt loam; weak fine granular structure; very friable; common fine and medium and few coarse roots; about 5 percent thin angular sandstone fragments; strongly acid; clear smooth boundary.

BA—4 to 9 inches; yellowish brown (10YR 5/6) silt loam; moderate fine and medium subangular blocky structure; friable; few medium and fine roots; about 5 percent angular sandstone fragments; very strongly acid; clear smooth boundary.

Bt—9 to 33 inches; strong brown (7.5YR 5/6) silty clay loam; moderate medium subangular blocky structure; friable; few fine and medium roots; common thin clay films; about 10 percent rounded and angular sandstone fragments; very strongly acid; clear wavy boundary.

Cr—33 inches; soft, weathered, thin-bedded shale.

The thickness of the solum ranges from 18 to 36 inches. The depth to bedrock is 20 to 40 inches. Rock fragments of shale, siltstone, and sandstone range from 5 to 40 percent in individual horizons of the solum and from 30 to 90 percent in the C horizon. Reaction ranges from extremely acid to strongly acid throughout.

The A horizon has hue of 10YR, value of 3 to 5, and chroma of 2 to 4.

The BA and Bt horizons have hue of 7.5YR or 10YR, value of 5, and chroma of 4 to 8. Texture of the fine earth is silt loam, loam, or silty clay loam.

The C horizon, if it occurs, has hue of 7.5YR or 10YR, value of 5, and chroma of 4 to 6. Texture of the fine earth is silt loam, loam, or silty clay loam.

Grigsby Series

The Grigsby series consists of very deep, well drained soils formed in mixed alluvium derived from sandstone, siltstone, and shale. Permeability is moderate to moderately rapid. These nearly level to gently sloping soils are on flood plains. Slopes range from 0 to 4 percent. Grigsby soils are coarse-loamy, mixed, mesic Dystric Fluventic Eutrochrepts.

Grigsby soils are on the same landscapes and are similar to Nolin and Rowdy soils. Nolin soils are in a fine-silty family and are on large flood plains. Rowdy soils are in a fine-loamy family and are on narrow flood plains and low terraces.

Typical pedon of Grigsby loam, in an area of Grigsby-Rowdy complex, frequently flooded; Guage Topographic Quadrangle, latitude 37 degrees 33 minutes 43 seconds N., longitude 83 degrees 09 minutes 30 seconds W.; about 6.25 miles east of the intersection of Kentucky Highway 30 and Kentucky Highway 542, near the confluence of Old Trace Branch and Quicksand Creek and about 2.5 miles west of the confluence of Quicksand Creek and Spring Fork, in a pasture of fescue:

Ap—0 to 10 inches; dark yellowish brown (10YR 4/4) loam; weak fine granular structure; very friable; common fine and medium roots; about 2 percent sandstone fragments; medium acid; clear smooth boundary.

Bw1—10 to 21 inches; yellowish brown (10YR 5/4) loam; weak medium and fine subangular blocky structure; friable; few fine roots; some intermixing of the Ap and this horizon by earthworms; slightly acid; clear wavy boundary.

Bw2—21 to 38 inches; yellowish brown (10YR 5/6) loam; moderate medium subangular blocky structure; friable; few fine roots; few wormholes and casts; about 2 percent sandstone fragments; medium acid; gradual wavy boundary.

BC—38 to 45 inches; yellowish brown (10YR 5/6) loam; weak moderate subangular blocky structure; friable; medium acid; gradual wavy boundary.

C—45 to 60 inches; yellowish brown (10YR 5/4) loam; massive; very friable; slightly acid.

The thickness of the solum ranges from 30 to 50 inches. Rock fragments, mostly pebbles, range from 0 to 15 percent in the solum 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 2 to 4.

The Bw horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 to 6. Some pedons have mottles in shades of gray or brown below a depth of 24 inches. Texture is loam, silt loam, fine sandy loam, or sandy loam.

The C horizon is commonly stratified and has hue of 10YR, value of 4 to 6, and chroma of 3 to 6. Some pedons have mottles in shades of gray or brown. Texture of the fine-earth is loam, fine sandy loam, or sandy loam.

Hazleton Series

The Hazleton series consists of deep and very deep, well drained soils formed in loamy colluvium derived from weathered sandstone and siltstone or in material weathered from sandstone, siltstone, and shale. Permeability is moderately rapid. These steep and very steep soils are on linear side slopes, benches, and coves. Slopes range from 20 to 70 percent. Hazleton soils are loamy-skeletal, mixed, mesic Typic Dystrochrepts.

Hazleton soils are on the same landscapes as Cloverlick, Cutshin, Gilpin, Kimper, and Shelocta soils. Cloverlick, Cutshin, and Kimper soils have a thicker, darker surface layer. Cutshin and Kimper soils are in a fine-loamy family. Gilpin and Shelocta soils are in a fine-loamy family and have a argillic horizon. Gilpin soils are 20 to 40 inches to bedrock.

Typical pedon of Hazleton channery loam, in an area of Shelocta-Gilpin-Hazleton complex, 20 to 70 percent slopes; Haddix Topographic Quadrangle, latitude 37 degrees 24 minutes 58 seconds N., longitude 83 degrees 20 minutes 41 seconds W.; south of Jackson on Kentucky Highway 15 to the Watts community; southwest 4.2 miles to the head of McIntosh Branch at the top of knob; follow unimproved road toward Fishtrap Branch 1.7 miles; profile on the upper road bank, in woodland:

Oi—2 inches to 0; recent forest litter.

A—0 to 3 inches; dark brown (10YR 3/3) channery loam; moderate medium granular structure; very friable; common fine and medium roots; about 15 percent sandstone channers; strongly acid; gradual wavy boundary.

AB—3 to 11 inches; dark yellowish brown (10YR 4/4) channery loam; weak medium granular and subangular blocky structure; very friable; common fine and medium roots; about 15 percent sandstone channers; strongly acid; clear wavy boundary.

Bw1—11 to 19 inches; yellowish brown (10YR 5/6) channery loam; moderate medium subangular blocky structure; friable; common medium roots; thin discontinuous clay films; about 15 percent sandstone fragments; strongly acid; gradual wavy boundary.

Bw2—19 to 53 inches; yellowish brown (10YR 5/6) very channery loam; moderate medium and fine subangular blocky structure; firm; few coarse roots; about 50 percent sandstone channers; thin discontinuous clay films; sand grains bridged and coated with clay; strongly acid; gradual diffuse boundary.

C—53 to 60 inches; yellowish brown (10YR 5/6) very channery loam; massive; friable; about 50 percent sandstone channers; strongly acid.

The thickness of the solum ranges from 40 to 60 inches and depth to bedrock ranges from 40 to more than 60 inches. Rock fragments, mostly channers and flagstones, commonly make up from 15 to 35 percent of the A horizon and from 15 to 70 percent of the Bw and C horizons. Reaction ranges from extremely acid to strongly acid.

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

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

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

The C horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 to 6. Texture of the fine-earth is loam, sandy loam, or fine sandy loam.

Kimper Series

The Kimper series consists of deep and very deep, well drained soils formed in loamy colluvium derived from sandstone, siltstone, and shale. Permeability is moderate to moderately rapid. These steep and very steep soils are in coves and on benches, predominantly on cool slopes. Slopes range from 20 to 70 percent. Kimper soils are fine-loamy, mixed mesic Umbric Dystrochrepts.

Kimper soil is on similar landscapes with Cloverlick, Cutshin, Gilpin, Hazleton, and Shelocta soils. Cloverlick and Hazleton soils are in a loamy-skeletal family. Hazleton soils do not have an umbric surface layer. Cutshin soils have a thick, dark surface horizon. Shelocta and Gilpin soils have an ochric epipedon and an argillic horizon. Gilpin soils are 20 to 40 inches to bedrock.

Typical pedon of Kimper loam, in an area of Shelocta-Gilpin-Kimper complex, 20 to 70 percent slopes; Haddix Topographic Quadrangle, latitude 37 degrees 27 minutes 46 seconds N., longitude 83 degrees 20 minutes 02 seconds W.; about 1 mile southwest of Marie Roberts Elementary School; up Duck Hollow to the head of a northeast facing cove and 400 feet southeast of a cemetery on the ridgetop, in woodland:

A—0 to 5 inches; very dark grayish brown (10YR 3/2) loam; weak fine and medium granular structure; very friable; many fine and medium roots; about 5 percent sandstone channers; medium acid; clear smooth boundary.

AB—5 to 9 inches; dark brown (10YR 3/3) loam; moderate fine and medium subangular blocky structure; friable; common fine and medium roots; few thin discontinuous brown (10YR 4/3) coatings on faces of peds; about 10 percent sandstone channers; medium acid; clear wavy boundary.

Bw1—9 to 22 inches; brown (10YR 4/3) silt loam; moderate fine and medium subangular blocky structure; friable; common fine and medium roots; common thin discontinuous brown (10YR 4/3) coatings on faces of peds; about 10 percent sandstone channers; strongly acid; clear smooth boundary.

Bw2—22 to 34 inches; yellowish brown (10YR 5/6) channery silt loam; weak medium subangular blocky structure; friable; few fine roots; common thin discontinuous pale brown (10YR 6/3) coatings on faces of peds; about 20 percent sandstone channers; strongly acid; clear smooth boundary.

Bw3—34 to 50 inches; yellowish brown (10YR 5/6) silt loam; weak medium subangular blocky structure; firm; few fine roots; about 10 percent sandstone channers; very strongly acid; gradual smooth boundary.

BC—50 to 65 inches; yellowish brown (10YR 5/6) channery silt loam; weak medium subangular blocky structure; firm; few fine roots; about 20 percent sandstone channers; very strongly acid.

The thickness of the solum ranges from 40 to more than 60 inches. Depth to bedrock ranges from 40 to 100 inches or more. Rock fragments range from 5 to 60 percent in individual horizons, but average less than 35 percent in the control section. Reaction ranges from very strongly acid to neutral in the A horizon and from very strongly acid to medium acid in the B and C horizons.

The A horizon has hue of 7.5YR, 10YR, or 2.5Y, value of 2 to 4, and chroma of 1 to 4.

The Bw horizon has hue of 7.5YR, 10YR, or 2.5Y, value of 4 or 5, and chroma of 3 to 6. Texture of the fine-earth is silt loam, loam, sandy loam, silty clay loam, or clay loam. Some pedons have mottles in shades of brown, yellow, or red, and, in the lower part, gray.

The C horizon, if it occurs, has hue of 7.5YR, 10YR, to 2.5Y, value of 4 or 5, and chroma of 2 to 8. Texture of the fine-earth is silt loam, loam, sandy loam, silty clay loam, or clay loam. Some pedons are mottled in shades of brown, yellow, red, or gray.

Latham Series

The Latham series consists of moderately deep, moderately well drained soils that formed in material derived from soft clay shale and interbedded siltstone. Permeability is slow. These sloping to very steep soils are on the upper third of side slopes, ridgetops, and nose slopes. Slopes range from 6 to 70 percent. Latham soils are clayey, mixed, mesic Aquic Hapludults.

Latham soils are on the same landscape as Dekalb and Marrowbone soils. Dekalb soils are in a loamy-skeletal family and do not have an argillic horizon. Marrowbone soils are in a coarse-loamy family and do not have an argillic horizon.

Typical pedon of Latham silt loam, in an area of Dekalb-Marrowbone-Latham complex, very rocky, 6 to 70 percent slopes; Tip Top Topographic Quadrangle, latitude 37 degrees 31 minutes 42 seconds N., longitude 83 degrees 05 minutes 35 seconds W.; east of the community of Quicksand on Kentucky Highway 1098, 0.6 mile beyond Quicksand Creek on Kentucky Highway 1111 to the top of the knob; site on ridgetop south of road, in woodland:

Oi—3 to 2 inches; recent forest litter.

Oe—2 inches to 0; very dark grayish brown (10YR 3/2) partly decomposed organic matter.

A—0 to 4 inches; dark grayish brown (10YR 4/2) silt loam; weak fine and medium granular structure; very friable; many fine and medium and few coarse roots; strongly acid; abrupt smooth boundary.

BA—4 to 7 inches; yellowish brown (10YR 5/6) silt loam; moderate medium subangular blocky structure; friable; many fine and medium and few coarse roots; common light yellowish brown (10YR 6/4) ped coatings; strongly acid; clear wavy boundary.

Bt1—7 to 14 inches; strong brown (7.5YR 5/6) silty clay; moderate medium subangular and angular blocky structure; firm; few fine, medium, and coarse roots; continuous brown (10YR 5/3) clay films on faces of peds; very strongly acid; clear wavy boundary.

Bt2—14 to 30 inches; strong brown (7.5YR 5/6) silty clay; common medium distinct light brownish gray (2.5Y 6/2) mottles; moderate medium subangular and angular blocky structure; firm; few medium and coarse roots; thin continuous brown (10YR 5/3) clay films on faces of peds; occasional lenses of thin relict shale structure; very strongly acid; clear smooth boundary.

Cr1—30 to 36 inches; gray (5Y 6/1) weathered shale; relict structure.

Cr2—36 inches; soft gray siltstone.

The thickness of the solum and depth to paralithic contact range from 20 to 40 inches. Rock fragments of shale and siltstone range from 0 to 15 percent throughout. Reaction ranges from extremely acid to strongly acid in the A and BA horizons and is extremely acid or very strongly acid in the Bt horizon.

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

The BA horizon has hue of 10YR or 7.5YR, value of 5, and chroma of 3 to 6. Texture is silt loam or silty clay loam.

The Bt horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 2 to 8. Mottles with chroma of 2 or less are within the upper 24 inches of the argillic horizon. Textures are silty clay or silty clay loam.

Marrowbone Series

The Marrowbone series consists of moderately deep, well drained soils formed in material weathered from acid sandstone. Permeability is moderately rapid. These sloping to very steep soils are on the upper third of side slopes, ridgetops, and nose slopes. Slopes range from 6 to 70 percent. Marrowbone soils are coarse-loamy, mixed, mesic Typic Dystrochrepts.

Marrowbone soils are on the same landscape as Dekalb and Latham soils. Dekalb soils are in a loamy-skeletal family. Latham soils are in a clayey family and have an argillic horizon.

Typical pedon of Marrowbone loam, in an area of Dekalb-Marrowbone-Latham complex, very rocky, 6 to 70 percent slopes; Landsaw Topographic Quadrangle, latitude 37 degrees 38 minutes 55 seconds N., latitude 83 degrees 26 minutes 05 seconds W.; about 9.7 miles north of Jackson, Kentucky, on Kentucky Highway 15; north on unimproved road toward gas well, 0.7 mile south of the Wolf County line; then to crest of hill to the west, in woodland:

Oe—1 inch to 0; very dark grayish brown (10YR 3/2) partly decomposed organic matter.
A—0 to 4 inches; dark yellowish brown (10YR 4/4) loam; moderate fine and medium granular structure; very friable; many fine and medium and few coarse roots; about 5 percent sandstone fragments; strongly acid; clear wavy boundary.
Bw1—4 to 17 inches; yellowish brown (10YR 5/6) loam; moderate medium subangular blocky structure; friable; many fine and few medium roots; few wormholes with casts; about 5 percent sandstone fragments; very strongly acid; gradual wavy boundary.
Bw2—17 to 24 inches; yellowish brown (10YR 5/6) channery loam; weak medium subangular blocky structure; friable; few medium and fine roots; about 15 percent sandstone channers; extremely acid; abrupt wavy boundary.
R—24 inches; sandstone bedrock, weathered in the upper part.

The thickness of the solum and depth to bedrock range from 20 to 40 inches. The content of sandstone fragments mostly less than 3 inches in diameter range from 5 to 15 percent throughout. Reaction ranges from extremely acid to strongly acid in all horizons.

The A horizon has hue of 10YR or 7.5YR, value of 3 or 4, and chroma of 2 to 4.

The Bw horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 to 8. Texture of the fine-earth is loam, sandy loam, or fine sandy loam.

The C horizon, if it occurs, has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 3 to 6. Texture of the fine-earth is sand, loamy sand, or sandy loam.

Nolin Series

The Nolin series consists of very deep, well drained soils formed in mixed alluvium derived from sandstone, siltstone, and shale. Permeability is moderate. These nearly level soils are on flood plains along the major streams. Slopes range from 0 to 3 percent. Nolin soils are fine-silty, mixed, mesic Dystric Fluventic Eutrochrepts.

Nolin series are on the same landscapes as Grigsby soils. Allegheny soils are on associated terrace landscapes. Grigsby soils are in a coarse-loamy family. Allegheny soils are in a fine-loamy family and have an argillic horizon.

Typical pedon of Nolin silt loam, in an area of Nolin-Grigsby complex, occasionally flooded; Tallega Topographic Quadrangle, latitude 37 degrees 32 minutes 44 seconds N., longitude 83 degrees 33 minutes 43 seconds W.; in a tobacco field adjacent to the Kentucky River, about 5/10 mile south of the community of Athol, on Kentucky Highway 315:

Ap—0 to 10 inches; brown (10YR 4/3) silt loam; weak fine granular structure; very friable; common fine roots; about 2 percent sandstone fragments; slightly acid; clear smooth boundary.
Bw1—10 to 29 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium subangular blocky structure; friable; few fine roots; common wormholes with casts; about 2 percent sandstone fragments; medium acid; clear wavy boundary.
Bw2—29 to 41 inches; brown (10YR 4/3) silt loam; moderate medium subangular blocky structure; friable; common fine roots; common wormholes with casts; about 2 percent sandstone fragments; medium acid; gradual wavy boundary.
C—41 to 60 inches; dark yellowish brown (10YR 4/4) silt loam; massive; friable; few fine roots; strongly acid.

The thickness of the solum is 40 inches or more. The depth to bedrock is more than 60 inches. Rock fragments, mostly sandstone pebbles, range from 0 to 5 percent throughout. Reaction ranges from medium acid to neutral in the Ap and Bw horizons and from strongly acid to neutral in the C horizon.

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 7.5YR or 10YR, value of 4 or 5, and chroma of 3 or 4. Texture is silt loam or silty clay loam.

The C horizon has hue of 7.5YR, 10YR, or 2.5Y, value of 4 or 5, and chroma of 2 to 4. It is silt loam, silty clay loam, or loam. Some pedons have mottles in shades of brown or gray.

Rowdy Series

The Rowdy series consists of very deep, well drained soils formed in loamy alluvium derived from sandstone, siltstone, and shale. Permeability is moderate. These nearly level to gently sloping soils are on narrow flood plains and low stream terraces throughout the county. Slopes range from 0 to 4 percent. Rowdy soils are fine-loamy, mixed, mesic Fluventic Dystrochrepts.

Rowdy soils are on the same landscapes as Grigsby soils. Grigsby soils are in a coarse-loamy family. Allegheny soils on adjacent, higher terraces have an argillic horizon.

Typical pedon of Rowdy loam, in an area of Grigsby-Rowdy complex, frequently flooded; Guage Topographic Quadrangle, latitude 37 degrees 33 minutes 7 seconds N., longitude 83 degrees 08 minutes 13 seconds W.; about 1.13 miles south of the confluence of Quicksand

Creek and Spring Fork of Quicksand Creek, on Kentucky Highway 542, in pasture:

Ap—0 to 6 inches; brown (10YR 4/3) loam; weak fine granular structure; very friable; many fine roots; few wormholes and casts; very strongly acid; clear smooth boundary.

A—6 to 16 inches; dark yellowish brown (10YR 4/4) silt loam; weak medium granular and subangular blocky structure; friable; many fine roots; about 5 percent angular sandstone fragments; few wormholes; very strongly acid; clear wavy boundary.

Bw—16 to 35 inches; yellowish brown (10YR 5/4) silt loam; weak coarse prismatic parting to moderate medium subangular blocky structure; friable; common fine and medium roots; about 2 percent sandstone fragments; very strongly acid; clear wavy boundary.

BC—35 to 43 inches; yellowish brown (10YR 5/6) loam; weak medium subangular blocky structure; friable; few fine roots; medium acid; gradual wavy boundary.

C—43 to 60 inches; yellowish brown (10YR 5/6) loam; common medium faint light yellowish brown (10YR 6/4) mottles; massive; friable; very strongly acid.

The thickness of the solum ranges from 40 to 60 inches. The depth to bedrock is more than 60 inches. Rock fragments, mostly pebbles, range from 0 to 10 percent in the A and Ap horizons, from 0 to 30 percent in the Bw horizon, and from 0 to 60 percent in the C horizon. Reaction is very strongly acid or medium acid, unless limed.

The Ap and A horizons have hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 2 to 4. Texture is loam in the Ap horizon and loam or silt loam in the A horizon.

The Bw horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. Texture of the fine-earth is silt loam, loam, or sandy clay loam.

The C horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 3 to 6. Most pedons are mottled in shades of gray or brown. Texture of the fine-earth is loam, fine sandy loam, sandy loam, clay loam, or sandy clay loam.

Shelocta Series

The Shelocta series consists of deep and very deep, well drained soils formed in loamy colluvium weathered from sandstone, siltstone, and shale. Permeability is moderate. These steep and very steep soils are on side slopes, benches, and toe slopes, and, in some areas, in coves on warm slopes. Slopes range from 20 to 70 percent. Shelocta soils are fine-loamy, mixed, mesic Typic Hapludults.

The Shelocta soils are on the same landscapes as Cloverlick, Cutshin, Gilpin, Hazleton, and Kimper soils. Cutshin and Kimper soils have a dark surface layer and do not have an argillic horizon. Cloverlick and Hazleton soils are in a loamy-skeletal family. Gilpin soils have bedrock at a depth of 20 to 40 inches.

Typical pedon of Shelocta channery loam, in an area of Shelocta-Gilpin-Kimper complex, 20 to 70 percent slopes; Jackson Topographic Quadrangle, latitude 37 degrees 37 minutes 21 seconds N., longitude 83 degrees 27 minutes 10 seconds W.; north of Jackson on Kentucky Highway 15 to the Vancleve community; west on Kentucky Highway 541 3.4 miles; north along the Kentucky River, 2.3 miles to Cedar Bend, in woodland:

Ap—0 to 7 inches; brown (10YR 4/3) channery loam; weak fine granular structure; friable; many fine and medium and few coarse roots; about 15 percent angular sandstone fragments; medium acid; clear wavy boundary.

Bt1—7 to 47 inches; strong brown (7.5YR 5/6) channery silt loam; moderate fine and medium subangular blocky structure; friable; few fine roots; thin discontinuous clay films; about 15 percent angular and subrounded sandstone fragments; strongly acid; gradual wavy boundary.

Bt2—47 to 60 inches; strong brown (7.5YR 5/6) channery silty clay loam; moderate medium subangular blocky structure; firm; occasional roots; common clay films on faces of peds; about 20 percent mostly angular sandstone fragments as much as 3 inches across; very strongly acid.

The thickness of the solum ranges from 40 to more than 60 inches. The depth to bedrock is more than 40 inches. Rock fragments range from 15 to 35 percent in the A horizon and from 5 to 45 percent in the Bt and C horizons. Reaction is very strongly acid or strongly acid, except for the A horizon, which is also medium acid.

The Ap horizon has hue of 7.5YR, 10YR, or 2.5Y, value of 4 or 5, and chroma of 2 to 4.

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

The C horizon, if it occurs, has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 to 6. Texture of the fine earth is silt loam, silty clay loam, clay loam, or loam.

Formation of the Soils

In this section the factors of soil formation and the soils in the survey area are discussed and related to each other. The processes of soil formation are described.

Factors of Soil Formation

This section discusses the major factors and processes that have affected the formation and morphology of soils in the county. The characteristics of a soil depend on climate, plant and animal life, the chemical and physical properties of the parent material, relief, and time. The relative influence of each factor varies from place to place, and in some places one factor may dominate in the formation of a soil. These factors are all interrelated and interdependent.

In the eastern coalfields of Kentucky, the influence of man on soils has been great. For example, with bulldozers and other earthmoving equipment, man has created and highly modified large areas of soil.

Climate

Climate has a pronounced effect on soils and vegetation within a relatively small geographic area. Soil development and the physiological activity of plants within the different microclimates have been documented by data gathered in making this soil survey (*10*).

The soils on uplands can be characterized as mesic, or medium, in soil temperature, and udic, or moist, in moisture regime.

Shallow to moderately deep, loamy, clayey, or sandy soils on ridgetops and upper slopes are characterized by droughtiness and a high content of rock fragments. Dekalb soils, for example, are loamy-skeletal, and Marrowbone soils are coarse-loamy. The A horizon of these soils is thin, and the B horizon is weakly developed. South- and west-facing slopes receive more direct radiation from the sun and are hotter and drier than north and east slopes. For example, Shelocta and Gilpin soils on warm slopes have thin O and A horizons but a well developed B horizon. The coolest sites are the lower slopes that face east to north and the concave draws in the coves. Shelocta soils on the cool slopes have a darker A horizon overlying a slightly less developed B horizon. Cutshin soils in coves and on concave slopes have an A horizon that is thick and dark and that overlies a weakly expressed B horizon.

Surface mining has created a large acreage of young soils, such as Fairpoint and Bethesda soils. Most of these soils formed from unweathered and unleached parent material. Weathering of the surface reduces small fragments to fine soil material, usually within a few years. Shale and siltstone weather especially fast.

Plant and Animal Life

Living organisms include vegetation, bacteria, fungi, and animals including man. Living organisms are the active forces that affect the formation of soils. Vegetation generally supplies the organic matter that decomposes to give soils a dark surface layer. It also transfers or cycles nutrients from the subsoil to the surface layer. Bacteria and fungi decompose the organic matter and release the minerals into the soil. Mixing of the soil by the action of worms, insects, and burrowing animals affects soil tilth and porosity.

Man affects the physical properties of soils by tillage and management practices. Man also can alter soils chemically by the use of lime, fertilizers, insecticides, and herbicides. The movement of vehicles on the surface compacts soils and makes them more dense.

Through strip mining, man has helped in the formation of new soils. These soils form where spoil and sediments from strip mining are deposited on mountainsides and on flood plains. They are subject to severe erosion. Their chemical, physical, and mineralogical properties are commonly quite variable within a few yards at the surface and within a few inches throughout the profile. Fairpoint and Bethesda soils, which formed as a result of surface mining, are extensive in the survey area.

Parent Material

Parent material is the unconsolidated geologic material from which soils have formed. It influences the physical and chemical properties of the soil as well as the rate at which soil formation takes place.

In this survey area soils formed in four types of parent material: (1) residual material derived from the weathering of bedrock; (2) colluvial material deposited on mountainsides over long periods of time; (3) recent alluvial deposits on flood plains and on stream terraces; and (4) soil and geologic material disturbed by strip mining and construction.

Residual parent material weathered from rocks is mostly on ridgetops and very steep hillsides. This residuum is derived mainly from sandstone, siltstone, and shale with intermittent coal seams. In places thin beds and concretions of limestone are in the sedimentary rocks. This residuum is the parent material of Dekalb, Marrowbone, and Latham soils.

Colluvial material deposited by water and gravity covers roughly the lower two-thirds of the mountains. The material is mostly loamy and contains variable amounts of rock fragments. The thickness of this material ranges from about 40 inches on the upper part to more than 60 inches on the lower part of the hillside and in coves. In places, especially on toe slopes, colluvial material may be 30 feet thick or more. This colluvium is the parent material for Cloverlick, Cutshin, Hazelton, Kimper, and Shelocta soils.

Recent alluvial deposits consist of material that has been washed from uplands and deposited by streams. Most of the Grigsby and Nolin soils formed in these recent alluvial materials. Rowdy soils also formed in alluvium. They are on young stream terraces and are subject to occasional flooding.

Fairpoint and Bethesda soils formed from soil material and fragments of bedrock that were mixed together by mining activities. The mixing of this material in varying proportions may exhibit, over short distances, marked heterogeneity of soils for parent materials, strata, texture, reaction, color, content, and size of fragments. These soils are on benches or cuts and outslopes and in filled hollows and areas where mountaintops have been removed.

Time

The length of time that parent material has been in place and exposed to the active forces of climate as well as plant and animal life strongly influences the nature of the soil.

The soils of Breathitt County are relatively young. As weathering processes act upon the exposed rocks, mostly on points and ridges, the residue is subjected to the forces of water and gravity. Weathered soil material and rock fragments are carried downslope and deposited as colluvium.

Where the colluvial deposits become thicker, the heavy weight of the colluvium, steep angle of slope, and water seeping along the bedrock tend to move the mass very slowly and irregularly downslope onto the flood plain. Soil is removed from the valleys by the action of the streams. Thus, the valleys slowly become wider and the mountains become smaller.

Most soils on ridgetops are relatively young and have a developed soil structure and a B horizon well defined by color. But, they have little illuvial clay accumulation. Dekalb soils, for example, are classified as Typic Dystrochrepts. They are young, acid soils that have a pale surface.

Most soils on mountainsides have a thick, well defined B horizon with a significant accumulation of illuvial clay. Examples are Shelocta and Gilpin soils, which are classified as Typic Hapludults. Shelocta and Gilpin soils are acid, moderately weathered, and exhibit an increas in clay in the subsoil Soils in coves and on concave slopes with cool aspects are characterized by a dark surface layer. Cutshin soils, for example, are classified as Typic Haplumbrepts. They are acid soils that developed above 1,300 feet and have a thick, dark surface layer.

Fairpoint and Bethesda soils, which formed in man-deposited residue from coal mining, are essentially unaltered, heterogeneous, geologic material. The C horizon in these soils is subdivided on the basis of texture, percentage of rock fragments, and reaction. The action of earthworms and plants is quite evident in soils that have been in place for several years. Fairpoint and Bethesda soils are classified as Typic Udorthents. Soils that have been disturbed by man are young and have little or no horizon development.

Soils of the valleys are divided into those on flood plains and those on stream terraces. Grigsby soils on flood plains formed in recent alluvial deposits along streams. These soils generally are not stratified and have a developed soil structure in the subsoil. However, some recent alluvial deposits that show stratification and do not have structure in the subsoil are mapped with Grigsby soils. These soils on flood plains are classified as Dystric Fluventic Eutrochrepts with inclusions of Entisols. They are young soils that formed by accumulations of water-deposited material that has pale colors.

Young soils on terraces, such as the Rowdy soils, formed in water-deposited material but do not now receive a significant amount of deposition. They are leached and weathered, and the amount of illuvial clay they contain depends upon their position in relation to the stream. Rowdy soils are classified as Fluventic Dystrochrepts. Allegheny soils on older terraces are not subject to flooding, are more leached and weathered, and have a well developed B horizon. Allegheny soils are classified as Typic Hapludults. They formed in older water-deposited material and have weathered somewhat to show an increase in clay in the subsoil.

Relief

The survey area is located in the Mountains and Eastern Coalfield Physiographic Region (*4*). It is within a large, dissected plateau of narrow, winding ridges, steep valley walls, and narrow, elongated bottoms. The level-bedded rocks are part of the Breathitt Formation of the Pottsville Series of the Lower and Middle Pennsylvanian System. Sandstone, siltstone, and shale of various hardness with interbedded coalbeds have weathered to form a benched landscape with a dendritic drainage pattern.

In soil formation, relief controls surface drainage and affects water percolation. Also, relief may affect the soil depth and water-holding capacity, which in turn affects plant and animal life and some soil-forming processes. Soils on ridgetops and points, such as Dekalb soils, are less than 40 inches to bedrock, have more than 35 percent rock fragments, and have a weakly expressed B horizon. In some areas they also have a noticeable amount of stones on the surface associated with rock outcrops. Soils on mountainsides formed chiefly in colluvial material. They are variable in depth to bedrock because they have complex slopes that are benched and dissected. Shelocta soils on mountainsides are more than 40 inches deep to rock and have a well defined B horizon.

Natural differences in elevation and shape of landforms account for many differences in the kinds of soils that formed in the survey area. The residual soils formed at higher elevations, on ridges, and on points. Most soils on mountainsides formed in colluvial material. Soils on flood plains and terraces formed in alluvial deposits.

Through strip mining, man has complicated relief as a soil-forming factor. By reshaping the land and making new landforms, man has changed drainage relationships and affected the rate of chemical and physical processes of soil formation.

Processes of Soil Formation

The results of the soil-forming factors are evidenced by the different layers, or soil horizons, in a profile. The soil profile extends from the surface down to materials that are little altered by soil-forming processes.

Most soils contain three major horizons: the A, B, and C horizons. Soils under a forest canopy have an O (organic) horizon at the surface. This horizon is an accumulation of organic materials, such as twigs and leaves or of humified organic material, that has little mixture of mineral material. Numbers and letters can be used to indicate differences that mark the subdivisions within the major horizons. The Bt horizon, for example, represents the most strongly developed part of a B horizon that has an accumulation of clay from overlying horizons. Shelocta soils have a Bt horizon.

The A horizon is a mineral surface layer. It is darkened by humified organic matter. An Ap horizon commonly is a plow layer also darkened with organic matter. The E horizon, if present, is a layer of maximum leaching, or eluviation, of clay and iron. If present, the E horizon is normally the lightest colored horizon in the profile.

The B horizon, which normally underlies the A horizon, is the subsoil. It is the horizon of maximum accumulation, or illuviation, of clay, iron, aluminum, or other compounds leached from the surface layer.

In some soils, such as Dekalb soils, the B horizon is formed mainly by the alteration of the original material rather than by illuviation. The alteration can be caused by the weathering of the parent material, the releasing of iron to give the rusty color, and the development of soil structure instead of the original rock or sediments structure. The B horizon commonly has blocky or prismatic structure. This horizon generally is firmer and is lighter in color than the A horizon, but is darker colored than the C horizon or the E horizon. The C horizon, if it occurs, is below the A or B horizon. It consists of materials that are little altered by the soil-forming processes, but that may be modified by weathering.

In young soils, such as those formed in recent alluvium or in man-deposited fill materials, the C horizon may nearly reach or reach the surface. These soils may not have a B horizon and in places even an A horizon.

Several processes are involved in the formation of soil horizons. Among these are the accumulation of organic matter, the leaching of soluble constituents, the chemical reduction and movement of iron, the formation of soil structure, and the formation and translocation of clay minerals. These processes often operate simultaneously. They have been going on for thousands of years in old soils.

The accumulation and incorporation of organic matter take place as plant residue and applied organic materials decompose and are mixed into the soil. These additions darken the mineral soil material and form the A horizon.

For a distinct subsoil to form, the soils must be leached of lime and more soluble materials. Then, the clay can be translocated more easily and be moved as part of the percolant. Clay has accumulated in the Bt horizon of the soils classified as Utisols. Clay was leached from the A and E horizons and deposited in the B horizon because of flocculation and the drying up of percolating water. Also, clay from dissolved silica and aluminum has accumulated in these horizons. Silt, sand-sized quartz, and other inert materials are concentrated in the A horizon as the more soluble material and clay are leached into the next horizon.

The naturally well drained soils in the survey area generally have a yellowish brown or strong brown subsoil. These colors come from finely divided iron oxide minerals that coat the sand, silt, or clay particles. These iron oxides formed from iron released during the weathering of silica minerals in the present soil or in the parent material in which the soil developed.

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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.

Alluvial fan. A body of alluvium, with or without flow deposits, with a surface that forms a segment of a cone radiating downslope from the point where a stream emerges from a narrow valley onto a less sloping surface.

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

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

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

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

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

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

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

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

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.

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

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

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

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

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

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

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

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.

Cool slope. A land surface that is inclined toward the north and east (315 to 135 degrees on the compass).

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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.

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

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

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

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

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

Highwall. A verticle wall of overburden exposed during surface mining.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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.

Poor outlets (in tables). In these areas, surface or subsurface drainage outlets are difficult or expensive to install.

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

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

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

Ultra acid	less than 3.5
Extremely acid	3.5 to 4.4
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Redoximorphic concentrations. Nodules, concretions, soft masses, pore linings, and other features resulting from the accumulation of iron or manganese oxide. An indication of chemical reduction and oxidation resulting from saturation.

Redoximorphic depletions. Low-chroma zones from which iron and manganese oxide or a combination of iron and manganese oxide and clay has been removed. These zones are indications of the chemical reduction of iron resulting from saturation.

Redoximorphic features. Redoximorphic concentrations, redoximorphic depletions, reduced matrices, a positive reaction to alpha,alpha-dipyridyl, and other features indicating the chemical reduction and oxidation of iron and manganese compounds resulting from saturation.

Reduced matrix. A soil matrix that has low chroma in situ because of chemically reduced iron (Fe II). The chemical reduction results from nearly continuous wetness. The matrix undergoes a change in hue or chroma within 30 minutes after exposure to air as the iron is oxidized (Fe III). A type of redoximorphic feature.

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

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

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

Rill. A steep-sided channel resulting from accelerated erosion. A rill generally is a few inches deep and not wide enough to be an obstacle to farm machinery.

Road cut. A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

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.

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

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

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

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

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

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

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

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shrink-swell (in tables). The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

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

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. In this survey, classes for simple slopes are as follows:

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 35 percent
Very steep	more than 35 percent

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

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 distance from the top of the soil to the underlying bedrock. The distance, in inches, is expressed as:

Shallow	0 to 20
Moderately deep	20 to 40
Deep	40 to 60
Very deep	more than 60

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

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

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

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

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

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

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

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the E horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

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

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

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

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field generally is built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay.* The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material that is too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Unstable fill (in tables). Risk of caving or sloughing on banks of fill material.

Upland. Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

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

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

Windthrow. The uprooting and tipping over of trees by the wind.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

(Recorded in the period 1951-84 at Jackson, Kentucky)

Month	Temperature						Precipitation				
				2 years in 10 will have--				2 years in 10 will have--			
	Average daily maximum	Average daily minimum	Average daily	Maximum temperature higher than--	Minimum temperature lower than--	Average number of growing degree days*	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-----	43.0	21.3	32.2	71	-10	65	3.75	1.74	5.55	8	4.3
February----	47.2	22.6	34.9	75	-4	72	3.47	1.71	4.75	8	3.1
March-------	58.9	31.5	45.2	85	10	221	4.60	2.73	6.21	9	1.2
April-------	70.1	40.2	55.2	90	24	456	4.21	2.55	5.61	8	.0
May---------	78.3	49.5	63.9	93	30	741	4.03	2.38	5.57	8	.0
June--------	64.4	58.6	71.5	96	43	945	3.79	2.13	5.10	8	.0
July--------	67.8	63.6	75.7	98	51	1,107	5.01	2.98	6.78	8	.0
August------	67.2	62.9	75.1	97	51	1,088	3.70	1.68	5.58	7	.0
September---	61.3	56.2	68.8	95	37	864	3.21	1.40	4.79	6	.0
October-----	71.2	42.1	56.7	88	22	518	2.25	.92	3.35	5	.0
November----	58.8	33.3	46.1	83	15	205	3.23	1.75	4.53	7	.7
December----	48.0	25.8	36.9	74	2	101	3.83	1.78	5.48	8	1.5
Yearly:											
Average---	68.0	42.3	55.2	---	---	---	---	---	---	---	---
Extreme---	---	---	---	98	-10	---	---	---	---	---	---
Total-----	---	---	---	---	---	6,383	45.08	37.41	52.19	90	10.8

* 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 1951-84 at Jackson, 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. 10	Apr. 21	May 14
2 years in 10 later than--	Apr. 4	Apr. 17	May 8
5 years in 10 later than--	Apr. 24	Apr. 9	Apr. 27
First freezing temperature in fall:			
1 year in 10 earlier than--	Oct. 25	Oct. 17	Oct. 3
2 years in 10 earlier than--	Oct. 30	Oct. 22	Oct. 8
5 years in 10 earlier than--	Nov. 10	Oct. 31	Oct. 18

TABLE 3.--GROWING SEASON

(Recorded in the period 1984-90 at Jackson, 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	225	196	166
8 years in 10	232	202	175
5 years in 10	245	214	195
2 years in 10	263	230	222
1 year in 10	>365	>365	>365

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
AlB	Allegheny loam, 2 to 6 percent slopes	183	0.1
AlC	Allegheny loam, 6 to 12 percent slopes	423	0.1
AlD3	Allegheny loam, 12 to 20 percent slopes, severely eroded	660	0.2
CsE	Cloverlick-Shelocta-Cutshin complex, 20 to 70 percent slopes	10,880	3.4
DmE	Dekalb-Marrowbone-Latham complex, very rocky, 6 to 70 percent slopes	82,250	26.0
FbD	Fairpoint and Bethesda soils, 0 to 20 percent slopes	5,167	1.6
FbE	Fairpoint and Bethesda soils, benched, 2 to 70 percent slopes	22,040	7.0
Gr	Grigsby-Rowdy complex, frequently flooded	8,996	2.8
Ng	Nolin-Grigsby complex, occasionally flooded	4,383	1.4
SgE	Shelocta-Gilpin-Hazleton complex, 20 to 70 percent slopes	102,663	32.4
SkE	Shelocta-Gilpin-Kimper complex, 20 to 70 percent slopes	76,167	24.0
	Water in areas of less than 40 acres	3,084	1.0
	Total	316,896	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	Grass-legume hay	Pasture
		Bu	Lb	Ton	AUM*
AlB: Allegheny	IIe	115	3,000	3.5	7.0
AlC: Allegheny	IIIe	105	2,750	3.5	7.0
AlD3: Allegheny	VIe	---	---	2.5	5.5
CsE: Cloverlick-Shelocta-Cutshin	VIIe	---	---	---	---
DmE: Dekalb-Marrowbone-Latham	VIIe	---	---	---	---
FbD: Fairpoint and Bethesda	VIs	---	---	---	2.5
FbE: Fairpoint and Bethesda	VIIe	---	---	---	---
Gr: Grigsby-Rowdy	IIw	113	---	3.2	6.1
Ng: Nolin-Grigsby	IIw	121	2,800	4.0	8.7
SgE: Shelocta-Gilpin-Hazleton	VIIe	---	---	---	---
SkE: Shelocta-Gilpin-Kimper	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.

TABLE 6.--CAPABILITY CLASSES AND SUBCLASSES

(Miscellaneous areas are excluded. Absence of an entry indicates no acreage)

Class	Total acreage	Major management concerns (Subclass)		
		Erosion (e)	Wetness (w)	Soil problem (s)
		Acres	Acres	Acres
I	---	---	---	---
II	13,562	183	13,379	---
III	423	423	---	---
IV	660	660	---	---
V	---	---	---	---
VI	5,167	---	---	5,167
VII	294,000	294,000	---	---
VIII	---	---	---	---

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: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Plant competition	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Volume*	Trees to plant
AlB, AlC-------- Allegheny	Slight	Moderate	Slight	Severe	Shortleaf pine------	80	130	Eastern white pine, yellow-poplar, black walnut, shortleaf pine, white oak, white 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--------	---	--	
AlD3----------- Allegheny	Moderate	Moderate	Slight	Severe	Shortleaf pine------	80	130	Eastern white pine, yellow-poplar, black walnut, shortleaf pine, white oak, white 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--------	---	--	
CsE**:								
Cloverlick-----	Moderate	Moderate	Slight	Moderate	Yellow-poplar-------	100	107	Yellow-poplar, eastern white pine, shortleaf pine, northern red oak.
					White oak-----------	---	--	
					Sugar maple---------	---	--	
					Northern red oak----	---	--	
Shelocta-------	Moderate	Moderate	Slight	Severe	White oak-----------	79	61	Yellow-poplar, black walnut, eastern white pine, shortleaf pine, white ash, white oak, northern red oak.
					Yellow-poplar-------	102	110	
					Cucumbertree--------	---	--	
					American beech------	---	--	
					Shortleaf pine------	77	124	
					Red maple-----------	---	--	
					Black oak-----------	79	61	
					Black gum-----------	---	--	
					Northern red oak----	---	--	

See footnote 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*	
CsE**:								
Cutshin	Moderate	Moderate	Slight	Severe	Yellow-poplar	108	117	Yellow-poplar, black walnut, white ash, shortleaf pine, eastern white pine, northern red oak, white oak.
					Northern red oak	---	--	
					American beech	---	--	
					Black walnut	---	--	
					Cucumbertree	---	--	
					Sweet birch	---	--	
					Sugar maple	---	--	
					American basswood	---	--	
					Red maple	---	--	
					White oak	78	60	
					Black oak	83	65	
					White ash	---	--	
					Blackgum	---	--	
					Eastern hemlock	---	--	
					Hickory	---	--	
DmE**:								
Dekalb	Moderate	Severe	Slight--	Moderate	Black oak	74	56	Eastern white pine, shortleaf pine, yellow-poplar, white oak.
					White oak	71	63	
					Hickory	--	--	
					American beech	--	--	
					Yellow-poplar	90	90	
					Scarlet oak	72	54	
Marrowbone	Moderate	Severe	Slight	Moderate	Yellow-poplar	95	98	Yellow-poplar, northern red oak, white oak, eastern white pine, shortleaf pine.
					Sweet birch	---	--	
					American beech	---	--	
					Northern red oak	---	--	
					Shortleaf pine	85	140	
Latham	Severe	Severe	Slight	Moderate	Scarlet oak	74	56	Eastern white pine, shortleaf pine, white oak.
					Black oak	69	51	
					Virginia pine	72	102	
					White oak	64	47	
					Shortleaf pine	75	120	
FbD**, FbE**:								
Fairpoint	Moderate	Moderate	Moderate	Moderate	Loblolly pine	82	114	Eastern white pine, black locust, shortleaf pine, white oak.
					Black locust	--	--	
Bethesda	Moderate	Moderate	Moderate	Moderate	Loblolly pine	69	91	Eastern white pine, black locust, shortleaf pine, white oak.
					Yellow-poplar	94	97	
					Black locust	---	--	
					Black oak	---	--	
					Sweetgum	---	--	

See footnote 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*	
Gr**:								
Grigsby	Slight	Slight	Slight	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	---	--	
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	---	--	
Ng**:								
Nolin	Slight	Slight	Slight	Severe	Yellow-poplar	107	119	Yellow-poplar, eastern white pine, white ash, sweetgum, black walnut.
					Sweetgum	92	112	
					Black walnut	---	--	
					American sycamore	---	--	
					River birch	---	--	
Grigsby	Slight	Slight	Slight	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	---	--	
SgE**:								
Shelocta	Severe	Severe	Moderate	Severe	White oak	65	47	Shortleaf pine, white oak, eastern white pine.
					Black oak	70	52	
					Scarlet oak	68	50	
					Yellow-poplar	92	43	
					Hickory	---	--	
					Red maple	---	--	
					Chestnut oak	68	50	
Gilpin	Severe	Severe	Moderate	Moderate	Black oak	74	56	Shortleaf pine, loblolly pine, white oak.
					White oak	61	44	
					Scarlet oak	72	54	
					Chestnut oak	68	50	
					Shortleaf pine	60	88	
					Virginia pine	--	--	

See footnote 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	Equip- ment limita- tion	Seedling mortal- ity	Plant competi- tion	Common trees	Site index	Volume*	
SgE**:								
Hazleton-------	Severe	Severe	Moderate	Moderate	Yellow-poplar-------	90	90	White oak, shortleaf pine, eastern white pine.
					White oak-----------	---	---	
					American beech------	---	---	
SkE**:								
Shelocta-------	Severe	Severe	Slight	Severe	White oak-----------	79	61	Yellow-poplar, black walnut, eastern white pine, shortleaf pine, white ash, white oak, northern red oak.
					Yellow-poplar-------	102	110	
					Cucumbertree--------	---	---	
					American beech------	---	---	
					Shortleaf pine------	77	124	
					Red maple-----------	---	---	
					Black oak-----------	79	61	
					Blackgum------------	---	---	
Gilpin---------	Severe	Severe	Slight	Moderate	Black oak-----------	80	62	Northern red oak, loblolly pine, shortleaf pine, white oak.
					Yellow-poplar-------	90	90	
					Scarlet oak---------	76	58	
					Chestnut oak--------	80	62	
					Shortleaf pine------	70	110	
					Virginia pine-------	71	110	
Kimper---------	Severe	Severe	Slight	Severe	White oak-----------	72	54	Yellow-poplar, white ash, northern red oak, white oak, eastern white pine, black walnut, shortleaf pine.
					Yellow-poplar-------	107	113	
					Sugar maple---------	---	---	
					American basswood---	---	---	
					American beech------	---	---	
					Sweet birch---------	---	---	
					Northern red oak----	75	57	
					Red maple-----------	---	---	

* 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
AlB------------------- Allegheny	Slight----------	Slight----------	Moderate: slope, small stones.	Slight----------	Slight.
AlC------------------- Allegheny	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----------	Moderate: slope.
AlD3------------------ Allegheny	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
CsE*:					
Cloverlick-----------	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope.	Severe: small stones, slope.
Shelocta-------------	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
Cutshin--------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
DmE*:					
Dekalb---------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Marrowbone-----------	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
Latham---------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
FbD*:					
Fairpoint------------	Severe: small stones.	Severe: small stones.	Severe: slope, small stones.	Slight----------	Severe: small stones, droughty.
Bethesda-------------	Moderate: slope, small stones, percs slowly.	Moderate: small stones, slope, percs slowly.	Severe: slope, small stones.	Slight----------	Severe: droughty.
FbE*:					
Fairpoint------------	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope.	Severe: small stones, droughty, slope.
Bethesda-------------	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: droughty, 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
Gr*:					
Grigsby	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
Rowdy	Severe: flooding.	Slight	Moderate: slope, flooding.	Slight	Moderate: flooding.
Ng*:					
Nolin	Severe: flooding.	Slight	Moderate: slope.	Severe: erodes easily.	Moderate: flooding.
Grigsby	Severe: flooding.	Slight	Moderate: small stones, flooding.	Slight	Moderate: flooding.
SgE*:					
Shelocta	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Hazleton	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope.	Severe: small stones, slope.
SkE*:					
Shelocta	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Kimper	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope.	Severe: small stones, 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 herba- ceous plants	Hardwood trees	Conif- erous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
AlB---------------- Allegheny	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
AlC---------------- Allegheny	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
AlD3--------------- Allegheny	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
CsE*:										
Cloverlick--------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Shelocta----------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Cutshin-----------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
DmE*:										
Dekalb------------	Very poor.	Poor	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Marrowbone--------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Latham------------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
FbD*, FbE*:										
Fairpoint---------	Very poor.	Very poor.	Poor	Poor	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.
Bethesda----------	Very poor.	Very poor.	Poor	Poor	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.
Gr*:										
Grigsby-----------	Fair	Fair	Fair	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
Rowdy-------------	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Ng*:										
Nolin-------------	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.
SgE*:										
Shelocta----------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Hardwood trees	Conif- erous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
SgE*:										
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	Good	Very poor.
SkE*:										
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.
Kimper------------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--BUILDING SITE DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry 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
AlB: Allegheny	Slight	Slight	Slight	Moderate: slope.	Slight	Slight.
AlC: Allegheny	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.
AlD3: Allegheny	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
CsE*:						
Cloverlick	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, slope.
Shelocta	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Cutshin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
DmE*:						
Dekalb	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.	Severe: slope.
Marrowbone	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
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.
FbD*:						
Fairpoint	Moderate: large stones, slope.	Severe: unstable fill.	Severe: unstable fill.	Severe: slope, unstable fill.	Severe: unstable fill.	Severe: small stones, droughty.
Bethesda	Moderate: dense layer, large stones, slope.	Severe: unstable fill.	Severe: unstable fill.	Severe: slope, unstable fill.	Severe: unstable fill.	Severe: droughty.
FbE*:						
Fairpoint	Severe: slope.	Severe: slope, unstable fill.	Severe: slope, unstable fill.	Severe: slope, unstable fill.	Severe: slope, unstable fill.	Severe: small stones, droughty, slope.
Bethesda	Severe: slope.	Severe: slope, unstable fill.	Severe: slope, unstable fill.	Severe: slope, unstable fill.	Severe: slope, unstable fill.	Severe: droughty, 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
Gr*:						
Grigsby----------	Moderate: flooding, wetness.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
Rowdy------------	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
Ng*:						
Nolin------------	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.	Moderate: flooding.
Grigsby----------	Moderate: flooding, wetness.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
SgE*:						
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.
Hazleton---------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, slope.
SkE*:						
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.
Kimper-----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, 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
AlB: Allegheny	Slight	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey, small stones.
AlC: Allegheny	Moderate: slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, small stones, slope.
AlD3: Allegheny	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
CsE*:					
Cloverlick	Severe: percs slowly, slope.	Severe: seepage, slope.	Severe: depth to rock, slope.	Severe: seepage, slope.	Poor: small stones, slope.
Shelocta	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: slope.	Poor: small stones, slope.
Cutshin	Severe: slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: small stones, slope.
DmE*:					
Dekalb	Severe: slope, depth to rock, poor filter.	Severe: slope, depth to rock, seepage.	Severe: slope, seepage, depth to rock.	Severe: slope, seepage, depth to rock.	Poor: slope, small stones, area reclaim.
Marrowbone	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: depth to rock, small stones, slope.
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.
FbD*:					
Fairpoint	Severe: percs slowly, unstable fill.	Severe: slope, unstable fill.	Severe: unstable fill.	Severe: unstable fill.	Poor: small stones.
Bethesda	Severe: percs slowly, unstable fill.	Severe: slope, unstable fill.	Severe: unstable fill.	Severe: unstable fill.	Poor: small stones.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
FbE*:					
Fairpoint	Severe: percs slowly, slope, unstable fill.	Severe: slope, unstable fill.	Severe: slope, unstable fill.	Severe: slope, unstable fill.	Poor: small stones, slope.
Bethesda	Severe: percs slowly, slope, unstable fill.	Severe: slope, unstable fill.	Severe: slope, unstable fill.	Severe: slope, unstable fill.	Poor: small stones, slope.
Gr*:					
Grigsby	Severe: flooding.	Severe: flooding, seepage.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage.	Good.
Rowdy	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding, seepage.	Severe: flooding.	Fair: small stones.
Ng*:					
Nolin	Severe: flooding, wetness.	Severe: seepage, flooding.	Severe: flooding, seepage, wetness.	Severe: flooding, wetness.	Fair: too clayey, wetness.
Grigsby	Severe: flooding.	Severe: flooding, seepage.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage.	Good.
SgE*:					
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.
Hazleton	Severe: percs slowly, slope.	Severe: seepage, slope.	Severe: depth to rock, slope.	Severe: seepage, slope.	Poor: small stones, slope.
SkE*:					
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 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
SkE*:					
Kimper	Severe: slope.	Severe: seepage, slope.	Severe: depth to rock, seepage, slope.	Severe: seepage, slope.	Poor: small stones, slope.

* 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
AlB------------------- Allegheny	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.
AlC------------------- Allegheny	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim, slope.
AlD3------------------ Allegheny	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
CsE*:				
Cloverlick-----------	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Shelocta-------------	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Cutshin--------------	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
DmE*:				
Dekalb---------------	Poor: slope, area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
Marrowbone-----------	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Latham---------------	Poor: area reclaim, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
FbD*:				
Fairpoint------------	Fair: shrink-swell, large stones.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
Bethesda-------------	Fair: large stones.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
FbE*:				
Fairpoint	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Bethesda	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
Gr*:				
Grigsby	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim.
Rowdy	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.
Ng*:				
Nolin	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, area reclaim.
Grigsby	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim.
SgE*:				
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.
Hazleton	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
SkE*:				
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.
Kimper	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, 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
AlB: Allegheny	Moderate: seepage, slope.	Severe: piping.	Deep to water	Favorable	Favorable.
AlC, AlD3: Allegheny	Severe: slope.	Severe: piping.	Deep to water	Slope	Slope.
CsE*:					
Cloverlick	Severe: seepage, slope.	Severe: piping.	Deep to water	Slope, large stones.	Large stones, slope, droughty.
Shelocta	Severe: seepage, slope.	Severe: piping.	Deep to water	Slope	Slope.
Cutshin	Severe: slope.	Severe: piping.	Deep to water	Slope	Slope, droughty.
DmE*:					
Dekalb	Severe: seepage, slope.	Severe: piping.	Deep to water	Slope, large stones, depth to rock.	Slope, large stones, droughty.
Marrowbone	Severe: seepage, slope.	Severe: piping.	Deep to water	Slope, depth to rock.	Slope, droughty, depth to rock.
Latham	Severe: slope.	Severe: thin layer.	Percs slowly, thin layer, frost action.	Slope, area reclaim, erodes easily.	Slope, erodes easily, area reclaim.
FbD*:					
Fairpoint	Severe: slope.	Severe: piping.	Deep to water	Slope, large stones.	Large stones, slope, droughty.
Bethesda	Severe: slope.	Severe: seepage, piping.	Deep to water	Slope, large stones.	Large stones, slope, droughty.
FbE*:					
Fairpoint	Severe: slope.	Severe: piping.	Deep to water	Slope, large stones, slippage.	Large stones, slope, droughty.
Bethesda	Severe: slope.	Severe: seepage, piping.	Deep to water	Slope, large stones, slippage.	Large stones, slope, droughty.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Terraces and diversions	Grassed waterways
Gr*:					
Grigsby	Severe: seepage.	Severe: piping.	Deep to water	Favorable	Favorable.
Rowdy	Moderate: seepage.	Severe: piping.	Deep to water	Favorable	Favorable.
Ng*:					
Nolin	Severe: seepage.	Severe: piping.	Deep to water	Erodes easily	Erodes easily.
Grigsby	Severe: seepage.	Severe: piping.	Deep to water	Favorable	Favorable.
SgE*:					
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.
Hazleton	Severe: seepage, slope.	Severe: piping.	Deep to water	Slope, large stones.	Large stones, slope, droughty.
SkE*:					
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.
Kimper	Severe: seepage, slope.	Severe: piping.	Deep to water	Slope, large stones.	Large stones, slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--ENGINEERING INDEX PROPERTIES

(The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated)

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
AlB, AlC, AlD3---Allegheny	0-6	Loam-------------	ML, CL	A-4	0	90-100	80-100	65-100	55-95	<35	NP-10
	6-40	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
	40-65	Clay loam, sandy loam, gravelly sandy loam.	SM, GC, ML, CL	A-4, A-6, A-2, A-1	0-5	65-100	55-100	35-95	20-75	<35	NP-15
CsE*:											
Cloverlick------	0-10	Silt-------------	CL-ML, ML, GM-GC, SC-SM	A-2, A-4, A-6	0-5	80-90	75-90	35-65	30-60	15-35	3-15
	10-41	Very channery silt loam, very channery silty clay loam.	CL-ML, CL, GC, SC	A-4, A-6, A-7-6	5-25	45-75	40-70	40-70	35-65	25-45	5-20
	41-60	Very channery loam, very channery silty clay loam.	CL-ML, GM-GC, SC-SM, CL	A-2, A-4, A-6, A-7-6	5-25	45-75	40-70	40-70	30-65	20-45	5-20
Shelocta--------	0-7	Channery loam----	ML, GM, SM	A-4	0-10	55-95	50-80	40-70	36-65	<35	NP-10
	7-47	Silty clay loam, silt loam, channery silty clay loam.	CL, CL-ML, GC, SC	A-6, A-4	0-10	55-95	50-95	45-95	40-90	25-40	4-15
	47-60	Channery silt loam, channery silty clay loam, very channery clay loam.	GM, GC, ML, CL	A-4, A-6, A-2, A-1-B	0-15	40-85	35-70	25-70	20-65	20-40	3-20
Cutshin---------	0-18	Loam-------------	ML, CL-ML	A-4, A-6, A-7	0-5	85-100	80-95	75-90	55-90	20-45	3-15
	18-60	Channery loam, gravelly loam, flaggy clay loam.	CL, ML, GC, SC	A-4, A-6, A-2, A-5	0-20	55-85	50-80	40-75	30-60	20-45	3-15
DmE*:											
Dekalb----------	0-2	Channery loam----	ML, CL-ML	A-4	0-5	80-90	40-85	40-80	40-70	10-32	NP-10
	2-16	Channery sandy loam, channery loam, very channery sandy loam.	SM, GM, ML, GM-GC	A-2, A-4, A-1	5-40	50-85	40-80	40-75	20-55	15-32	NP-9
	16-26	Channery sandy loam, flaggy sandy loam, very flaggy loamy sand.	SM, GM, SC, GC	A-2, A-4, A-1	10-50	45-85	25-75	20-65	15-40	15-32	NP-9
	26	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 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
DmE*:											
Marrowbone	0-4	Loam	SC-SM, SM, SC, GM	A-4	0-5	70-95	65-90	55-85	35-49	16-25	2-10
	4-24	Channery loam, loam, fine sandy loam.	SC-SM, SM, SC, GM-GC	A-4, A-2-4	0-15	50-95	50-90	40-85	25-49	16-30	2-10
	24	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Latham	0-7	Silt loam	CL-ML, CL, ML	A-4, A-6	0-5	85-100	75-100	70-100	65-90	20-35	5-12
	7-30	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
	30-36	Weathered bedrock	---	---	---	---	---	---	---	---	---
FbD*, FbE*:											
Fairpoint	0-5	Channery 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
	5-60	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
Bethesda	0-4	Channery 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
	4-65	Very channery clay loam, very channery silty clay loam, channery clay loam.	GM-GC, ML, CL, GM	A-4, A-6, A-7, A-2	10-30	45-80	25-65	25-65	20-60	24-50	3-23
Gr*:											
Grigsby	0-10	Loam	ML, CL-ML, CL	A-4	0-5	80-100	80-100	70-100	50-80	<25	NP-10
	10-45	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
	45-60	Fine sandy loam, loam, gravelly sandy loam.	SM, SC-SM, ML, GM-GC	A-2, A-1, A-4	0-30	40-100	30-100	25-100	20-70	<20	NP-5
Rowdy	0-6	Loam	ML, SC, CL, SM	A-4	0	80-100	80-100	70-100	40-75	<30	NP-10
	6-43	Loam, gravelly loam, sandy clay loam.	ML, CL, GM, SC	A-4, A-6, A-2	0-5	60-100	60-100	50-100	25-75	<30	NP-15
	43-60	Loam, clay loam, gravelly sandy loam.	ML, GM-GC, SC-SM, CL	A-4, A-2, A-6, A-1-B	0-25	30-100	30-100	25-100	20-75	<30	NP-15

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Ng*:											
Nolin-----------	0-10	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	95-100	90-100	80-100	25-40	5-18
	10-41	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6, A-7	0	100	95-100	85-100	75-100	25-46	5-23
	41-60	Loam, silt loam, gravelly loam.	ML, CL, CL-ML, GM	A-4, A-6	0-10	50-100	50-100	40-95	35-95	<30	NP-15
Grigsby---------	0-10	Loam-------------	ML, CL-ML, CL	A-4	0-5	80-100	80-100	70-100	50-80	<25	NP-10
	10-45	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
	45-60	Fine sandy loam, loam, gravelly sandy loam.	SM, SC-SM, ML, GM-GC	A-2, A-1, A-4	0-30	40-100	30-100	25-100	20-70	<20	NP-5
SgE*:											
Shelocta--------	0-7	Channery loam----	ML, GM, SM	A-4	0-10	55-95	50-80	40-70	36-65	<35	NP-10
	7-47	Silty clay loam, silt loam, channery silty clay loam.	CL, CL-ML, GC, SC	A-6, A-4	0-10	55-95	50-95	45-95	40-90	25-40	4-15
	47-60	Channery silt loam, channery silty clay loam, very channery clay loam.	GM, GC, ML, CL	A-4, A-6, A-2, A-1-B	0-15	40-85	35-70	25-70	20-65	20-40	3-20
Gilpin----------	0-4	Silt loam--------	CL, CL-ML	A-4, A-6	0-5	80-95	75-90	70-85	65-80	20-40	4-15
	4-9	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
	9-33	Channery loam, very channery silt loam, very channery silty clay loam.	GC, GM-GC	A-1, A-2, A-4, A-6	0-35	25-55	20-50	15-45	15-40	20-40	4-15
	33	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Hazleton--------	0-11	Very channery loam.	CL-ML, ML, GM-GC, SC-SM	A-2, A-4, A-6	5-25	45-80	40-70	35-65	30-60	15-35	3-15
	11-53	Very channery silt loam, very channery silty clay loam.	CL-ML, CL, GC, SC	A-4, A-6, A-7-6	5-25	45-75	40-70	40-70	35-65	25-45	5-20
	53-60	Very channery loam, very channery silty clay loam.	CL-ML, GM-GC, SC-SM, CL	A-2, A-4, A-6, A-7-6	5-25	45-75	40-70	40-70	30-65	20-45	5-20

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
SkE*:											
Shelocta--------	0-7	Channery loam----	ML, GM, SM	A-4	0-10	55-95	50-80	40-70	36-65	<35	NP-10
	7-47	Silty clay loam, silt loam, channery silty clay loam.	CL, CL-ML, GC, SC	A-6, A-4	0-10	55-95	50-95	45-95	40-90	25-40	4-15
	47-60	Channery silt loam, channery silty clay loam, very channery clay loam.	GM, GC, ML, CL	A-4, A-6, A-2, A-1-B	0-15	40-85	35-70	25-70	20-65	20-40	3-20
Gilpin----------	0-4	Silt loam--------	CL, CL-ML	A-4, A-6	0-5	80-95	75-90	70-85	65-80	20-40	4-15
	4-9	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
	9-33	Channery loam, very channery silt loam, very channery silty clay loam.	GC, GM-GC	A-1, A-2, A-4, A-6	0-35	25-55	20-50	15-45	15-40	20-40	4-15
	33	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Kimper----------	0-9	Loam------------	ML, CL-ML, GM, SM	A-2-4, A-4, A-1-B	0-5	80-90	80-90	30-70	20-65	22-30	4-10
	9-50	Channery loam, channery silt loam, very channery loam.	ML, CL-ML, GM, CL	A-2-4, A-4	5-20	40-85	40-75	30-70	20-65	27-41	6-18
	50-65	Very channery loam, very channery silt loam, very channery sandy loam.	ML, CL-ML, GM, CL	A-2-4, A-4, A-1-B	5-15	40-85	40-75	30-70	20-65	23-30	3-10

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

(The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated)

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Organic matter
	In	Pct	G/cc	In/hr	In/in	pH				Pct
AlB, AlC, AlD3---Allegheny	0-6	15-27	1.20-1.40	0.6-2.0	0.12-0.22	3.6-7.3	Low----------	0.32	4	1-4
	6-40	18-35	1.20-1.50	0.6-2.0	0.13-0.18	3.6-5.5	Low----------	0.28		
	40-65	10-35	1.20-1.40	0.6-2.0	0.08-0.17	3.6-5.5	Low----------	0.28		
CsE*:										
Cloverlick------	0-10	15-27	1.10-1.30	0.6-2.0	0.07-0.15	3.6-6.5	Low----------	0.17	4	2-5
	10-41	15-30	1.30-1.55	0.6-2.0	0.07-0.13	3.6-5.5	Low----------	0.17		
	41-60	15-30	1.55-1.70	0.6-2.0	0.05-0.11	3.6-5.5	Low----------	0.17		
Shelocta--------	0-7	10-25	1.15-1.30	0.6-2.0	0.10-0.18	4.5-6.0	Low----------	0.28	4	.5-5
	7-47	18-34	1.30-1.55	0.6-2.0	0.10-0.20	4.5-5.5	Low----------	0.28		
	47-60	15-34	1.30-1.55	0.6-6.0	0.08-0.16	4.5-5.5	Low----------	0.17		
Cutshin---------	0-18	12-30	1.20-1.40	0.6-2.0	0.10-0.18	4.1-7.3	Low----------	0.32	4	3-7
	18-60	12-30	1.20-1.40	0.6-2.0	0.08-0.16	4.5-6.0	Low----------	0.28		
DmE*:										
Dekalb----------	0-2	10-20	1.20-1.50	6.0-20	0.08-0.12	3.6-5.5	Low----------	0.24	2	1-4
	2-16	7-18	1.20-1.50	6.0-20	0.06-0.12	3.6-5.5	Low----------	0.17		
	16-26	5-15	1.20-1.50	>6.0	0.05-0.10	3.6-5.5	Low----------	0.17		
	26	---	---	---	---	---	-------------	----		
Marrowbone------	0-4	5-18	1.20-1.60	2.0-6.0	0.10-0.18	3.6-5.5	Low----------	0.24	2	.5-4
	4-24	5-27	1.20-1.70	2.0-6.0	0.08-0.16	3.6-5.5	Low----------	0.17		
	24	---	---	---	---	---	-------------	----		
Latham----------	0-7	20-27	1.30-1.50	0.6-2.0	0.16-0.20	3.6-5.5	Low----------	0.43	3	1-3
	7-30	35-55	1.40-1.70	0.06-0.2	0.11-0.15	3.6-5.0	Moderate-----	0.32		
	30-36	---	---	---	---	---	-------------	----		
FbD*, FbE*:										
Fairpoint-------	0-5	18-27	1.40-1.55	0.6-2.0	0.09-0.18	5.6-7.3	Low----------	0.28	5	<.5
	5-60	18-35	1.60-1.80	0.2-0.6	0.03-0.10	5.6-7.3	Moderate-----	0.28		
Bethesda--------	0-4	18-27	1.40-1.55	0.6-2.0	0.10-0.16	3.6-7.3	Low----------	0.28	5	<.5
	4-65	18-35	1.60-1.90	0.2-0.6	0.04-0.10	3.6-5.5	Low----------	0.32		
Gr*:										
Grigsby---------	0-10	5-25	1.20-1.40	0.6-6.0	0.10-0.20	5.6-7.3	Low----------	0.32	5	1-4
	10-45	5-18	1.20-1.50	0.6-6.0	0.10-0.20	5.6-7.3	Low----------	0.28		
	45-60	5-10	1.20-1.50	2.0-6.0	0.03-0.16	5.1-7.3	Low----------	0.28		
Rowdy-----------	0-6	10-25	1.20-1.40	0.6-2.0	0.11-0.21	4.5-7.3	Low----------	0.32	5	1-3
	6-43	18-30	1.20-1.50	0.6-2.0	0.09-0.21	4.5-6.0	Low----------	0.28		
	43-60	10-30	1.20-1.50	0.6-6.0	0.07-0.18	4.5-6.0	Low----------	0.28		
Ng*:										
Nolin-----------	0-10	12-35	1.20-1.40	0.6-2.0	0.18-0.23	5.6-7.3	Low----------	0.43	5	2-4
	10-41	18-35	1.25-1.50	0.6-2.0	0.18-0.23	5.6-7.3	Low----------	0.43		
	41-60	10-30	1.30-1.55	0.6-6.0	0.10-0.23	5.1-7.3	Low----------	0.43		

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Organic matter
	In	Pct	G/cc	In/hr	In/in	pH				Pct
Ng*:										
Grigsby---------	0-10	5-25	1.20-1.40	0.6-6.0	0.10-0.20	5.6-7.3	Low----------	0.32	5	1-4
	10-45	5-18	1.20-1.50	0.6-6.0	0.10-0.20	5.6-7.3	Low----------	0.28		
	45-60	5-10	1.20-1.50	2.0-6.0	0.03-0.16	5.1-7.3	Low----------	0.28		
SgE*:										
Shelocta--------	0-7	10-25	1.15-1.30	0.6-2.0	0.10-0.18	4.5-6.0	Low----------	0.28	4	.5-5
	7-47	18-34	1.30-1.55	0.6-2.0	0.10-0.20	4.5-5.5	Low----------	0.28		
	47-60	15-34	1.30-1.55	0.6-6.0	0.08-0.16	4.5-5.5	Low----------	0.17		
Gilpin----------	0-4	15-27	1.20-1.40	0.6-2.0	0.12-0.18	3.6-5.5	Low----------	0.32	3	.5-4
	4-9	18-35	1.20-1.50	0.6-2.0	0.12-0.16	3.6-5.5	Low----------	0.24		
	9-33	15-35	1.20-1.50	0.6-2.0	0.08-0.12	3.6-5.5	Low----------	0.24		
	33	---	---	0.2-2.0	---	---	-------------	----		
Hazleton--------	0-11	15-27	1.10-1.30	2.0-6.0	0.07-0.15	3.6-6.5	Low----------	0.17	4	.5-5
	11-53	18-34	1.30-1.55	2.0-6.0	0.07-0.13	3.6-5.5	Low----------	0.17		
	53-60	18-34	1.55-1.70	2.0-6.0	0.05-0.11	3.6-5.5	Low----------	0.17		
SkE*:										
Shelocta--------	0-7	10-25	1.15-1.30	0.6-2.0	0.10-0.18	4.5-6.0	Low----------	0.28	4	.5-5
	7-47	18-34	1.30-1.55	0.6-2.0	0.10-0.20	4.5-5.5	Low----------	0.28		
	47-60	15-34	1.30-1.55	0.6-6.0	0.08-0.16	4.5-5.5	Low----------	0.17		
Gilpin----------	0-4	15-27	1.20-1.40	0.6-2.0	0.12-0.18	3.6-5.5	Low----------	0.32	3	.5-4
	4-9	18-35	1.20-1.50	0.6-2.0	0.12-0.16	3.6-5.5	Low----------	0.24		
	9-33	15-35	1.20-1.50	0.6-2.0	0.08-0.12	3.6-5.5	Low----------	0.24		
	33	---	---	0.2-2.0	---	---	-------------	----		
Kimper----------	0-9	12-27	1.00-1.40	0.6-6.0	0.13-0.20	4.5-7.3	Low----------	0.17	4	2-10
	9-50	18-30	1.20-1.70	0.6-6.0	0.13-0.20	4.5-6.0	Low----------	0.17		
	50-65	12-20	1.20-1.70	0.6-6.0	0.10-0.16	4.5-6.0	Low----------	0.17		

* 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	Hydro-logic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hard-ness	Uncoated steel	Concrete
					Ft			In			
AlB, AlC, AlD3---- Allegheny	B	None--------	---	---	>6.0	---	---	>60	---	Low-----	High.
CsE*:											
Cloverlick-------	B	None--------	---	---	>6.0	---	---	>40	Hard	Low-----	High.
Shelocta---------	B	None--------	---	---	>6.0	---	---	>40	Hard	Low-----	High.
Cutshin----------	B	None--------	---	---	>6.0	---	---	>40	Soft	Low-----	Low.
DmE*:											
Dekalb-----------	C	None--------	---	---	>6.0	---	---	20-40	Hard	Low-----	High.
Marrowbone-------	C	None--------	---	---	>6.0	---	---	20-40	Hard	Low-----	Moderate.
Latham-----------	D	None--------	---	---	1.5-3.0	Perched	Jan-Apr	20-40	Soft	High----	High.
FbD*, FbE*:											
Fairpoint--------	C	None--------	---	---	>6.0	---	---	>60	---	High----	Moderate.
Bethesda---------	C	None--------	---	---	>6.0	---	---	>60	---	Moderate	High.
Gr*:											
Grigsby----------	B	Frequent----	Very brief to brief.	Dec-May	3.5-6.0	Apparent	Jan-Apr	>60	---	Low-----	Low.
Rowdy------------	B	Occasional	Brief-----	Jan-Apr	>6.0	---	---	>60	---	Moderate	Moderate.
Ng*:											
Nolin------------	B	Occasional	Brief-----	Feb-May	3.0-6.0	Apparent	Feb-Mar	>60	---	Low-----	Moderate.
Grigsby----------	B	Occasional	Very brief to brief.	Dec-May	3.5-6.0	Apparent	Jan-Apr	>60	---	Low-----	Low.
SgE*:											
Shelocta---------	B	None--------	---	---	>6.0	---	---	>40	Hard	Low-----	High.
Gilpin-----------	C	None--------	---	---	>6.0	---	---	20-40	Soft	Low-----	High.
Hazleton---------	B	None--------	---	---	>6.0	---	---	>40	Hard	Low-----	High.
SkE*:											
Shelocta---------	B	None--------	---	---	>6.0	---	---	>40	Hard	Low-----	High.
Gilpin-----------	C	None--------	---	---	>6.0	---	---	20-40	Soft	Low-----	High.
Kimper-----------	B	None--------	---	---	>6.0	---	---	>40	Hard	Low-----	Moderate.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--CLASSIFICATION OF THE SOILS

(An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series)

Soil name	Family or higher taxonomic class
Allegheny	Fine-loamy, mixed, mesic Typic Hapludults
Bethesda	Loamy-skeletal, mixed, acid, mesic Typic Udorthents
Cloverlick	Loamy-skeletal, mixed, mesic Umbric Dystrochrepts
Cutshin	Fine-loamy, mixed, mesic Typic Haplumbrepts
Dekalb	Loamy-skeletal, mixed, mesic Typic Dystrochrepts
Fairpoint	Loamy-skeletal, mixed, nonacid, mesic Typic Udorthents
Gilpin	Fine-loamy, mixed, mesic Typic Hapludults
Grigsby	Coarse-loamy, mixed, mesic Dystric Fluventic Eutrochrepts
Hazleton	Loamy-skeletal, mixed, mesic Typic Dystrochrepts
Kimper	Fine-loamy, mixed, mesic Umbric Dystrochrepts
Latham	Clayey, mixed, mesic Aquic Hapludults
Marrowbone	Coarse-loamy, mixed, mesic Typic Dystrochrepts
Nolin	Fine-silty, mixed, mesic Dystric Fluventic Eutrochrepts
Rowdy	Fine-loamy, mixed, mesic Fluventic Dystrochrepts
Shelocta	Fine-loamy, mixed, mesic Typic Hapludults

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