



United States  
Department of  
Agriculture

Soil  
Conservation  
Service

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

# Soil Survey of Jackson and Owsley Counties, Kentucky





# How To Use This Soil Survey

## General Soil Map

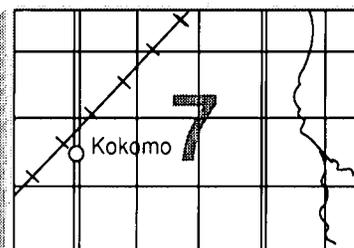
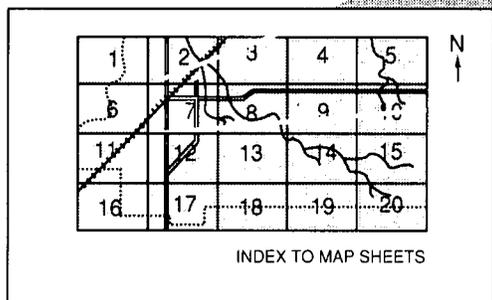
The general soil map, which is the color map preceding the detailed soil maps, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

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

## Detailed Soil Maps

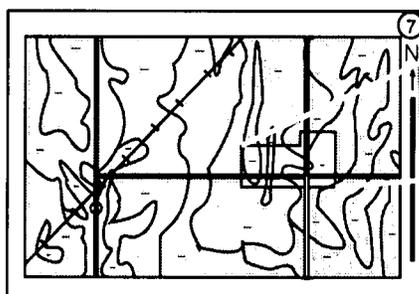
The detailed soil maps follow the general soil map. These maps can be useful in planning the use and management of small areas.

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

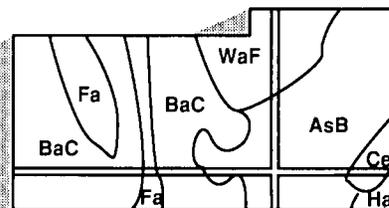


MAP SHEET

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



MAP SHEET



AREA OF INTEREST

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

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

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

Major fieldwork for this soil survey was completed in 1983. Soil names and descriptions were approved in 1983. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1984. This soil survey was made cooperatively by the Soil Conservation Service, the United States Department of Agriculture, Forest Service, the Kentucky Natural Resources and Environmental Protection Cabinet, and the Kentucky Agricultural Experiment Station. It is part of the technical assistance furnished to the Jackson County Conservation District and the Owsley County Conservation District.

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

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

**Cover: The narrow valleys and some of the lower hillsides in areas of Shelocta-Gilpin channery silt loams, steep, have been cleared and are used for farming.**

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# Foreword

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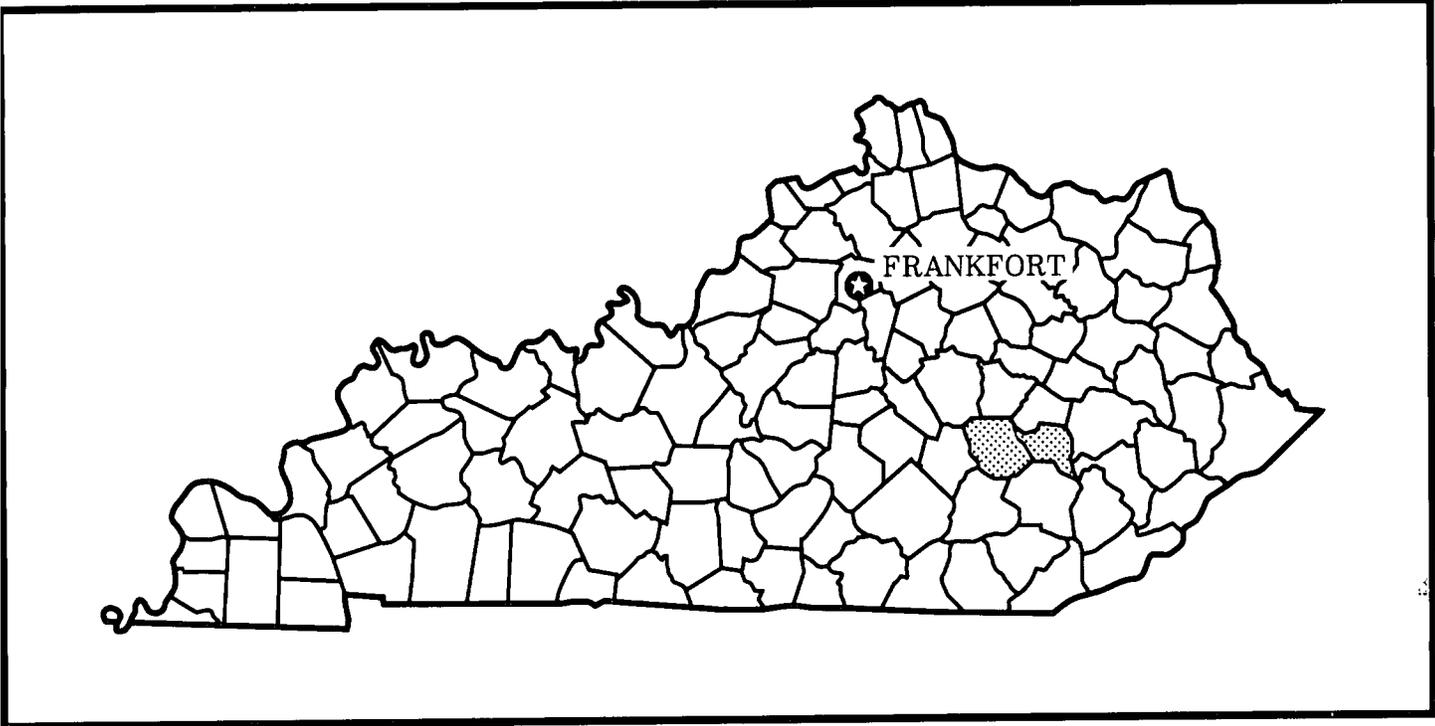
This soil survey contains information that can be used in land-planning programs in Jackson and Owsley Counties. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and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

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

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

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

Randall W. Giessler  
State Conservationist  
Soil Conservation Service



Location of Jackson and Owsley Counties in Kentucky.

# Soil Survey of Jackson and Owsley Counties, Kentucky

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By Raymond A. Hayes, Soil Conservation Service

Fieldwork by Raymond A. Hayes, Roy V. Rice, and Paul M. Love, Soil Conservation Service; Sally Browning, Forest Service; and Jackie D. McIntosh, Kentucky Natural Resources and Environmental Protection Cabinet

United States Department of Agriculture, Soil Conservation Service

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

JACKSON AND OWSLEY COUNTIES are in the southeastern part of Kentucky along the edge of the eastern Kentucky Mountains. A small part of the western edge of Jackson County is within the eastern Pennyroyal physiographic region. The rest of both counties is within the Eastern Coal Fields physiographic region (22). Jackson County has 221,811 acres of land area and Owsley County has 126,944 acres, a total land area of about 545 square miles. The Daniel Boone National Forest includes about 56,079 acres of Jackson County and about 16,333 acres of Owsley County.

The landscape mostly consists of long and narrow ridgetops, valleys, and steep hillsides. Most of the soils formed in colluvial or alluvial material weathered mainly from sandstone, siltstone, or shale. Along the west and north edges of Jackson County, soils formed in a regolith weathered from interbedded sandstone, siltstone, shale, and limestone. Jackson County is dissected by Station Camp Creek and Rock Lick Creek that drain the northern part of the county. War Fork Creek drains the northwestern part; Moores Creek and Pond Creek drain most of the southern part; Lick Creek drains the western part; and the Middle Fork of the Rockcastle River drains the central part of the county. Owsley County is dissected from north to south by the South Fork of the Kentucky River. Sturgeon Creek and its tributaries drain the northwestern part of Owsley County.

Farming is limited to the narrow valleys in much of the survey area; however, in the south-central part of Jackson County where the topography is hilly rather than steep, beef cattle and dairy cattle farms are common. Most of the survey area is wooded and much of the farming is a part-time operation. Manufacturing and mining in nearby counties provide most of the employment.

McKee, the county seat of Jackson County, and Booneville, the county seat of Owsley County, are the major trade centers.

## General Nature of the Survey Area

This section gives general information about Jackson and Owsley Counties. It discusses climate, natural resources, and geology and topography of the survey area.

### Climate

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

In Jackson and Owsley Counties, summers are hot in the valleys and slightly cooler on the hills; winters are moderately cold. Rains are fairly heavy and well

distributed throughout the year. Snow falls nearly every winter, but the snow cover usually lasts only a few days.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Heidelberg Lock in the period 1951 to 1980. 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 38 degrees F, and the average daily minimum temperature is 26 degrees. The lowest temperature on record, which occurred at Heidelberg Lock on January 24, 1963, is -22 degrees. In summer the average temperature is 74 degrees, and the average daily maximum temperature is 86 degrees. The highest recorded temperature, which occurred at Heidelberg Lock on July 27, 1952, is 103 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 50 inches. Of this, 25 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 21 inches. The heaviest 1-day rainfall during the period of record was 5.02 inches at Heidelberg Lock on December 8, 1978. Thunderstorms occur on about 47 days each year, and most occur in summer.

The average seasonal snowfall is 16 inches. The greatest snow depth at any one time during the period of record was 12 inches. On an average of 9 days, at least 1 inch of snow is 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 60 percent of the time possible in summer and 40 percent in winter. The prevailing wind is from the south. Average windspeed is highest, 12 miles per hour, in spring.

## Natural Resources

The major natural resources in the survey area are soil, water, timber, coal, and limestone. The soils of Jackson and Owsley Counties are the main source of food and fiber. This is an important consideration in managing the soils for the most appropriate uses.

Supplies of surface water, adequate to meet present needs, are available from streams and rivers. Ground water is also adequate to satisfy the needs of most rural homes. The McKee Reservoir, near the community of Gray Hawk, provides water for the city of McKee and

outlying water districts. The South Fork of the Kentucky River provides water for Booneville and the outlying water districts.

Most of the soils in the survey area are used as woodland. Red oak, black oak, white oak, yellow poplar, Virginia pine, shortleaf pine, pitch pine, American beech, red maple, ash, and hickories are common native trees. The Forest Service maintains about 56,079 acres in Jackson County (21 percent of the county) and 16,333 acres in Owsley County (11 percent of the county). All of the acreage is part of the Daniel Boone National Forest. This forest is the main source of logs for local sawmills.

Although the major coal seams of the eastern Kentucky coal fields are to the south and east of the survey area, coal is still a part of the economy of Jackson and Owsley Counties. Deep mines in thin coal seams once provided coal for the local market as well as some commercial markets. Currently, most coal is mined by strip mining. Coal beds are generally thin and discontinuous; consequently, mines are small and scattered throughout the survey area. Contour strip mines are common in southeast Owsley County, where relief is highest.

In Jackson County, two limestone quarries provide crushed limestone for construction stone and for agriculture uses. These quarries are in the Newman Limestone. Sandstone is mined locally for dimensional stone.

## Geology and Topography

Most of Jackson and Owsley Counties are within the Eastern Coal Fields physiographic region. A small part of the western edge of Jackson County is within the eastern Pennyroyal physiographic region. Both counties are underlain by the level-bedded sedimentary rocks of the Lee and Breathitt Formations of the Pennsylvanian geologic system. Rock outcrops of the Mississippian geologic system are on steep side slopes along the west and north edge of Jackson County (22).

The Lee and Breathitt Formations consist of interbedded layers of sandstone, siltstone, and shale with thin discontinuous coal beds. Topography ranges from hilly to steep, depending upon the resistance to weathering of the underlying members. In places, sandstone bluffs and ledge-like rock outcrops are common. Soils commonly associated with the Lee and Breathitt Formations are Shelocta, Rayne, Gilpin, Lily, and Sequoia.

The Lee Formation, where present, underlies the Breathitt Formation and rests on the Pennington Formation, the upper member of the Mississippian geologic system. The Pennington Formation is thin and discontinuous and consists of shale, siltstone, sandstone, dolomite, and limestone. This formation is characterized by benched landscapes that are generally more pronounced on cool aspects. These landscapes

are commonly covered by several feet of debris from the overlying formations.

The Newman Limestone underlies the Pennington Formation and ranges in thickness from about 30 to 180 feet. The members of this formation tend to form ledge-like steep slopes or cliffs that are benched at the top. Most of this formation is exposed along the major streams in the western and northern parts of Jackson County. The cliff-forming members of this formation are included in the Bledsoe silt loam, steep, very rocky, map unit. Caneyville soils are predominant on the benched landforms.

The Borden Formation underlies the Newman Limestone. It consists of level-bedded layers of dolomitic limestone, shale, siltstone, sandstone, and limestone. Thickness ranges from about 430 to 520 feet. Except for pointed ridges and eroded areas, this formation is mostly covered by colluvial material from the overlying formations. Bledsoe silt loam, steep, very rocky, is the dominant soil on this formation.

## How This Survey Was Made

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

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

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

are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

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

While a soil survey is in progress, samples of some of the soils in the area are generally collected for laboratory analyses and for engineering tests. Soil scientists interpreted the data from these analyses and tests as well as the field-observed characteristics and the soil properties in terms of expected behavior of the soils under different uses. Interpretations for all of the soils were field tested through observation of the soils in different uses under different levels of management. Some interpretations are modified to fit local conditions, and new interpretations sometimes are developed to meet local needs. Data were 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 were 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 state with a fairly high degree of probability that a given soil will have a high water table within certain depths in most years, but they cannot assure that a high water table will always be at a specific level in the soil on a specific date.

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

## Map Unit Composition

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

Most inclusions have properties and behavioral patterns similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting (similar)

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

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

# General Soil Map Units

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

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

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

Each map unit is rated for *farming, woodland, urban uses, and as habitat for wildlife*. Farming includes cultivated crops and hay crops and pasture. Cultivated crops and hay crops are those grown extensively in the survey area. Woodland refers to areas of native or introduced trees. Urban uses include residential, commercial, and industrial developments. Habitat for wildlife includes habitat for openland and woodland wildlife.

## 1. Shelocta-Gilpin

*Deep and moderately deep, well drained, steep to gently sloping soils that have a loamy subsoil; on long hillsides and ridgetops*

This map unit is in the central and southern parts of Jackson County and in the northern part of Owsley County. The landscapes consist of long winding ridges, steep side slopes, and long narrow valleys (fig. 1). The soils of this map unit are underlain by stratified, level-bedded, acid sandstone, siltstone, and shale of the Pennsylvanian geologic system. Most areas of this map unit consist of hardwood forest with scattered pine plantations. The narrow valleys and some of the lower hillsides have been cleared and used for farming. A dendritic drainage pattern of many intermittent streams is typical of this map unit. Except for a few communities, most development consists of farmsteads along the drainageways. Development is restricted by narrow valleys and ridges coupled with steep side slopes. The

important structures are farm buildings, roads, and gas, power, and communication facilities.

This map unit makes up about 46 percent of the survey area. It is about 40 percent Shelocta soils, 20 percent Gilpin soils, and 40 percent soils of minor extent and Rock outcrop.

Shelocta soils are deep and well drained. They are on steep to strongly sloping side slopes. The surface layer is channery silt loam, and the subsoil is channery silt loam or silty clay loam.

Gilpin soils are moderately deep and well drained. They are on steep to gently sloping hillsides and ridgetops. The surface layer is channery silt loam on side slopes and silt loam on ridges.

Of minor extent are the Rigley, Rayne, Lily, Steinsburg, Allegheny, Allegheny Variant, Grigsby, and Rowdy soils and Rock outcrop. Rigley, Rayne, Lily, and Steinsburg soils are on hillsides. Rigley and Rayne soils are deep and well drained. Lily and Steinsburg soils are moderately deep and well drained. The Allegheny, Allegheny Variant, Grigsby, and Rowdy soils are on flood plains and terraces. Rock outcrop is on the hillsides.

The soils of this map unit are mainly used as woodland. Most cultivated areas are along the narrow bottoms and to a lesser extent, on ridges. These soils are limited mainly by complex slopes.

These soils are poorly suited to farming and urban uses. They are, however, suited to use as woodland and as habitat for woodland wildlife. The steep slopes restrict the use of equipment, and erosion is a severe hazard.

## 2. Shelocta-Gilpin-Cutshin

*Deep and moderately deep, well drained, steep to gently sloping soils that have a loamy subsoil; on long steep hillsides, narrow ridges, and in coves*

This map unit is in the southern and eastern parts of Owsley County. Landscapes consist of ridges and valleys (fig. 2). The soils of this map unit are underlain by level-bedded, stratified sandstone, siltstone, shale, and in places, thin coal deposits of the Pennsylvanian geologic system. Most areas of this map unit consist of hardwood forest. The narrow valleys have been cleared and are used for farming. A dendritic drainage pattern of intermittent streams and a few perennial streams is typical of this map unit. Except for a few small communities, most development consists of farms along

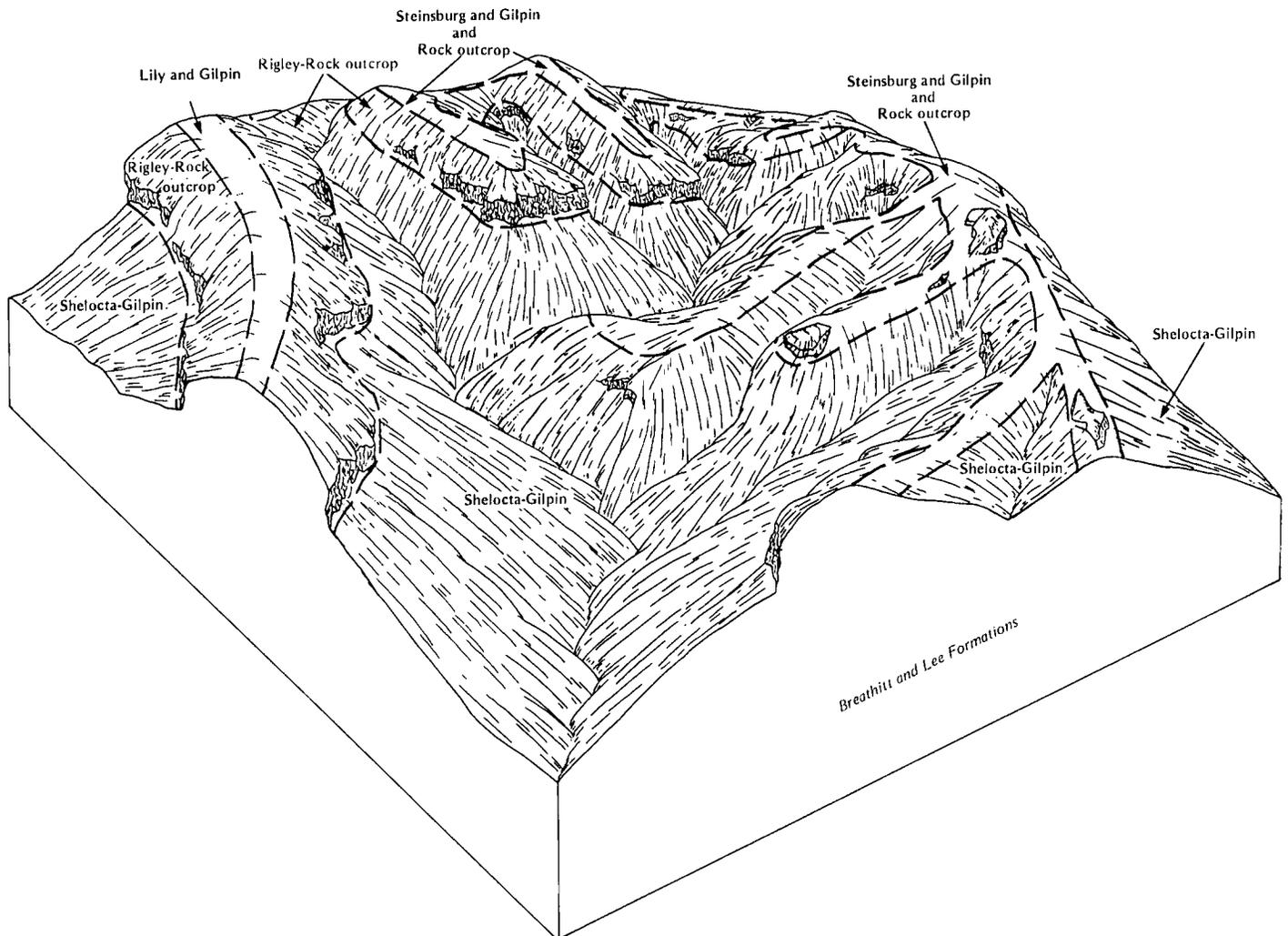


Figure 1.—Typical pattern of soils and parent material in the Shelocta-Gilpin map unit.

drainageways. The soils of this map unit are poorly suited to development because of steep slopes, narrow valleys, and ridges. The important structures are farm buildings and gas, power, and communication facilities.

This map unit makes up about 24 percent of the survey area. It is about 34 percent Shelocta soils, 14 percent Gilpin soils, 6 percent Cutshin soils, and about 46 percent soils of minor extent.

Shelocta soils are deep and well drained. They are on steep to strongly sloping hillsides. The surface layer is channery silt loam, and the subsoil is channery silt loam or silty clay loam.

Gilpin soils are moderately deep and well drained. They are on steep hillsides and ridgetops. The surface layer is channery silt loam on side slopes and silt loam on ridgetops. The subsoil is silt loam, channery silt loam, channery loam, or channery silty clay loam.

Cutshin soils are deep and well drained. They are on steep hillsides that have cool aspects. These soils are commonly in coves and on narrow benches. The surface layer is channery loam, and the subsoil is channery loam or clay loam.

Of minor extent are the Rowdy, Grigsby, Huntington, Fairpoint, Bethesda, and Steinsburg soils. Rowdy and Grigsby soils are on low stream terraces, alluvial fans,

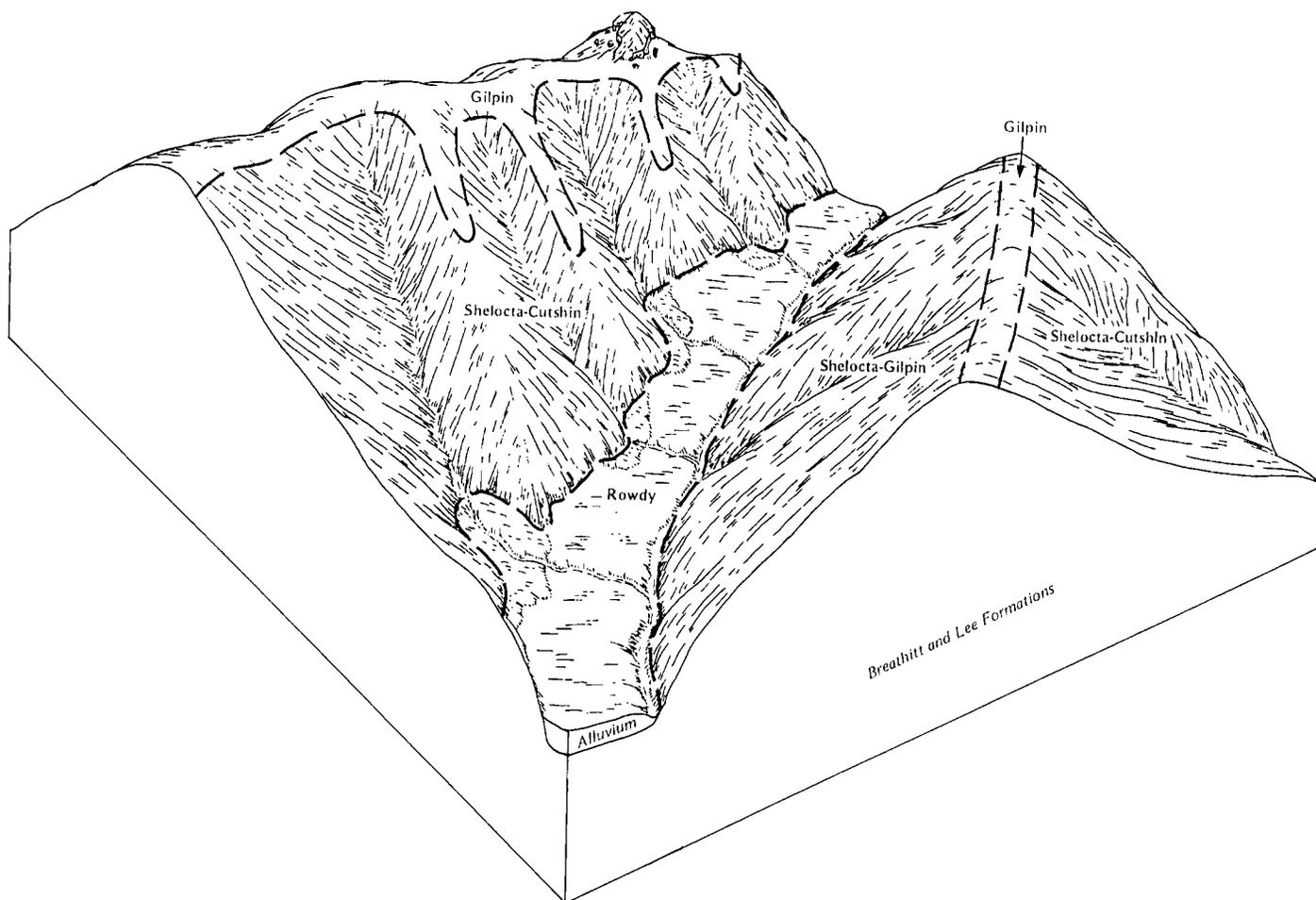


Figure 2.—Typical pattern of soils and parent material in the Shelocta-Gilpin-Cutshin map unit.

and flood plains. Huntington soils are along the Middle Fork of the Kentucky River. Fairpoint and Bethesda soils are in strip mined areas, and Steinsburg soils are on ridges.

The soils of this map unit are mainly used as woodland. Most cultivated areas are along the narrow flood plains and terraces. These soils are limited mainly by steep, complex slopes.

These soils are poorly suited to farming and urban uses. They are, however, suited to use as woodland and as habitat for woodland wildlife. Steep slopes restrict the use of equipment, and erosion is a severe hazard.

### 3. Shelocta-Bledsoe-Gilpin

*Deep and moderately deep, well drained, steep to gently sloping soils that have a loamy subsoil; on steep hillsides and narrow ridges*

This map unit is in the northern and northwestern parts of Jackson County, mainly within the watersheds of

Station Camp Creek and Horse Lick Creek. Landscapes consist of ridges and valleys (fig. 3). The soils are underlain by stratified, level-bedded, acid sandstone, siltstone, and shale of the Pennsylvanian geologic system and level-bedded, stratified limestone, dolomite, sandstone and shale of the Mississippian geologic system. Most areas of this map unit consist of hardwood forest and scattered pine plantations. A few narrow ridgetops and bottoms have been cleared and are used for farming. A dendritic drainage pattern of many intermittent streams is typical of this map unit. Except for a few small communities, most development consists of farmsteads scattered along the narrow ridgetops. Development is restricted by narrow valleys and ridges coupled with steep side slopes. The important structures are farm buildings, roads, and power and communication facilities.

This map unit makes up about 16 percent of the survey area. It is about 30 percent Shelocta soils, 13

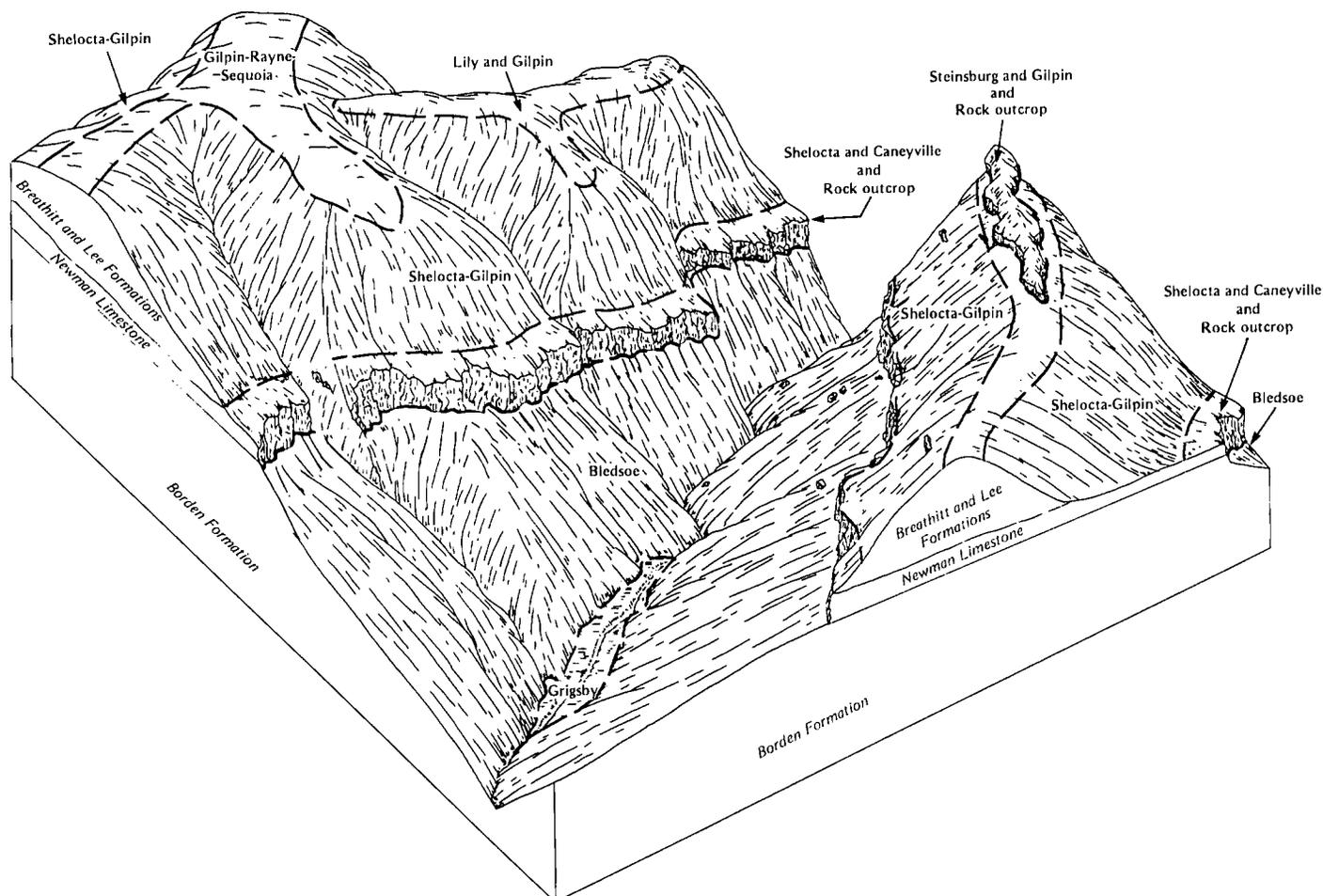


Figure 3.—Typical pattern of soils and parent material in the Shelocta-Bledsoe-Gilpin map unit.

percent Bledsoe soils, 13 percent Gilpin soils, and 44 percent soils of minor extent and Rock outcrop.

Shelocta soils are deep and well drained. They are on steep to strongly sloping hillsides. The surface layer is channery silt loam, and the subsoil is channery silt loam or channery silty clay loam.

Bledsoe soils are deep and well drained. They are on steep hillsides, commonly below outcrops of limestone. The surface layer is silt loam, and the subsoil is silty clay loam.

Gilpin soils are moderately deep and well drained. They are on sloping to steep hillsides and narrow ridges. The surface layer is silt loam on ridges and channery silt loam on hillsides. The subsoil is silt loam, channery silt loam, channery loam, or channery silty clay loam.

Of minor extent are the Caneyville, Sequoia, Rayne, Steinsburg, Lily, Rigley and Grigsby soils and Rock outcrop. Caneyville, Sequoia, and Rayne soils are on

hillsides. Caneyville and Sequoia soils are moderately deep and well drained and have a clayey subsoil. Rayne soils are deep and well drained and have a loamy subsoil. Steinsburg and Lily soils are moderately deep and well drained and formed mainly from sandstone residuum on ridges. Rigley soils are deep and well drained and are on upper side slopes. Grigsby soils are well drained and are on flood plains. Rock outcrop is on the hillsides.

The soils of this map unit are mainly used as woodland. On ridgetops and in less sloping areas, they are used for farming. The soils in narrow valleys are commonly used for cultivated crops, hay, or pasture. These soils are limited mainly by steep, complex slopes.

These soils are poorly suited to farming and urban uses. They are, however, suited to use as woodland and

as habitat for woodland wildlife. Steep slopes restrict the use of equipment, and erosion is a severe hazard.

**4. Gilpin-Shelocta-Rayne**

*Moderately deep and deep, well drained, steep to gently sloping soils that have a loamy subsoil; on hillsides and ridges*

This map unit is in the south-central part of Jackson County. Landscapes consist of low hills with rounded ridgetops (fig. 4). Slopes are steep to moderately steep. Ridges and flood plains are narrow. The soils of this map unit are underlain by thin-bedded, stratified layers of sandstone, siltstone, and shale of the Pennsylvania geologic system. Most of the less steep areas have been cleared and are used mainly for hay and pasture crops. Most of the steep side slopes and narrow pointed ridges are in hardwoods with scattered pine plantations. A dendritic drainage pattern of many intermittent streams and a few perennial streams is typical of this map unit.

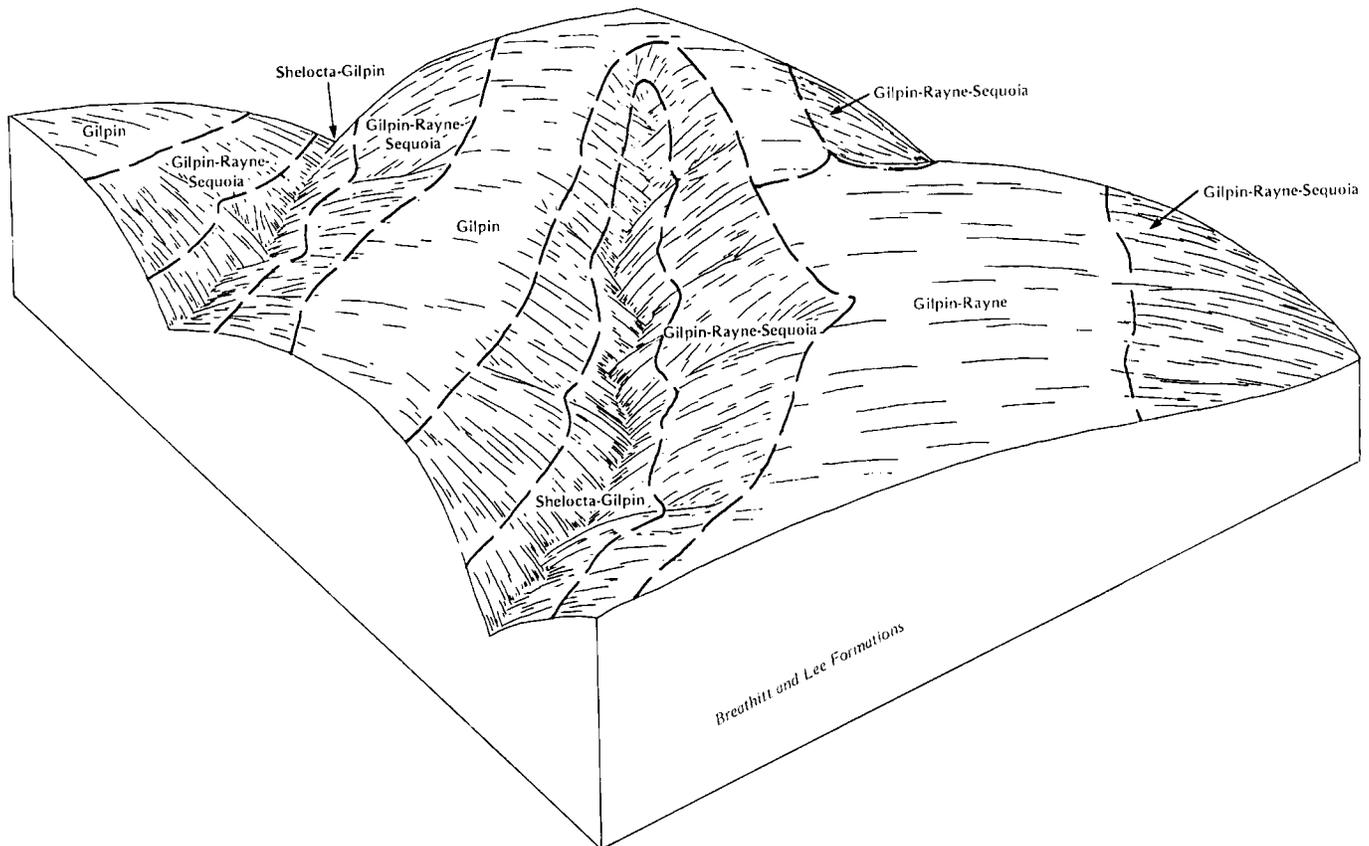
Except for a few communities, most development consists of farmsteads along primary highways and larger drainageways. Development is restricted by narrow valleys and ridgetops coupled with steep side slopes. The important structures are farm buildings, roads, and gas, power and communication facilities.

This map unit makes up about 14 percent of the survey area. It is about 33 percent Gilpin soils, 29 percent Shelocta soils, 13 percent Rayne soils, and 25 percent soils of minor extent.

Gilpin soils are moderately deep and well drained. They are on steep to strongly sloping hillsides and on sloping ridgetops. The surface layer is silt loam on ridges and channery silt loam on hillsides. The subsoil is silt loam, silty clay loam, or channery silty clay loam.

Shelocta soils are deep and well drained. They are on steep to strongly sloping hillsides. The surface layer and the subsoil are channery silt loam.

Rayne soils are deep and well drained. They are on ridgetops and hilly landscapes. The surface layer is silt



**Figure 4.—Typical pattern of soils and parent material in the Gilpin-Shelocta-Rayne map unit.**

loam, and the subsoil is silt loam, silty clay loam, or channery silty clay loam.

Of minor extent are the Grigsby, Lily, Steinsburg, and Sequoia soils. Grigsby soils are deep and well drained. Lily, Steinsburg, and Sequoia soils are moderately deep and well drained. Grigsby soils are on narrow flood plains, Lily and Steinsburg soils are on narrow ridges, and Sequoia soils are on hillsides.

Most areas of the soils in this map unit are used as pasture, although some row crops are grown. The hilly terrain and narrow ridges are major limitations.

These soils generally are poorly suited to most farming operations and urban uses. Most of these soils on ridges, however, are suited to use as pasture, as woodland, and as habitat for wildlife. The steep to moderately steep slopes restrict the use of equipment, and erosion is a severe hazard.

## Detailed Soil Map Units

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

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

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

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

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

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

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

A *soil association* is made up of two or more geographically associated soils or a geographically associated soil and a miscellaneous area that are shown as one unit on the maps. Because of present or anticipated soil uses in the survey area, it was not considered practical or necessary to map them

separately. The pattern and relative proportion of each are somewhat similar. Rigley-Rock outcrop association, steep, is an example.

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

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

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example. Miscellaneous areas are shown on the soil maps. Some that are too small to be shown are identified by a special symbol on the soil maps.

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

**AvB—Allegheny Variant silt loam, 2 to 6 percent slopes.** This soil is deep and well drained. It is on stream terraces along major streams. The slopes are complex. The areas of this soil range from 5 to about 100 acres.

Typically, the surface layer is dark yellowish brown silt loam about 10 inches thick. The upper part of the subsoil, to a depth of about 18 inches, is strong brown silt loam. The middle part, to a depth of about 40 inches, is strong brown silty clay loam. The lower part, to a depth of about 48 inches, is brownish yellow silt loam. Hard sandstone bedrock is below the subsoil.

The permeability of this Allegheny Variant soil is moderate. The available water capacity is high. The soil has good tilth and is easily tilled throughout a wide range

of moisture content. The root zone is deep and is easily penetrated by roots. Depth to bedrock ranges from 40 to 60 inches. The natural fertility is medium, and the content of organic matter is moderate. This soil is medium acid to extremely acid throughout except where lime has been added.

Included in mapping are small areas of Allegheny and Rowdy soils. Also included are small areas of soils that are moderately well drained and somewhat poorly drained. In places, generally along drainageways, depth to bedrock is less than 40 inches as a result of erosion. The included soils make up less than 10 percent of the map unit.

This Allegheny Variant soil is mainly used for row crops, hay, or pasture. In many areas, however, it is used as homesites and for gardening.

This soil is well suited to row crops, mainly corn and tobacco. High yields are possible if the soil is properly managed. Crops respond well to lime and fertilizer. Management and conservation practices are needed that reduce erosion and improve tilth and fertility.

This soil is well suited to hay and pasture. High yields are possible if proper management and conservation practices are used.

This soil is well suited to use as woodland, although most areas have been cleared. This soil has the capability of producing 130 cubic feet per acre of shortleaf pine at the point of highest yearly growth. Yellow poplar, northern red oak, eastern white pine, shortleaf pine, and black walnut are the most suitable trees to plant. Plant competition is a concern in management.

This soil is well suited to most urban use. Depth to bedrock can be a moderate limitation for sanitary facilities and dwellings with basements.

This Allegheny Variant soil is in capability subclass IIe. The woodland ordination symbol is 9A.

**AvD—Allegheny Variant silt loam, 6 to 20 percent slopes.** This soil is deep and well drained. It is on stream terraces. In most areas, this soil is along the South Fork of the Kentucky River, but small areas are along Sturgeon Creek in eastern Jackson County. The slopes are short and complex. The areas of this soil range from 10 to 100 acres.

Typically, the surface layer is dark yellowish brown silt loam about 10 inches thick. The upper part of the subsoil, to a depth of about 18 inches, is strong brown silt loam. The middle part, to a depth of about 40 inches, is strong brown silty clay loam. The lower part, to a depth of about 48 inches, is brownish yellow silt loam. Hard sandstone bedrock is below the subsoil.

The permeability of this Allegheny Variant soil is moderate. The available water capacity is high. The soil has good tilth and is easily tilled throughout a wide range of moisture content. The root zone is deep and is easily penetrated by roots. Depth to bedrock ranges from 40 to

60 inches. The natural fertility is medium, and the content of organic matter is moderate. This soil is medium acid to extremely acid throughout except where lime has been added.

Included in mapping are small areas of Allegheny, Riney, and Shelocta soils. Also included are small areas where depth to bedrock is less than 40 inches as a result of erosion. The included soils make up less than 10 percent of the map unit.

This Allegheny Variant soil is mainly used for pasture or hay.

Row crop production is restricted by the severe hazard of erosion and equipment use limitation.

This soil is suited to hay and pasture. Moderate yields are possible if the soil is properly managed. Conservation practices are needed that reduce erosion and improve tilth and fertility. Plants that produce adequate forage and provide satisfactory ground cover are preferable. Lime and fertilizers, proper stocking, and control of undesirable plants are needed for maintaining good yields.

This soil is well suited to use as woodland although most areas have been cleared. This soil has the capability of producing 130 cubic feet per acre of shortleaf pine at the point of highest yearly growth. Yellow poplar, northern red oak, shortleaf pine, black walnut, and eastern white pine are suitable trees to plant. Plant competition is a concern in management.

In most areas, this soil has limited potential for urban use because of moderately steep slopes.

This Allegheny Variant soil is in capability subclass IVe. The woodland ordination symbol is 9A.

**BfF—Bethesda-Fairpoint complex, steep, benched.** The soils in this complex are deep and well drained. They formed from soil and geologic material disturbed as a result of strip mining. These soils are mostly on narrow benches and slopes where steep hillsides have been contour mined; however, other mined areas are included. The areas in this complex range from about 5 to 200 acres or more. The slopes are as much as 70 percent.

Bethesda very channery loam makes up about 50 percent of the map unit, Fairpoint channery silt loam makes up about 40 percent, and small areas of included soils make up about 10 percent. The Bethesda and Fairpoint soils are so intermingled that mapping them separately at the scale used for the maps in the back of this publication was not practical. This complex mostly consists of long narrow bands on the contours of hillsides. These areas include a highwall, ranging in height from 10 to 50 feet, a narrow bench, and a steep outslope.

Typically, the surface layer of the Bethesda soil is gray, very channery loam about 5 inches thick. The next layer, to a depth of 60 inches, is very dark gray and yellowish brown channery loam. Below that layer is dark

grayish brown very channery loam that has pockets of yellowish brown and very dark gray.

Typically, the surface layer of the Fairpoint soil is brownish yellow and brown channery silt loam about 11 inches thick. The next layers to a depth of 60 inches are gray and very dark gray very channery loam.

The permeability of the Bethesda and Fairpoint soils is moderately slow. The available water capacity is low. The root zone is deep, but root penetration may be restricted by compacted soil and coarse fragments. The natural fertility and content of organic matter of these soils is low. Bethesda soil is strongly acid to extremely acid throughout except where lime has been added. Fairpoint soil is medium acid to neutral. The shrink-swell potential of this soil is moderate.

Included in mapping are small areas of Allegheny Variant, Gilpin, Rayne, Sequoia, and Steinsburg soils. Also included are small mine areas that have been reclaimed.

In most recently disturbed areas, these soils have been reshaped and seeded to grasses and legumes; however, most areas have not been graded back to the original contour. *Sericea lespedeza* and Kentucky 31 fescue is the most common legume and grass mixture. Steep slopes and coarse fragments can restrict the use of equipment. Differential settling and steep, unstable outcrops can be concerns in management. These soils need a fast-growing, protective, permanent cover. A suitable seedbed is needed, along with adequate amounts of seed, fertilizer, and lime.

These soils are suited to use as woodland. Bethesda soil has the capability of producing 91 cubic feet per acre of loblolly pine at the point of highest yearly growth, and Fairpoint soil has the capability of producing 114 cubic feet per acre. Shortleaf pine, white oak, and eastern white pine are suitable trees to plant. In steep areas, herbaceous plants should be planted at the same time as the seedlings to adequately control erosion. The hazard of erosion, equipment use limitations, plant competition, and seedling mortality are concerns in management.

These soils are suited to either herbaceous or woody plants that provide food and cover for wildlife.

These soils have severe limitations for most urban use because of steep slopes, moderately slow permeability, differential settling, and slippage.

The soils in this complex are in capability subclass VIIe. For the Bethesda soil, the woodland ordination symbol is 6R; and for the Fairpoint soil, the woodland ordination symbol is 8R.

**BsF—Bledsoe silt loam, steep, very rocky.** This soil is deep and well drained. It is in the northern and northwestern parts of Jackson County. This soil is in narrow areas that make up the lower two-thirds of hillsides. It is on benches and side slopes and in narrow valleys on complex landscapes. It is generally below

limestone outcrops. Fragments from the limestone bluff are randomly scattered over the surface, and rock outcrop covers from 2 to 10 percent of the surface. Numerous drainageways dissect areas of this soil. The slopes range from 20 to 65 percent, averaging about 40 percent.

Typically, the surface layer is very dark grayish brown silt loam about 4 inches thick. The subsoil to a depth of about 60 inches is dark brown silty clay loam. Coarse limestone, siltstone, and sandstone fragments make up about 10 percent of the subsoil.

The permeability of this Bledsoe soil is slow. The available water capacity is high. The natural fertility is high, and the content of organic matter is moderate. The surface layer is medium acid to mildly alkaline, and the subsoil is very strongly acid to mildly alkaline. The root zone is deep and is easily penetrated by roots. The shrink-swell potential is moderate.

Included in mapping are small areas of Shelocta, Rigley, and Grigsby soils. Sandstone and shale fragments are commonly deposited on Shelocta and Rigley soils from sandstone and shale formations that are in higher positions on the landscape. Grigsby soils are deep and well drained. They are on some narrow valley floors. Also included is a discontinuous band of limestone bedrock that is in a higher position on the landscape. The included soils make up about 20 percent of the map unit.

This Bledsoe soil is mostly used as woodland.

This soil is poorly suited to hay and pasture. It is not suited to row crops.

This soil is well suited to use as woodland. On north aspects, Bledsoe soil has the capability of producing 114 cubic feet per acre of yellow poplar at the point of highest yearly growth; and on south aspects, it has the capability of producing 81 cubic feet per acre of yellow poplar. Northern red oak, yellow poplar, white ash, and white oak are suitable trees to plant on north aspects. White oak, white ash, and northern red oak trees are suitable to plant on south aspects. Erosion is a severe hazard. Plant competition and equipment use limitations are the main concerns in management.

This soil is well suited to use as woodland wildlife habitat.

The soil is poorly suited to urban use. The steep slopes, slow permeability, and surface stones are severe limitations. Most areas of this soil are relatively inaccessible.

This Bledsoe soil is in capability subclass VIIs. The woodland ordination symbol is 8R on north aspects and is 6R on south aspects.

**CaF—Caneyville silt loam, steep, very rocky.** This soil is moderately deep and well drained. It formed in residuum from limestone. This soil is in long narrow bands on the middle to upper parts of hillsides in the northern part of Jackson County, and on lower parts of

hillsides in the western part of the county. In most areas, this soil is inaccessible. Exposed bedrock covers up to 10 percent of the surface. The slopes range from 15 to 60 percent. The areas of this soil range from 5 to 100 acres or more.

Typically, the surface layer is dark brown silt loam about 4 inches thick. The subsoil extends to a depth of about 30 inches and is yellowish red silty clay. The substratum, to a depth of about 36 inches, is yellowish red clay. Limestone bedrock is below the substratum.

The permeability of this Caneyville soil is moderately slow. The available water capacity is moderate. Natural fertility is medium, and the content of organic matter is moderate. The surface layer is neutral, and the subsoil is medium acid. The root zone is less than 40 inches deep. The shrink-swell potential is moderate.

Included with this soil in mapping are small areas of Shelocta and Bledsoe soils and a discontinuous band of limestone bedrock at the base of the Caneyville soil. Also included are soils that are similar to Caneyville soil except that some are more than 40 inches to limestone bedrock and others are less than 20 inches to bedrock. In some places are similar soils that are more than 40 inches to acid shale. The included soils make up about 20 percent of the map unit.

This Caneyville soil is mainly used as woodland.

This soil is suited to hay and pasture in areas where farm machinery can be used and where access roads are available. Because of steep slopes and rock outcrops, this soil is not suited to row crops, hay, or to use as pasture.

This soil is suited to use as woodland. On north aspects, this soil has the capability of producing 53 cubic feet per acre of black oak at the point of highest yearly growth. On south aspects, the production capability is 34 cubic feet per acre of scarlet oak. White oak, white ash, yellow poplar, and eastern white pine are suitable trees to plant on north aspects. On south to west aspects, eastern redcedar and Virginia pine are suitable trees to plant. The severe hazard of erosion and equipment use limitations are concerns in management.

This soil is poorly suited to urban use. Steep slopes, rock outcrop, slow permeability of the clayey subsoil, and moderate depth to bedrock are severe limitations.

This soil is suited to use as woodland wildlife habitat.

This Caneyville soil is in capability subclass VII<sub>s</sub>. The woodland ordination symbol is 4R on north aspects and 3R on south aspects.

**GnC—Gilpin silt loam, 6 to 12 percent slopes.** This soil is moderately deep and well drained. It is on convex ridgetops. The areas of this soil range from 10 to 300 acres.

Typically, the surface layer is dark yellowish brown silt loam about 2 inches thick. The subsoil, to a depth of about 36 inches, is yellowish brown silt loam. Bedrock is below the subsoil.

The permeability of this Gilpin soil is moderate. The available water capacity is moderate. The soil is easily tilled throughout a wide range of moisture content. The root zone is moderately deep and is easily penetrated by roots. The natural fertility is medium, and the content of organic matter is moderate. This soil is strongly acid to extremely acid throughout except where lime has been added.

Included in mapping are small areas of Lily, Rayne, Sequoia, and Steinsburg soils. Individual areas of the included soils generally are less than 5 acres. The included soils make up about 15 percent of the map unit.

This Gilpin soil is used for row crops, hay, or pasture. In some areas, the soil is used as woodland.

This soil is suited to row crops, hay, and pasture. Moderate yields are possible when proper management and conservation practices are used that reduce erosion and improve tilth and fertility.

This soil is suited to use as woodland. It has the capability of producing 93 cubic feet per acre of yellow poplar at the point of highest yearly growth. Common native trees include white oak, red maple, scarlet oak, black oak, yellow poplar, and hickory. Shortleaf pine, white oak, northern red oak, eastern white pine, and yellow poplar are suitable trees to plant. Plant competition is a concern in management.

Most limitations for urban use are moderate; however, slope and depth to bedrock are major concerns for construction of houses and commercial buildings. Limitations to use of this soil as septic tank absorption fields are severe because of depth to bedrock.

This Gilpin soil is in capability subclass III<sub>e</sub>. The woodland ordination symbol is 6A.

**GpB—Gilpin-Rayne silt loams, 2 to 6 percent slopes.** The soils in this complex are well drained, moderately deep and deep. They are on ridgetops. The slopes are dominantly convex, although they are complex in places. The areas of this map unit range from 20 to about 100 acres and generally are elongated and of variable width.

The Gilpin soil makes up about 50 percent of the map unit, the Rayne soil about 35 percent, and included soils about 15 percent. Rayne and Gilpin soils are so intermingled that mapping them separately at the scale used for the maps in the back of this publication was not practical.

Typically, the surface layer of the Gilpin soil is dark yellowish brown silt loam about 2 inches thick. The upper part of the subsoil, to a depth of about 11 inches, is yellowish brown silt loam. The lower part, to a depth of about 36 inches, is yellowish brown channery silt loam. Bedrock is below the subsoil.

Typically, the surface layer of the Rayne soil is brown silt loam about 2 inches thick. The upper part of the subsoil, to a depth of about 6 inches, is yellowish brown silt loam. The middle part, to a depth of about 37 inches,

is strong brown silty clay loam that has red and reddish yellow mottles below a depth of about 25 inches. The lower part, to a depth of about 46 inches, is variegated reddish yellow, red, and light gray channery silty clay loam. The substratum to a depth of about 60 inches is dominantly gray weathered siltstone or sandstone that has red and gray variegations.

The permeability of the Gilpin and Rayne soils is moderate. The available water capacity is moderate in Gilpin soil and high in Rayne soil. These soils have good tilth and are easily tilled throughout a wide range of moisture content. The root zone of these soils is deep and is easily penetrated by roots. The natural fertility is medium, and the content of organic matter is moderate. Gilpin soil is strongly acid to extremely acid throughout except where lime has been added. Depth to bedrock ranges from 20 to 40 inches. Rayne soil is strongly acid or very strongly acid throughout except where lime has been added.

Included in mapping are small areas of Lily, Sequoia, and Steinsburg soils. Also included near the heads of draws is a soil that has characteristics of a fragipan. This soil has gray mottles in the subsoil and is compact and brittle in some parts. Some small areas have been severely eroded. Individual areas of the included soils generally are less than 5 acres.

The soils in this map unit are used mainly for row crops, hay, or pasture. A few areas are in woodland.

These Gilpin and Rayne soils are well suited to most row crops commonly grown in the survey area. Moderate to high yields are possible if proper management and conservation practices are used that reduce erosion and improve tilth and fertility.

These soils are well suited to hay and pasture. High yields are possible if the soil is properly managed. A moderately deep root zone limits the available water capacity of the Gilpin soil, and production may be limited during dry seasons.

These soils are well suited to use as woodland. Gilpin soil has the capability of producing 93 cubic feet per acre of yellow poplar at the point of highest yearly growth. Rayne soil has the capability of producing 62 cubic feet per acre of northern red oak. Shortleaf pine, eastern white pine, white oak, and northern red oak are suitable trees to plant. Plant competition is a concern in management.

The soils in this complex are suitable for some urban uses, but care is needed in site selection. Depth to bedrock and impervious layers is a limitation that good design and proper installation can help overcome.

These Gilpin and Rayne soils are in capability subclass IIe. For Gilpin soil, the woodland ordination symbol is 6A, and for Rayne soil, it is 4A.

**GrD—Gilpin-Rayne-Sequoia silt loams, 12 to 25 percent slopes.** These soils are well drained, steep and moderately steep. They are in complex patterns on hilly

terrain mainly in the south-central part of Jackson County. Gilpin soil is moderately deep, and Rayne soil is deep. These soils formed in loamy residuum. The Sequoia soil is moderately deep and formed in clayey residuum. The areas of this map unit range from about 20 to several hundred acres, and some areas include entire hills and associated ridgetops.

Gilpin soil makes up about 35 percent of this complex, Rayne soil about 30 percent, Sequoia soil about 20 percent, and included soils about 15 percent. These soils are so intermingled that mapping them separately is not practical at the scale used for the maps at the back of this publication.

Typically, the surface layer of the Gilpin soil is dark yellowish brown silt loam about 2 inches thick. The upper part of the subsoil, to a depth of about 11 inches, is yellowish brown silt loam. The lower part, to a depth of about 36 inches, is yellowish brown channery silt loam. Bedrock is below the subsoil.

The permeability of this Gilpin soil is moderate. The available water capacity is moderate. This soil is easily tilled throughout a wide range of moisture content. The root zone is moderately deep and is easily penetrated by roots. The natural fertility is medium, and the content of organic matter is moderate. This soil is strongly acid to extremely acid throughout except where lime has been added. Depth to bedrock ranges from 20 to 40 inches.

Typically, the surface layer of the Rayne soil is brown silt loam about 2 inches thick. The upper part of the subsoil, to a depth of about 6 inches, is yellowish brown silt loam. The middle part, to a depth of about 37 inches, is strong brown silty clay loam that has red and reddish yellow mottles beginning at a depth of about 25 inches. The lower part, to a depth of about 46 inches, is variegated reddish yellow, red, and light gray channery silty clay loam. The substratum to a depth of about 60 inches is dominantly gray with red and brown variegations.

The permeability of this Rayne soil is moderate. The available water capacity is high. The soil has good tilth and is easily tilled throughout a wide range of moisture content. The root zone is deep and is easily penetrated by roots. The natural fertility is medium, and the content of organic matter is moderate. This soil is strongly acid or very strongly acid throughout except where lime has been added.

Typically, the surface layer and subsurface layer of the Sequoia soil are dark grayish brown and yellowish brown silt loam about 5 inches thick. The subsoil extends to a depth of about 29 inches. The upper part of the subsoil, to a depth of about 10 inches, is yellowish brown silty clay loam. The lower part is strong brown silty clay that has red mottles below a depth of about 16 inches. The substratum to a depth of about 60 inches is red clayey shale that has very pale brown, brownish yellow, and light gray mottles.

Permeability of this Sequoia soil is moderately slow. The available water capacity is moderate. The root zone is moderately deep, and clayey shale is at a depth of about 29 inches. The natural fertility is medium, and the content of organic matter is low. This soil is strongly acid or very strongly acid. The shrink-swell potential is moderate.

Included in mapping are small areas of Grigsby, Lily, Steinsburg, and Shelocta soils. Also included is a soil similar to Sequoia soil except that it has gray mottles in the upper part of the subsoil, and in some places, similar soils that are more than 40 inches to soft shale. Individual areas of the included soils are not extensive and generally are less than 10 acres.

The soils in this complex are used mainly for hay, pasture, or woodland.

These soils are poorly suited to row crops because severe erosion is a hazard and the steep and moderately steep slopes restrict equipment use. Crops respond favorably to proper management and conservation practices that reduce erosion and improve tilth and fertility.

The soils in this complex are suited to hay and pasture (fig. 5). Moderate yields are possible with good management.

These soils are suited to use as woodland, although most areas of this complex are cleared. Gilpin soil has the capability of producing 93 cubic feet per acre of yellow poplar at the point of highest yearly growth. Rayne soil has the capability of producing 62 cubic feet per acre of northern red oak; and Sequoia soil, 52 cubic feet per acre of northern red oak. Gilpin and Rayne soils



Figure 5.—Gilpin-Rayne-Sequoia silt loams, 12 to 25 percent slopes, are used mainly for hay, pasture, or woodland.

are suited to white oak, northern red oak, eastern white pine, shortleaf pine, and yellow poplar. Sequoia soils are suited to shortleaf pine and white oak. Plant competition, the hazard of erosion, and limited equipment use are concerns in management.

The soils in this complex are poorly suited to urban use because of steep slopes and in places, depth to bedrock.

These Gilpin, Rayne, and Sequoia soils are in capability subclass IVe. The woodland ordination symbol is 6R for Gilpin soil, 4R for Rayne soil, and 4A for Sequoia soil.

**Gs—Grigsby fine sandy loam, 0 to 3 percent slopes, frequently flooded.** This soil is deep and well drained. It is on flood plains of tributary streams throughout the survey area. The areas of this soil are generally elongated and parallel to streams; they range from 5 to more than 100 acres.

Typically, the surface layer is dark yellowish brown fine sandy loam about 9 inches thick. The upper part of the subsoil, to a depth of about 17 inches, is yellowish brown fine sandy loam. The lower part, to a depth of about 44 inches, is strong brown and yellowish brown loam. The substratum, to a depth of about 60 inches, is yellowish brown and strong brown sandy loam. Hard sandstone bedrock is below the subsoil.

The permeability of this Grigsby soil is moderate or moderately rapid. The available water capacity is high. This soil is subject to frequent flooding, but generally not during the growing season. The soil has good tilth and is easily tilled throughout a wide range of moisture content. The root zone is deep and is easily penetrated by roots. The natural fertility is high, and the content of organic matter is moderate. The soil is medium acid to neutral in the surface layer and subsoil and is strongly acid to neutral in the substratum.

Included with this soil in mapping are small areas of Orrville Variant and Rowdy soils. Also included are small areas of poorly drained soils, soils that contain more than 35 percent coarse fragments in their control section, and sandy soils that have been recently deposited by streams. Individual areas of the included soils generally are less than 3 acres. The included soils make up about 25 percent of the map unit.

This Grigsby soil is mostly used for row crops, hay, or pasture.

This soil is well suited to row crops, and high yields are possible with proper management. The soil can be used for continuous cultivation if it is managed properly and if conservation practices are used that improve tilth and fertility.

This soil is well suited to hay and pasture. Grasses and legumes are seldom damaged by flooding.

The Grigsby soil is well suited to use as woodland, although most areas are cleared. This soil has the capability of producing 124 cubic feet per acre of yellow

poplar at the point of highest yearly growth. Yellow poplar, black walnut, eastern white pine, white ash, northern red oak, and white oak are suitable trees to plant. Plant competition is a concern in management.

This soil is poorly suited to most urban uses because flooding is a hazard.

This Grigsby soil is in capability subclass IIw, and the woodland ordination symbol is 9A.

**Gv—Grigsby-Orrville Variant complex, 0 to 3 percent slopes, frequently flooded.** The soils in this complex are deep, well drained and somewhat poorly drained. They are on narrow flood plains. The Grigsby soil is well drained and is in nearly level to convex areas. The Orrville Variant soil is somewhat poorly drained and is in nearly level to slightly concave areas. The areas of this complex generally include the entire flood plain and range from 20 to 100 acres or more.

The Grigsby soil makes up about 45 percent of the map unit, the Orrville Variant soil makes up about 35 percent, and included soils make up about 20 percent. The soils are in a regular and repeating pattern and are so intermingled that mapping them separately is not practical at the scale used for the maps in the back of this publication.

Typically, the surface layer of the Grigsby soil is dark grayish brown fine sandy loam about 9 inches thick. The upper part of the subsoil, to a depth of about 17 inches, is yellowish brown fine sandy loam. The lower part, to a depth of about 44 inches, is strong brown and yellowish brown loam. The substratum, to a depth of about 60 inches, is yellowish brown and strong brown sandy loam. Hard bedrock is below the substratum.

The permeability of this Grigsby soil is moderate or moderately rapid. The available water capacity is high. This soil is subject to frequent flooding, but generally not during the growing season. The soil has good tilth and is easily tilled throughout a wide range of moisture content. The root zone is deep and is easily penetrated by roots. The natural fertility is high, and the content of organic matter is moderate. This soil is medium acid to neutral in the surface layer and subsoil and is strongly acid to neutral in the substratum.

Typically, the surface layer of the Orrville Variant soil is very dark grayish brown silt loam about 3 inches thick. The subsoil extends to a depth of about 29 inches. It is light olive brown loam in the upper part and grayish brown loam in the lower part. Gray and brown mottles are throughout the subsoil. The substratum extends to a depth of about 48 inches. It is light brownish gray clay loam that has gray and brown mottles, pebbles, and shale fragments. Gravel content increases with depth. Hard fissile shale is below the substratum.

The permeability of this Orrville Variant soil is moderate. The available water capacity is high. This soil is subject to frequent flooding, but generally not during the growing season. In winter and early in spring, the soil

is saturated below a depth of 1 foot to 2.5 feet. The root zone is deep and is easily penetrated by roots. The natural fertility is high, and the content of organic matter is moderate. This soil is strongly acid to slightly acid in the surface layer and subsoil, and it is medium acid to neutral in the substratum.

Included with these soils in mapping are small areas of Allegheny Variant and Rowdy soils on higher convex landforms. Also included are poorly drained soils and gravelly soils on colluvial fans at the mouths of hollows. Individual areas of the included soils generally are less than 5 acres.

The soils in this complex are mainly used as pasture and for hay.

These soils are suited to use as pasture and hay. They are also suited to row crops that can be cropped year after year. Proper management and conservation practices are needed that improve fertility, tilth, and organic matter and that provide surface and subsurface drainage. Some plants may be damaged by flooding or wetness (fig. 6).

The soils in this complex are well suited to use as woodland. Grigsby soil has the capability of producing 124 cubic feet per acre of yellow poplar at the point of highest yearly growth. Orrville soil has the capability of producing 90 cubic feet per acre. Yellow poplar, black walnut, eastern white pine, shortleaf pine, white oak, northern red oak, and white ash are suitable trees to plant on Grigsby soil. Eastern white pine, yellow poplar, white oak, green ash, and sweetgum are preferred on Orrville soil. Plant competition is a concern in management.

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

These Grigsby and Orrville Variant soils are in capability subclass IIw. The woodland ordination symbol is 9A for Grigsby soil and 4A for Orrville Variant soil.

**Hu—Huntington loam, 0 to 4 percent slopes, occasionally flooded.** This soil is deep and well drained. It is on flood plains of the Middle Fork of the Kentucky River. The areas of this soil range from about 10 to several hundred acres.

Typically, the upper part of the surface layer is dark brown loam about 10 inches thick. The lower part, to a depth of about 17 inches, is very dark grayish brown silty clay loam. The subsurface layer, to a depth of about 24 inches, is dark brown clay loam. The subsoil extends to a depth of about 64 inches. It is brown clay loam in the upper part, dark yellowish brown silty clay loam in the middle part, and dark brown clay loam in the lower part.

The permeability of this Huntington soil is moderate. The available water capacity is high. The soil is subject to occasional flooding, but generally not during the growing season. This soil has good tilth and is easily tilled throughout a wide range of moisture content. The root zone is deep and is easily penetrated by roots. The

natural fertility is high, and the content of organic matter is high. This soil is very strongly acid to slightly acid.

Included with this soil in mapping are long, narrow, discontinuous areas of Grigsby soil. Also included are narrow elongated areas of soils that are silty and are somewhat poorly drained and poorly drained. These soils are near the base of some hills that are above steep riverbanks. The included soils make up about 20 percent of the map unit.

This Huntington soil is used mainly for row crops. High yields are possible if the soil is properly managed and if conservation practices are used that maintain tilth and fertility. Erosion is not a problem, but scouring and sand deposits may be a problem in places.

This soil is suited to hay and pasture, and it produces high yields.

This soil is well suited to use as woodland, although most areas have been cleared. It has the capability of producing 98 cubic feet per acre of yellow poplar at the point of highest yearly growth. Preferred trees to plant are yellow poplar, northern red oak, black walnut, white oak, white ash, and eastern white pine. Plant competition is a concern in management.

This soil is poorly suited to urban use because of flooding.

The Huntington soil is in capability subclass IIw, and the woodland ordination symbol is 7A.

**LyC—Lily and Gilpin soils, sloping.** This undifferentiated group consists of soils that are moderately deep and well drained. These soils are on long, narrow ridgetops throughout Jackson County, but they are more common in the western and northern parts. The slopes are convex and range from 6 to 15 percent. The areas of this map unit are typically elongated; they range from 20 to 100 acres or more.

Lily soil makes up about 55 percent of this map unit, Gilpin soil about 20 percent, and included soils about 25 percent, but the composition is highly variable. The soils are not consistently associated and have no regular pattern.

Typically, the surface layer of the Lily soil is very dark gray sandy loam about 3 inches thick. The subsurface layer, to a depth of about 10 inches, is light yellowish brown sandy loam. The subsoil extends to a depth of about 29 inches. It is brown and strong brown sandy loam and sandy clay loam. Hard sandstone bedrock is below the subsoil.

The permeability of this Lily soil is moderately rapid. The available water capacity is moderate. The soil has good tilth and is easily tilled throughout a wide range of moisture content. The root zone is moderately deep and is easily penetrated by roots. The natural fertility is medium, and the content of organic matter is moderate. This soil is very strongly acid or extremely acid throughout except where lime has been added. Depth to bedrock ranges from 20 to 40 inches.



**Figure 6.—Wet spots are common on most narrow flood plains, but soils of the Grigsby-Orrville Variant complex, 0 to 3 percent slopes, frequently flooded, generally are not flooded during the growing season.**

Typically, the surface layer of the Gilpin soil is dark yellowish brown silt loam about 2 inches thick. The upper part of the subsoil, to a depth of about 11 inches, is yellowish brown silt loam. The lower part, to a depth of about 36 inches, is yellowish brown channery silt loam. Bedrock is below the subsoil.

The permeability of this Gilpin soil is moderate. The available water capacity is moderate. The soil is easily tilled throughout a wide range of moisture content. The root zone is moderately deep and is easily penetrated by roots. The natural fertility is medium, and the content of organic matter is moderate. This soil is strongly acid to

extremely acid throughout except where lime has been added.

Included in mapping are small areas of Rayne, Sequoia, and Steinsburg soils. Also included are soils that are less than 20 inches to bedrock, small areas of sandstone bedrock outcrop, and small seep spots at the heads of drains. Individual areas of the included soils generally are less than 5 acres.

The soils in this map unit are mainly used as woodland, pasture, or hay. A few small areas are used for row crops.

These soils are suited to row crops; however, proper management and conservation practices that reduce erosion and improve tilth and fertility are needed.

These soils are suited to hay and pasture. Moderate yields are possible if proper management and conservation practices are used.

These soils are suited to use as woodland. Lily soil has the capability of producing 95 cubic feet per acre of shortleaf pine at the point of highest yearly growth. Gilpin soil has the capability of producing 93 cubic feet per acre of yellow poplar. Shortleaf pine, white oak, eastern white pine, yellow poplar, and northern red oak are suitable trees to plant on Lily soil. Eastern white pine, white oak, northern red oak, and shortleaf pine are suitable on Gilpin soil. Plant competition is a concern in management.

These soils are suited to some urban uses, but moderate depth to bedrock severely limits their use as septic tank absorption fields.

These Lily and Gilpin soils are in capability subclass IIIe. The woodland ordination symbol is 7A for Lily soil and 6A for Gilpin soil.

**LyD—Lily and Gilpin soils, moderately steep.** This undifferentiated group consists of soils that are moderately deep and well drained. These soils are on ridgetops and are generally in the western and northern parts of Jackson County. The slopes are convex and range from 15 to 25 percent. The areas of this map unit range from 20 to about 100 acres.

Lily soil makes up about 40 percent of the map unit, Gilpin soil about 35 percent, and included soils about 25 percent, but the composition is highly variable. These soils are not consistently associated and have no regular pattern.

Typically, the surface layer of the Lily soil is very dark gray sandy loam about 3 inches thick. The subsurface layer, to a depth of about 10 inches, is light yellowish brown sandy loam. The subsoil extends to a depth of about 29 inches and is brown and strong brown sandy loam and sandy clay loam. Hard sandstone bedrock is below the subsoil.

The permeability of this Lily soil is moderately rapid. The available water capacity is moderate. The soil has good tilth and is easily tilled throughout a wide range of moisture content. The root zone is moderately deep and is easily penetrated by roots. Depth to bedrock ranges from 20 to 40 inches. The natural fertility is medium, and the content of organic matter is moderate. This soil is very strongly acid or extremely acid throughout except where lime has been added.

Typically, the surface layer of the Gilpin soil is dark yellowish brown silt loam about 2 inches thick. The upper part of the subsoil, to a depth of about 11 inches, is yellowish brown silt loam. The lower part, to a depth of about 36 inches, is yellowish brown channery silt loam. Bedrock is below the subsoil.

The permeability of this Gilpin soil is moderate. The available water capacity is moderate. The soil is easily tilled throughout a wide range of moisture content. The root zone is moderately deep and is easily penetrated by roots. The natural fertility is medium, and the content of organic matter is moderate. This soil is strongly acid to extremely acid throughout except in areas where lime has been added.

Included in mapping are small areas of Rayne, Sequoia, and Steinsburg soils. Also included are soils that are less than 20 inches to bedrock and small areas of sandstone bedrock outcrop. Individual areas of the included soils generally are less than 5 acres.

The soils in this map unit are mainly used as woodland. A few small areas are used as pasture.

These soils are poorly suited to row crops and pasture because steep slopes limit the use of equipment needed in establishing and maintaining plant cover.

These soils are suited to use as woodland. Lily soil has the capability of producing 95 cubic feet per acre of shortleaf pine at the point of highest yearly growth. Gilpin soil has the capability of producing 93 cubic feet per acre of yellow poplar on north aspects, and on south aspects, 54 cubic feet per acre of scarlet oak. Eastern white pine, white oak, shortleaf pine, and northern red oak are suitable trees to plant on north aspects. Shortleaf pine and white oak are suitable on south aspects. The hazard of erosion, equipment use limitations, and plant competition are concerns in management.

These soils are poorly suited to urban use because of steep slopes, seepage, and moderate depth to bedrock.

These Lily and Gilpin soils are in capability subclass IVe. The woodland ordination symbol is 7R for Lily soil. The woodland ordination symbol for Gilpin soil is 6R on north aspects and 4R on south aspects.

**RCF—Rigley-Rock outcrop association, steep.** The Rigley soil is deep and well drained. It is on convex slopes commonly in a lower position on the landscape than the soft sandstone Rock outcrop. Rock outcrop is on upper hillsides in the northern and western parts of Jackson County. Areas of this map unit are narrow, elongated, and commonly parallel to and directly below ridgetops. The slopes range from 20 to about 60 percent. The areas of this map unit range from 10 to several hundred acres.

The Rigley soil makes up about 55 percent of the map unit. Rock outcrop generally makes up about 20 percent, but ranges from 10 to 30 percent. The included soils make up about 25 percent. The Rigley soil and Rock outcrop are in a regular pattern and are consistently associated on the landscape.

Typically, the surface layer of the Rigley soil is brown loam about 6 inches thick. The subsurface layer, to a depth of about 14 inches, is yellowish brown sandy loam. The subsoil extends to a depth of about 62 inches. It is

strong brown channery loam in the upper part and brown channery sandy loam in the lower part. The substratum to a depth of about 72 inches is strong brown very channery sandy loam.

The permeability of this Rigley soil is moderately rapid. The available water capacity is moderate. The root zone is deep and is easily penetrated by roots. The natural fertility is medium, and the content of organic matter is moderate. This soil is extremely acid to neutral.

Typically, Rock outcrop consists of sandstone bluffs ranging in height from 10 to 40 feet. These bluffs are not always continuous. In some areas, erosion has exposed bedrock above the bluffs. In places, small areas of rubble, the result of weathering, are downslope from the bluffs.

Included in mapping are Gilpin, Lily, Sequoia, and Steinsburg soils. Also included are steep ledges, between the bluffs, that have shallow sandy soils, and small areas where gravel, stones, and boulders cover up to 25 percent of the surface. The included soils have similar land use and generally are less than 20 acres.

Most areas of this map unit are used as woodland.

This Rigley soil is well suited to use as woodland. On north aspects, this soil has the capability of producing 130 cubic feet per acre of shortleaf pine at the point of highest yearly growth; and on south aspects, 47 cubic feet per acre of white oak. Preferred trees to plant on north aspects are white oak, northern red oak, yellow poplar, eastern white pine, and shortleaf pine. Eastern white pine, shortleaf pine, and white oak are preferred on south aspects. The erosion hazard, equipment use limitations, and plant competition are concerns in management. Seedling mortality is also a management concern on south aspects.

The soils of this map unit have severe limitations for most urban uses because of the steep slopes.

The Rigley soil is in capability subclass VIIe. Rock outcrop is in capability subclass VIIIs. The woodland ordination symbol for the Rigley soil is 9R on north aspects and 3R on south aspects.

**ReC—Riney-Allegheny complex, 4 to 12 percent slopes.** The soils in this complex are deep and well drained. They are on high terraces mostly along the Middle Fork of the Kentucky River in Owsley County, and to a lesser extent along major streams in eastern Jackson County. The Riney soil is on the high convex slopes, and the Allegheny soil is on slightly lower, linear to convex slopes. The areas of this map unit range from about 5 to 100 acres.

Riney soil makes up about 45 percent of the map unit, Allegheny soil about 40 percent, and included soils about 15 percent. These soils are in an intricate pattern and mapping them separately is not practical at the scale used for the maps at the back of this publication.

Typically, the surface layer of the Riney soil is dark yellowish brown loam about 5 inches thick. The upper

part of the subsoil, to a depth of about 13 inches, is yellowish brown loam. The lower part to a depth of about 62 inches has common pebbles and sandstone fragments and is yellowish red and red sandy clay loam and sandy loam.

The permeability of this Riney soil is moderately rapid. The available water capacity is high. This soil has good tilth and is easily tilled throughout a wide range of moisture content. The root zone is deep and is easily penetrated by roots. The natural fertility is medium, and the content of organic matter is moderate. This soil ranges from very strongly acid to neutral in the surface layer and the upper part of the subsoil, and it is very strongly acid or strongly acid in the lower part of the subsoil.

Typically, the surface layer of the Allegheny soil is dark yellowish brown silt loam about 8 inches thick. The upper part of the subsoil, to a depth of about 17 inches, is yellowish brown silt loam. The lower part, to a depth of about 52 inches, is yellowish brown and strong brown silty clay loam. The substratum to a depth of 62 inches is brownish yellow loam that has very pale brown mottles.

The permeability of this Allegheny soil is moderate. The available water capacity is high. The soil has good tilth and is easily tilled throughout a wide range of moisture content. The root zone is deep and is easily penetrated by roots. The natural fertility is medium, and the content of organic matter is moderate. This soil is strongly acid to extremely acid throughout except in areas where lime has been added.

Included in this complex are small areas of Sequoia soils on points and benches. Also included is a soil that has more clay and less sand in the subsoil than the Riney soil. In places, the surface layer on linear side slopes has been removed as a result of erosion.

These soils are mostly used for pasture or row crops (fig. 7).

These soils are suited to cultivated crops but are better suited to hay and pasture. Proper management and conservation practices are needed that help control erosion and improve tilth and fertility.

These soils are well suited to use as woodland, although most areas are cleared. Riney soil has the capability of producing 95 cubic feet per acre of yellow poplar at the point of highest yearly growth. Allegheny soil has the capability of producing 130 cubic feet per acre of shortleaf pine. Eastern white pine, yellow poplar, black walnut, and shortleaf pine are suitable trees to plant. Plant competition is a concern in management.

These soils are suited to most urban uses, but slope and seepage are moderate limitations.

These Riney and Allegheny soils are in capability subclass IIIe. The woodland ordination symbol for Riney soil is 7A. It is 9A for Allegheny soil.



Figure 7.—This old, high river terrace, now used as pasture, is in an area of Riney-Allegheny complex, 4 to 12 percent slopes.

**Ro—Rowdy silt loam, 0 to 4 percent slopes, occasionally flooded.** This soil is deep and well drained. It is on low stream terraces and alluvial fans along major streams and their tributaries throughout the survey area. The slopes are commonly smooth or slightly convex. The areas of this soil range from 5 to about 100 acres or more.

Typically, the surface layer is dark brown silt loam about 10 inches thick. The upper part of the subsoil, to a

depth of about 17 inches, is dark yellowish brown loam. The lower part of the subsoil and the substratum to a depth of about 65 inches is strong brown, yellowish brown, and brownish yellow loam.

The permeability of this Rowdy soil is moderate, and the available water capacity is high. This soil has good tilth and is easily tilled throughout a wide range of moisture content. The root zone is deep and is easily penetrated by roots. This soil is subject to occasional

flooding. The natural fertility is medium, and the content of organic matter is moderate. This soil is very strongly acid to neutral except where lime has been added.

Included in mapping are small areas of Allegheny Variant, Grigsby, Huntington, and Orrville Variant soils. Also included are deep, well drained, gravelly soils on colluvial fans at the mouths of hollows (generally not subject to flooding) and small areas of poorly drained soils. The included soils make up about 25 percent of the map unit.

This Rowdy soil is mainly used for row crops (fig. 8), hay, or pasture. It is idle in some narrow hollows.

Colluvial fans and a few of the higher terraces are used as homesites.

This soil is well suited to row crops, and high yields are possible if it is properly managed. Management and conservation practices are needed that reduce erosion, improve tilth and fertility, provide internal drainage for wet spots, and control surface runoff from adjacent hillsides.

This soil is well suited to hay and pasture. Grasses and legumes are seldom damaged by flooding. Management needs are similar to those required for row crops.



Figure 8.—Rowdy silt loam, 0 to 4 percent slopes, occasionally flooded, is well suited to row crops, such as tobacco.

This soil is well suited to use as woodland, although most of it is cleared. It has the capability of producing 107 cubic feet per acre of yellow poplar at the point of highest yearly growth. Yellow poplar, black walnut, shortleaf pine, and eastern white pine are suitable trees to plant. Plant competition is a concern in management.

In most areas, this soil is poorly suited to urban use because of the hazard of flooding and the wet spots; however, some colluvial fans and soil on higher elevations are suitable for homesites.

This Rowdy soil is in capability subclass IIe. The woodland ordination symbol is 8A.

**SaE—Shelocta and Caneyville soils and Rock outcrop, steep.** This undifferentiated group of soils and Rock outcrop is on benched hillsides in the northern and western parts of Jackson County. The soils are deep and moderately deep and well drained. The slopes range from 12 to 35 percent. The areas of this map unit range from 20 to several hundred acres.

Shelocta soil makes up about 55 percent of the map unit, Caneyville soil about 20 percent, Rock outcrop about 10 percent, and included soils about 15 percent. These soils do not occur in a regular pattern, and composition of individual areas is highly variable.

Typically, the surface layer of the Shelocta soil is dark brown channery silt loam about 2 inches thick. The subsoil extends to a depth of about 49 inches and is yellowish brown and strong brown channery silt loam. The substratum to a depth of 60 inches is yellowish brown channery loam.

The permeability of this Shelocta soil is moderate. The available water capacity is high. The root zone is deep and is easily penetrated by roots. The natural fertility is medium and the content of organic matter is moderate. This soil is strongly acid or very strongly acid throughout except where lime has been added.

Typically, the surface layer of the Caneyville soil is dark brown silt loam about 4 inches thick. The subsoil extends to a depth of about 30 inches and is yellowish red silty clay. The substratum, to a depth of about 36 inches, is yellowish red clay. Limestone bedrock is below the substratum.

The permeability of the Caneyville soil is moderately slow. The available water capacity is moderate. The root zone is moderately deep, and root penetration by some plants can be restricted by the clayey subsoil. The shrink-swell potential is moderate. Depth to bedrock ranges from 20 to 40 inches. The natural fertility is medium, and the content of organic matter is moderate. This soil is very strongly acid to neutral in the surface layer and upper part of the subsoil, and it is medium acid to mildly alkaline in the lower part of the subsoil and in the substratum.

Rock outcrop is exposed discontinuous limestone bedrock that is along the upper part of the map unit. It is more common on southern and western exposures. In

some areas, detached segments occur as boulders below the outcrops.

Included in mapping are areas of Grigsby soils on narrow flood plains. Also included are soils similar to Caneyville soil except they are more than 40 inches to bedrock; soils that have a clayey subsoil and are less than 20 inches to bedrock; and a few areas of soils that are deep and well drained and have a clayey subsoil that is underlain by shale. These soils are on the upper benches above the Rock outcrop. Gravelly colluvial fans are common at the mouth of drainageways.

The soils in this complex are mainly used as pasture or woodland. The narrow upper benches are occasionally used for gardens or small acreages of specialty crops.

These soils are not suited to row crops. They are poorly suited to hay or pasture because steep slopes and Rock outcrop limit the use of farm equipment. In addition, erosion is a severe hazard. Proper management and conservation practices that provide adequate ground cover to reduce erosion and improve fertility are needed if the soils are used for hay or pasture.

The soils in this complex are suited to use as woodland. On north aspects, Shelocta soil has the capability of producing 124 cubic feet per acre of shortleaf pine at the point of highest yearly growth. On south aspects, the production capability is 47 cubic feet per acre of white oak. Caneyville soil has the capability of producing 53 cubic feet per acre of black oak on north aspects and 47 cubic feet per acre on south aspects. On north aspects, eastern white pine, shortleaf pine, yellow poplar, black walnut, white ash, and white oak are suitable trees to plant on Shelocta soil; and on south aspects, shortleaf pine, white oak, and eastern white pine are suitable trees to plant. On Caneyville soil, white oak, white ash, yellow poplar, and eastern white pine are suitable trees to plant on north aspects; and on south aspects, Virginia pine and eastern redcedar are suitable trees to plant. The severe hazard of erosion and equipment use limitations caused by steep slopes and the Rock outcrop are concerns in management.

The soils in this complex are poorly suited to most urban use. Slope, moderate depth to bedrock, slow permeability, and the moderate shrink-swell potential are limitations of the Caneyville soil for urban use. Steepness of slope is a severe limitation of Shelocta soil for urban use, and Shelocta soil is subject to slippage in places where it is underlain by the Pennington Formation.

Shelocta and Caneyville soils are in capability subclass VIe, and Rock outcrop is in capability subclass VIIIs. For Shelocta soil, the woodland ordination symbol is 9R on north aspects and 3R on south aspects. For Caneyville soil, the woodland ordination symbol is 4R on north aspects and 3R on south aspects.

**ScF—Shelocta-Cutshin complex, steep.** The soils in this complex are deep and well drained. These soils have north aspects in the southeastern and eastern parts of Owsley County. The Shelocta soil has benched, linear slopes. The Cutshin soil has benched, linear, concave slopes and is in coves. The slopes range from 25 to 60 percent. The areas of this complex commonly are several hundred acres.

Shelocta soil makes up about 55 percent of the map unit, Cutshin soil about 30 percent, and included soils about 15 percent. These soils occur in a pattern too intricate to map separately at the scale used for the maps in the back of this publication.

Typically, the surface layer of the Shelocta soil is dark brown channery silt loam about 2 inches thick. The subsoil extends to a depth of about 49 inches and is yellowish brown and strong brown channery silt loam. The substratum to a depth of 60 inches is yellowish brown channery loam.

The permeability of this Shelocta soil is moderate. The available water capacity is high. The root zone is deep and is easily penetrated by roots. The natural fertility is medium, and the content of organic matter is moderate. This soil is strongly acid or very strongly acid throughout.

Typically, the surface layer of the Cutshin soil is dark brown channery loam about 11 inches thick. The subsoil extends to a depth of about 50 inches and is yellowish brown channery loam. The substratum to a depth of 72 inches is yellowish brown channery loam. The amount of channers and flagstones increases as depth increases.

The permeability of this Cutshin soil is moderate. The available water capacity is high. The root zone is deep and is easily penetrated by roots. The natural fertility is medium, and the content of organic matter is high. The surface layer is medium acid to neutral, and the subsoil is very strongly acid to medium acid.

Included in mapping are small areas of Gilpin, Grigsby, Sequoia, and Steinsburg soils. Individual areas of included soils commonly are narrow, elongated bands and are less than 15 acres. Also included are small areas of sandstone rock outcrop that occur randomly throughout the map unit.

The soils in this map unit are mostly used as woodland.

These soils are not suited to row crops, hay, or pasture. Steep slopes restrict the use of farm equipment, and erosion is a very severe hazard.

These soils are well suited to use as woodland. Shelocta soil has the capability of producing 124 cubic feet per acre of shortleaf pine at the point of highest yearly growth. Cutshin soil has the capability of producing 121 cubic feet per acre of yellow poplar. The most suitable trees to plant are yellow poplar, black walnut, white ash, eastern white pine, northern red oak, and white oak. Plant competition, the limited use of equipment, and the hazard of erosion are concerns in management.

These soils are suited to use as habitat for woodland wildlife. They are poorly suited to urban use because of steep slopes.

These Shelocta and Cutshin soils are in capability subclass VIIe. The woodland ordination symbol is 9R for Shelocta soil. It is 8R for Cutshin soil.

**SgF—Shelocta-Gilpin channery silt loams, steep.**

The soils in this complex are deep and moderately deep, and they are well drained. They have mainly south and west aspects in the southeastern and eastern parts of Owsley County. The soils have north and south aspects in the rest of the survey area. The Shelocta soil commonly is on the lower two-thirds of steep hillsides that have linear, convex slopes. The Gilpin soil has short, steep, convex slopes. The slopes range from 25 to 60 percent. The areas of this complex are several hundred acres.

The Shelocta soil makes up about 60 percent of this complex, Gilpin soil about 20 percent, and included soils about 20 percent. The soils are so intermingled that mapping them separately is not practical at the scale used for the maps in the back of this publication.

Typically, the surface layer of the Shelocta soil is dark brown channery silt loam about 2 inches thick. The subsoil extends to a depth of about 49 inches and is yellowish brown and strong brown channery silt loam. The substratum to a depth of 60 inches is yellowish brown channery loam.

The permeability of this Shelocta soil is moderate. The available water capacity is high. The root zone is deep and is easily penetrated by roots. The natural fertility is medium, and the content of organic matter is moderate. This soil is strongly acid or very strongly acid throughout.

Typically, the surface layer of the Gilpin soil is dark brown channery silt loam about 3 inches thick. The upper part of the subsoil, to a depth of about 22 inches, is yellowish brown silt loam or channery loam. The lower part, to a depth of 36 inches, is yellowish brown channery silty clay loam. Sandstone bedrock is below the subsoil.

Permeability of this Gilpin soil is moderate. The available water capacity is moderate. The soil is easily tilled throughout a wide range of moisture content. The root zone is moderately deep and is easily penetrated by roots. The natural fertility is low, and the content of organic matter is moderate. This soil is strongly acid to extremely acid throughout.

Included in mapping are areas of Cutshin soils in coves, Grigsby soils on narrow flood plains, Rigley soils below sandstone rock outcrops, and Sequoia and Steinsburg soils on points and ridges. Also included in some places are soils containing more sand in the subsoil than is typical for Shelocta soil. Individual areas of included soils generally are smaller than 20 acres.

The soils in most areas of this map unit are used as woodland.

These soils are not suited to row crops, and they are poorly suited to hay and pasture because of steep slopes. Grasses and legumes are difficult to establish and maintain because equipment use is restricted and erosion is a severe hazard.

These soils are suited to use as woodland. Shelocta soil on north aspects has the capability of producing 124 cubic feet per acre of shortleaf pine at the point of highest yearly growth. On south aspects, the production capability is 47 cubic feet per acre of white oak. Gilpin soil has the capability of producing 93 cubic feet per acre of yellow poplar on north aspects and 52 cubic feet per acre of northern red oak on south aspects. On north aspects, shortleaf pine, yellow poplar, white oak, and northern red oak are suitable trees to plant. On south aspects, shortleaf pine and white oak are suitable. The hazard of erosion and equipment use limitations are concerns in managing these soils for timber production. Plant competition is an additional concern for Shelocta soil.

These soils are suited to use as habitat for woodland wildlife. They are not suited to urban use because of steep slopes.

These Shelocta-Gilpin soils are in capability subclass VIIe. The woodland ordination symbol is 9R for Shelocta soil on north aspects and 3R on south aspects. The woodland ordination symbol is 6R for Gilpin soil on north aspects and 4R on south aspects.

**SrF—Steinsburg and Gilpin soils and Rock outcrop, steep.** This undifferentiated group consists of moderately deep, well drained soils and Rock outcrop. These soils and Rock outcrop are on the upper one-third of steep hillsides in the southeastern part of Jackson County and in most of Owsley County. The landscapes generally are ridges, points, saddles, and adjoining steep side slopes. Rock outcrop occurs randomly throughout the map unit as small isolated areas of bedrock and discontinuous cliffs below the shoulder slope. The slopes are complex and range from 20 to 60 percent. The areas are narrow and elongated, and they range from 20 to several hundred acres.

Steinsburg soil makes up about 35 percent of the map unit, Gilpin soil about 25 percent, Rock outcrop about 12 percent, and included soils about 28 percent. These soils do not occur in a regular pattern on the landscape, but were combined in mapping because use and management are similar.

Typically, the surface layer of the Steinsburg soil is dark yellowish brown loam about 3 inches thick. The subsoil extends to a depth of 23 inches and is yellowish brown channery fine sandy loam and channery loam. The substratum extends to a depth of about 33 inches and is yellowish brown channery sandy loam. Bedrock is below the substratum.

The permeability of this Steinsburg soil is moderately rapid. The available water capacity is low. The root zone is moderately deep and is easily penetrated by roots. The natural fertility is low, and the content of organic matter is low. This soil is strongly acid or very strongly acid.

Typically, the surface layer of the Gilpin soil is dark brown channery silt loam about 3 inches thick. The upper part of the subsoil, to a depth of about 22 inches, is yellowish brown silt loam or channery silt loam. The lower part, to a depth of about 36 inches, is yellowish brown channery silty clay loam. Sandstone bedrock is below the subsoil.

The permeability of this Gilpin soil is moderate. The available water capacity is moderate. This soil is easily tilled throughout a wide range of moisture content. The root zone is moderately deep and is easily penetrated by roots. Depth to bedrock ranges from 20 to 40 inches. The natural fertility is low, and the content of organic matter is moderate. This soil is strongly acid to extremely acid throughout except where lime has been added.

Included in mapping are small areas of Rigley, Sequoia, and Shelocta soils. Also included is a soil similar to Sequoia soil except that it has gray mottles in the upper part of the subsoil. A few small areas of shaly and sandy soils that are less than 20 inches deep to bedrock are also included. Individual areas of included soils generally measure less than 10 acres.

The soils of this map unit are mainly used as woodland.

These soils are not suited to row crops, hay crops, or pasture. Steep slopes and the severe hazard of erosion limit the use of equipment in establishing and maintaining plant cover.

These soils are suited to use as woodland. Steinsburg soil has the capability of producing 109 cubic feet per acre of Virginia pine on north aspects at the point of highest yearly growth and 49 cubic feet per acre of black oak on south aspects. Gilpin soil has the capability of producing 93 cubic feet per acre of yellow poplar on north aspects and 54 cubic feet per acre of scarlet oak on south aspects. Eastern white pine and white oak are suitable trees to plant on north aspects. Shortleaf pine and white oak are suitable on south aspects. The hazard of erosion, equipment use limitations, seedling mortality, and plant competition are concerns in management.

These soils are poorly suited to urban use because of steep slopes and moderate depth to bedrock.

The Steinsburg and Gilpin soils are in capability subclass VIIe. Rock outcrop is in capability subclass VIIIIs. The woodland ordination symbol for Steinsburg soil is 8R on north aspects and 3R on south aspects. For Gilpin soil, it is 6R on north aspects and 4R on south aspects.

## Prime Farmland

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In this section, prime farmland is defined and discussed, and the prime farmland soils in Jackson and Owsley Counties are listed.

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in meeting the nation's short- and long-range needs for food and fiber. The acreage of high-quality farmland is limited, and the U.S. Department of Agriculture recognizes that government at local, state, and federal levels, as well as individuals, must encourage and facilitate the wise use of our nation's prime farmland.

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

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

Prime farmland soils usually get an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and growing season are favorable. The acidity or alkalinity level of the soils is acceptable. The soils have few or no rocks and are

permeable to water and air. They are not excessively erodible or saturated with water for long periods and are not subject to frequent flooding during the growing season. The slope ranges mainly from 0 to 6 percent.

The following map units, or soils, make up prime farmland in Jackson and Owsley Counties, Kentucky. The location of each map unit is shown on the detailed soil maps at the back of this publication. The extent of each unit is given in table 4. The soil qualities that affect use and management are described in the section "Detailed Soil Map Units." This list does not constitute a recommendation for a particular land use.

Soils that have limitations, such as a high water table or flooding, may qualify as prime farmland if these limitations are overcome by such measures as drainage or flood control. In the following list, the measures needed to overcome the limitations of a map unit, if any, are shown in parentheses after the map unit name. Onsite evaluation is necessary to determine if the limitations have been overcome by the corrective measures.

About 19,954 acres is prime farmland or has the potential to be prime farmland. This is about 5.7 percent of the survey area. Areas of prime farmland are scattered throughout the two counties and occur along wide ridgetops, tributary stream flood plains, and along the South Fork of the Kentucky River. Most areas are in general soil map unit 4 and to a lesser extent in map unit 2. Most of the prime farmland is used for crops.

- AvB Allegheny Variant silt loam, 2 to 6 percent slopes
- GpB Gilpin-Rayne silt loams, 2 to 6 percent slopes
- Gs Grigsby fine sandy loam, 0 to 3 percent slopes, frequently flooded (where protected from flooding or not frequently flooded during the growing season)
- Gv Grigsby-Orrville Variant complex, 0 to 3 percent slopes, frequently flooded (where drained and protected from flooding or not frequently flooded during the growing season)
- Hu Huntington loam, 0 to 4 percent slopes, occasionally flooded
- Ro Rowdy silt loam, 0 to 4 percent slopes, occasionally flooded



# Use and Management of the Soils

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

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

Information in this section can be used to plan the use and management of soils for crops and pasture; woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation 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 that is in harmony with nature.

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, Pasture, and Hayland

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

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

In 1982, about 57,000 acres in the survey area was used for crops and pasture. In Jackson County, about 32,000 acres was used for hay and pasture and about 12,600 acres was used for corn, tobacco, and other crops. In Owsley County, about 6,200 acres was used for hay and pasture and about 6,200 acres was used for corn, tobacco, and other crops (20, 21).

*Soil erosion* is a primary concern in management of the soils in Jackson and Owsley Counties. Soils with slopes of more than 2 percent are susceptible to excessive erosion if cultivated. Sheet and rill erosion strips the surface layer of essential organic matter, plant nutrients, and micro-organisms.

Loss of the surface layer is especially damaging to soils that have restrictive root zones because those soils have shallow depth to bedrock and fragipans. Some of the harmful effects of soil erosion are poor tilth; decreased water infiltration, fertility, crop yields, and aesthetic value; and increased runoff and production cost.

Soil erosion is so destructive; therefore, cropping systems and erosion control practices are needed to keep soil and water losses to acceptable levels. Some practices that help control erosion and maintain the soil base are contour farming, conservation tillage, stripcropping, and crop rotation of grasses and legumes. Also helpful is the use of crop residue, green manure crops, cover crops, grassed waterways, diversions, and terraces. The local office of the Soil Conservation Service can provide technical assistance in applying these and other conservation practices.

*Organic matter* must be maintained to achieve optimum crop production. Organic matter is an important source of nitrogen for crops. It also increases water infiltration, reduces surface crusting, improves tilth, and provides a suitable environment for micro- and macro-organisms. The organic matter content can be maintained by controlling erosion, adding barnyard manure, managing crop residue, using green manure crops and cover crops, and including grasses and legumes in the cropping system. Most of the soils in

Jackson County are low to medium in organic matter content.

*Soil fertility* is the quality that enables soil to provide nutrients in adequate amounts and in proper balance for growth. Most of the soils in Jackson County are low to medium in natural fertility. Natural soil fertility is directly related to the amount of organic matter (humus) present in the soil. Maintaining the organic matter content is essential in sustaining or increasing natural soil fertility. Different plants require different soil pH values and nutrient requirements for optimum growth. Additions of lime and fertilizer should be based on the results of soil tests and the needs of the specific crops. The Kentucky Cooperative Extension Service provides assistance in determining the kinds and amounts of lime and fertilizer to apply.

*Tilth* is important in seed germination, root penetration, and water infiltration. Shoots also emerge more easily if tilth is good. Soils that have good tilth have granular structure, are friable, and are porous. Most soils in the survey area have good tilth. Excessive tillage combined with intense rainfall breaks down the granular structure and causes a crust to form on the surface. Once the crust forms, it increases water runoff and reduces the ability of the soil to provide proper amounts of air and water to plants. Growing grasses and legumes, maintaining the organic matter content, and using reduced tillage will help maintain good tilth.

*Artificial drainage* of wet soils is a management need in many parts of Jackson and Owsley Counties. Many cultivated crops would be partly or totally destroyed by wetness without proper drainage. When excess or free water is removed by artificial drainage, the soil becomes better aerated, which enhances the essential bacterial action to manufacture plant food. Soils that are artificially drained warm up earlier in the spring, which lengthens the growing season and provides better conditions for seed germination and root penetration. The two most commonly used artificial drainage methods are open ditches (surface drainage) and tile drains (subsurface drainage). Open ditches are generally less expensive to install than tile drains, but require more maintenance and are less effective. Suitable outlets are required by either method of artificial drainage. Information on drainage design for soils in Jackson County is available at the local office of the Soil Conservation Service.

*Cultivated crops* commonly grown in the area are corn, burley tobacco, and some soybeans. Wheat, barley, and rye are grown mainly for cover crops. Specialty crops, such as vegetables and fruits, are commonly grown in the survey area. Latest information and recommendations for cultivated crops or specialty crops can be obtained from local offices of the Kentucky Cooperative Extension Service and the Soil Conservation Service.

*Pasture and hay* management is required to produce the quantity and quality of forages needed for a

successful livestock program. A successful forage program can furnish up to 78 percent of feed for beef cattle (7, 8).

The soils in Jackson and Owsley Counties vary widely in their capabilities and properties because of differences in depth to rock or limiting layers, internal drainage, ability to supply moisture, and many other properties. Grasses and legumes and grass-legume combinations vary widely in their ability to persist and produce on different soils. The plant species or mixture of species need to be matched to the different soils so that the greatest returns can be realized along with maximum soil and water conservation.

Plants need to be adapted not only to the soil but also to the intended use. Selected plants should provide maximum quality and versatility in the forage program. Legumes generally produce higher quality feed than grasses, and result in higher animal performance. Legumes should be used to the maximum extent possible. Taller growing legumes, such as alfalfa and red clover, are more versatile than a legume, such as white clover that is used mainly for grazing. Grasses, such as orchardgrass, timothy, and tall fescue are better adapted for hay and silage.

Tall fescue is an important cool-season grass that is suited to a wide range of soil conditions. It is used for both pasture and hay. Growth that occurs from August to November is commonly permitted to accumulate in the field and is "stockpiled" for deferred grazing late in fall and in winter. Nitrogen fertilizer is important for maximum production during the stockpiling period. The desired production levels determine the rates of application.

Renovation is one way to increase yields. Renovation improves pasture and hay fields by partly destroying the sod. Desirable forage plants are then reestablished by seeding and by adding lime and fertilizer. Legumes added to these grass fields provide high quality feed. Legumes increase summer production and take nitrogen from the air. Under Kentucky growing conditions, red clover can fix 100 to 200 pounds of nitrogen per acre every year, and Ladino clover, 100 to 150 pounds. An acre of Korean lespedeza, vetch, and other annual forage legumes can fix 75 to 100 pounds of nitrogen a year.

For additional information on pasture and hayland management, contact the local office of the Soil Conservation Service or the Kentucky Cooperative Extension Service.

### **Yields Per Acre**

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

The 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 insures the smallest possible loss.

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

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

### Land Capability Classification

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

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. Only class and subclass are used in this survey. These levels are defined in the following paragraphs.

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

Class I soils have few limitations that restrict their use. No class I soils are in Jackson and Owsley Counties.

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 they have other limitations, impractical to remove, that limit their use. No class V soils are in Jackson and Owsley Counties.

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*, or *s* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless a close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); and *s* shows that the soil is limited mainly because it is shallow, droughty, or stony.

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."

### Woodland Management and Productivity

Charles A. Foster, forester, Soil Conservation Service, assisted in preparing this section.

The history of the Jackson and Owsley County survey area is typical of much of Appalachia. Early settlers saw the majestic forests as a hindrance to farming and a hiding place for hostiles. They cleared and burned as much of the forest as possible. After the Civil War, the timber was noticed by northern and eastern speculators and logging "boomed" in the hills. Kentucky ranked 15th in total timber production (23), but near first in hardwood production. The boom peaked in 1907 and by 1925 had become a bust. Land had been severely cutover, mined, and left to the ravages of erosion. Most timberland was understocked with desirable trees.

To prevent further damage and to assure some restoration, the Kentucky Legislature asked the Federal Government to take part of the damaged lands into the National Forest System. In 1930, President Hoover issued the proclamation to open the Timberland Purchase Area, and land purchases began in 1934. Even before this period, better forestry practices on privately

owned lands had been encouraged, and these efforts had begun to take root. Establishment of the Civilian Conservation Corp (CCC) in 1933 had a profound effect on the advancement of forestry and land restoration. In 1937, President Roosevelt proclaimed that the Cumberland National Forest was to be protected and was to be a multiple-use area. In later years, the forest name was changed to Daniel Boone National Forest. In 1983, the national forest had 672,155 acres; 56,079 acres in Jackson County (21 percent of the county), and 16,333 acres in Owsley County (11 percent).

Jackson County has approximately 97,621 acres of privately owned commercial forest land, and Owsley County has 88,967 acres (10). The average size of a private ownership in Kentucky is 24 acres. Forest growth averages 33 cubic feet per acre per year, which is well below the potential of most sites. The main reason for the low growth is because of the past cutting practice of taking the best quality trees and leaving the worst. The result is that most privately owned forest lands are not well stocked with desirable high quality trees.

Forests in these two counties are in the Mixed Mesophytic Forest region of the Deciduous Forest Formation. They are characterized by a wide variety of species in the understory and overstory. The complexity of species varies in composition with changes in aspect and relationship of water and soil. Over 40 commercial species are in these counties along with at least as many noncommercial trees and shrubs. The two dominant timber types are the oak-hickory and central mixed hardwoods, which make up approximately 80 percent of the forest acreage in each of the counties. Less common timber types include the southern pine, redcedar-hardwood, oak-pine, white oak, maple-beech, and elm-ash-cottonwood. Conspicuous in the forest understory are the rhododendron or fern ephemerals on moist sites and the mountain laurel or blueberry-huckleberry on dry sites.

The large privately owned forest acreage in Jackson and Owsley Counties is divided among many small owners. Most of these holdings are not managed for wood crop production; instead, they are held for their beauty, wildlife values, and underlying coal reserves or are held because the woodland happens to be a part of the land holding.

Since 1965, personnel in the Daniel Boone National Forest use an even-aged silvicultural system of management with rotations of 80 years for all species except Virginia pine, which is managed on a 60-year rotation. Four working groups are presently used to manage the timber resource; upland hardwood, cove hardwood, yellow pine, and Virginia pine. The quantity of timber offered for sale (mostly low quality) has exceeded demand. Demand for small roundwood products (pulpwood) has been especially slight. Traditionally, the forest has offered for sale 30 to 35 million board feet per year, but actual sales have been only 20 to 25 million

board feet. Jackson County currently has eight commercial mills and one bolt mill. The combined capacity exceeds 6.5 million board feet per year. Owsley County has one custom mill that has a capacity of about 50,000 board feet per year. Products produced include rough lumber, pallet stock, crossties, chip wood, dimension stock, and cants (11).

The most significant factors affecting site productivity (site index) are soil texture, depth, pH, available water capacity, and topographic factors, such as slope position, percent slope, and aspect or direction of slope faces (9). The actual amount of water in the soil during the growing season seems to be more closely related to tree growth than to the available water capacity.

The highest site index values occur on north and east aspects, the lower one-third of south and west aspects, and bottoms as opposed to ridgetops and the upper two-thirds of south and west aspects. Differences in site index are as much as 10 feet.

Compared to soils that have south aspects, soils that have north aspects have a somewhat lower mean annual temperature, have more organic matter (creating a darker color), hold more water during periods of stress, and receive less solar radiation. These characteristics provide high potential productivity for growing high quality trees.

Soils that have south and west aspects and ridgetops tend to be lighter in color, have more acid, and have less organic matter than soils that have north aspects. South aspects have more wind, solar radiation, higher air and soil temperatures, and therefore, increased evapotranspiration and water loss from the upper part of the soil. The result is slower growth rates and generally poorer quality trees on these sites.

Common overstory plants on north aspects and coves are: yellow poplar, red maple, white oak, northern red oak, shortleaf pine, Virginia pine, sweet birch, American beech, chestnut oak, black oak, white ash, pignut hickory, mockernut hickory, pitch pine, and black locust.

Common understory plants on north aspects and coves are: red maple, flowering dogwood, Virginia creeper, Christmas fern, wild yam, poison ivy, greenbrier, sassafras, false Solomons seal, trefoil tickclover, stonecrop, cinquefoil, yellow poplar, eastern redbud, galax, white oak, black oak, wild ginger, may apple, slippery elm, mapleleaf viburnum, sourwood, chestnut oak, alumroot, violet, hogpeanut, blackgum, blue beech, New York fern, groundcedar, pawpaw, American beech, dwarf iris, jack in the pulpit, spice bush, eastern hemlock, white baneberry, maidenhair fern, hophornbeam, wild grape, northern red oak, and serviceberry.

Common overstory plants on south aspects and ridgetops are white oak, scarlet oak, and black oak.

Common understory plants on south aspects and ridgetops are red maple, huckleberry, and greenbrier.

This soil survey can be used by woodland managers planning ways to increase the productivity of forest land.

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

The first tree listed for each soil under the column "Common trees" is the indicator species for that soil. An indicator species is a tree that is common in the area and that is generally the most productive on a given soil.

Table 7 lists the *ordination symbol* for each soil. The first part of the ordination symbol, a number, indicates the potential productivity of a soil for the indicator species in cubic meters per hectare. The larger the number, the greater the potential productivity. Potential productivity is based on the site index and the point where mean annual increment is the greatest.

The second part of the ordination symbol, a letter, indicates the major kind of soil limitation for use and management. The letter *R* indicates a soil that has a significant limitation because of steepness of slope. The letter *A* indicates a soil that has no significant restrictions or limitations for forest use and management.

Ratings of the *erosion hazard* indicate the probability that damage may occur if site preparation activities or harvesting operations expose the soil. The risk is *slight* if no particular preventive measures are needed under ordinary conditions; *moderate* if erosion control measures are needed for particular silvicultural activities; and *severe* if special precautions are needed to control erosion for most silvicultural activities. Ratings of *moderate* or *severe* indicate the need for construction of higher standard roads, additional maintenance of roads, additional care in planning of harvesting and reforestation operations, or use of specialized equipment (fig. 9).

Ratings of *equipment limitation* indicate limits on the use of forest management equipment, year-round or seasonal, because of such soil characteristics as slope, wetness, stoniness, or susceptibility of the surface layer to compaction. As slope gradient and length increase, it becomes more difficult to use wheeled equipment. On the steeper slopes, tracked equipment must be used. On the steepest slopes, even tracked equipment cannot operate; more sophisticated systems are needed. The rating is *slight* if equipment use is restricted by soil wetness for less than 2 months and if special equipment is not needed. The rating is *moderate* if slopes are steep enough that wheeled equipment cannot be operated safely across the slope, if soil wetness restricts

equipment use from 2 to 6 months per year, if stoniness restricts ground-based equipment, or if special equipment is needed to avoid or reduce soil compaction. The rating is *severe* if slopes are steep enough that tracked equipment cannot be operated safely across the slope, if soil wetness restricts equipment use for more than 6 months per year, if stoniness restricts ground-based equipment, or if special equipment is needed to avoid or reduce soil compaction. Ratings of *moderate* or *severe* indicate a need to choose the most suitable equipment and to carefully plan the timing of harvesting and other management operations.

Ratings of *seedling mortality* refer to the probability of death of naturally occurring or properly planted seedlings of good stock in periods of normal rainfall as influenced by kinds of soil or topographic features (fig. 10). *Seedling mortality* is caused primarily by too much water or too little water. The factors used in rating a soil for seedling mortality are texture of the surface layer, depth and duration of the water table, rock fragments in the surface layer, rooting depth, and the aspect of the slope. Mortality generally is greatest on soils that have a sandy or clayey surface layer. The risk is *slight* if, after site preparation, expected mortality is less than 25 percent; and *moderate* if expected mortality is between 25 and 50 percent. Ratings of *moderate* indicate that it may be necessary to use containerized or larger than usual planting stock or to make special site preparations, such as bedding, furrowing, installing surface drainage, or providing artificial shade for seedlings. Reinforcement planting is often needed if the risk is *moderate*.

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

The potential productivity of *common trees* on a soil is expressed as a *site index*. Common trees are listed in the order of their observed general occurrence. Generally, only two or three tree species dominate.

The soils that are commonly used to produce timber have the yield predicted in cubic feet. The yield is predicted at the point where mean annual increment



Figure 9.—A closed logging road, graded, drained, and revegetated, is ready for the next entry.

culminates. The productivity of the soils in this survey is mainly based on yellow poplar, but other species are also used.

The *site index* is determined by taking height measurements and determining the age of selected trees within stands of a given species. This index is the average height, in feet, that the trees attain in a specified number of years. This index applies to fully stocked, even-aged, unmanaged stands. The procedure and technique used are in the site index tables for Jackson and Owsley Counties (3, 4, 5, 6, 12, 13, 14, 16, and 17).

The *productivity class* represents an expected volume produced by the most important trees, expressed in cubic feet per acre per year. Cubic feet per acre can be converted to cubic meters per hectare by dividing by 14.3. Cubic feet can be converted to board feet by

multiplying by a factor of about 5. For example, a productivity class of 114 means the soil can be expected to produce 114 cubic feet per acre per year at the point where mean annual increment culminates, or about 570 board feet per acre per year.

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



**Figure 10.—**After a seed-tree cut, the remaining pines will provide seed to propagate the next generation of trees.

## Recreation

In table 8, the soils of the survey area are rated according to the limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a

site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. 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 use by the duration and intensity of flooding

and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

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

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

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

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

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

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

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

## Wildlife Habitat

The wildlife population of Jackson and Owsley Counties consists of an estimated 44 species of mammals, 61 species of reptiles and amphibians, and 102 species of birds that are either summer or year-round residents. Many of the more than 200 other kinds of birds that are known to visit Kentucky each year are in these counties in one or another of the four seasons.

The kinds of wildlife currently most important are those that furnish recreation in the form of sport hunting; economic gain in the form of commercial trapping; and aesthetic enjoyment in the form of observing or photographing. Of concern are those species thought to be in danger of extinction.

In Jackson and Owsley Counties, those species that are most hunted are the gray squirrel, ruffed grouse, raccoon, and white-tailed deer. Trapping is concentrated on mink, muskrat, and foxes. Photographers and bird watchers are especially interested in rare or unusual species that are seldom seen or difficult to approach. The red-cockaded woodpecker and the Virginia big-eared bat, whose ranges include Jackson and Owsley Counties, are on the U.S. Fish and Wildlife Service's list of endangered species.

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.

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

*Grain and seed crops* are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. 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, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, lovegrass, 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 flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, trefoil tickclover, wild carrot, and frostweed.

*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, the 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 gray dogwood, autumn olive, and crabapple.

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

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

*Shallow water areas* have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow

water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

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

*Habitat for openland wildlife* consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The 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. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

*Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet, and 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 must 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 to 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 kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

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

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

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

### Building Site Development

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

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

depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

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

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

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

### Sanitary Facilities

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

special design, significant increases in construction costs, and possibly increased maintenance are required.

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

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

Excessive seepage due to rapid permeability of 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 needs to be considered.

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

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

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

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

### Construction Materials

Table 12 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good*, *fair*, or *poor* as a source of roadfill and topsoil. They are rated as an 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 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, 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 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 the depth to the water table is 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. Sand and gravel 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, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and releases a variety of plant-available nutrients as it decomposes.

## Water Management

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

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

*Pond reservoir areas* hold water behind a dam or embankment. Soils best suited to this use have low

seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

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

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

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

*Drainage* is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; or susceptibility to flooding. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock, large stones, slope, and the hazard of cutbanks caving.

*Terraces and diversions* are embankments or a combination of channels and ridges constructed across a slope to reduce 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 wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

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



# Soil Properties

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

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics. These results are reported in table 19.

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 characterize key soils.

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

## Engineering Index Properties

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

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

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

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

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

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

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20, or higher, for the poorest. The AASHTO classification for soils tested, with group index numbers in parentheses, is given in table 19.

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

*Percentage (of soil particles) passing designated sieves* is the percentage of the soil fraction less than 3 inches in diameter based on an oven-dry 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.

## Physical and Chemical Properties

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

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

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They influence the soil's adsorption of cations, moisture retention, 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 earth-moving operations.

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

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

*Available water capacity* refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage in each major soil layer is stated in inches of water per inch of soil. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure.

Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

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

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

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

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

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

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

*Organic matter* is the plant and animal residue in the soil at various stages of decomposition.

In table 15, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

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

## Soil and Water Features

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

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

The four hydrologic soil groups are:

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

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

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

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

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

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

Frequency, duration, and probable dates of occurrence are estimated. Frequency generally is expressed as *none*, *occasional*, or *frequent*. *None* means that flooding is not probable. *Occasional* means that flooding occurs

infrequently under normal weather conditions (there is a 5 to 50 percent chance of flooding in any year).

*Frequent* means that flooding occurs often under normal weather conditions (there is more than a 50 percent chance of flooding in any year). Duration is expressed as *very brief* (less than 2 days) and *brief* (2 to 7 days). The time of year that floods are most likely to occur is expressed in months. November-May, for example, means that flooding can occur during the period November through May. About two-thirds to three-fourths of all flooding occurs during the stated period.

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

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 depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 16 are the depth to the seasonal high water table; the kind of water table, that is, *apparent*; and the months of the year that the water table commonly is highest. A water table that is seasonally high for less than 1 month is not indicated in table 16.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil.

The two numbers in the "High water table-Depth" column 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 the water table exists for less than a month.

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

*Risk of corrosion* pertains to potential soil-induced electrochemical or chemical action that dissolves or

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

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

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

## Physical and Chemical Analyses of Selected Soils

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

Most determinations, except those for grain-size analysis and bulk density, were made on soil material smaller than 2 millimeters in diameter. Measurements reported as percent or quantity of unit weight were calculated on an oven-dry basis. The methods used in obtaining the data are indicated in the list that follows. The codes in parentheses refer to published methods (19).

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

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

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

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

*Cation-exchange capacity*—ammonium acetate, pH 7.0 (5A1a).

*Cation-exchange capacity*—sodium acetate, pH 8.2 (5A2a).

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

*Base saturation*—ammonium acetate, pH 7.0 (5C1).

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

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

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

*Available phosphorus*—(procedure 656, Kentucky Agricultural Experiment Station).

## Engineering Index Test Data

Table 19 shows laboratory test data for several pedons sampled at carefully selected sites in the survey area. The pedons are typical of the series and are described in the section "Soil Series and Their Morphology." The soil samples were tested by Soil Mechanics Laboratory, South National Technical Center, Fort Worth, Texas.

The testing methods generally are those of the American Association of State Highway and Transportation Officials (AASHTO) (1) or the American Society for Testing and Materials (ASTM) (2).

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

# Classification of the Soils

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The system of soil classification used by the National Cooperative Soil Survey has six categories (18). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or on laboratory measurements. Table 20 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

**ORDER.** Ten 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*, 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; 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 an udic moisture regime).

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

**FAMILY.** Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties

and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed, mesic Typic Hapludults.

**SERIES.** The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. There can be some variation in the texture of the surface layer or of the substratum within a series. An example is the Shelocta series, which is a member of the fine-loamy, mixed, mesic family of Typic Hapludults.

## Soil Series and Their Morphology

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

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the *Soil Survey Manual* (15). Many of the technical terms used in the descriptions are defined in *Soil Taxonomy* (18). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

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

### Allegheny Variant

The Allegheny Variant consists of deep, well drained, moderately permeable soils. They formed in loamy alluvium derived mainly from acid sandstone, siltstone, and shale. These soils are on gently sloping to moderately steep terraces along the major tributary streams throughout the survey area. In a few low-lying areas, the soils are subject to rare flooding in winter or early in spring. The slopes range from 2 to 20 percent.

Allegheny Variant soils are adjacent to Allegheny, Riney, Gilpin, Shelocta, Grigsby, Orrville, and Rowdy soils. Allegheny and Riney soils are on high terraces, Gilpin and Shelocta soils are on uplands, and Grigsby, Orrville, and Rowdy soils are on low terraces and flood plains. Allegheny soils are more than 60 inches to bedrock, and Gilpin soils are less than 40 inches to bedrock. Riney soils are more red than Allegheny Variant soils and are on high upland terraces. Shelocta soils formed in colluvial material on hillsides. Grigsby, Rowdy, and Orrville soils contain less clay in their control section than Allegheny Variant.

Typical pedon of Allegheny Variant silt loam, 2 to 6 percent slopes; about 12.1 miles south of McKee on U.S. Highway 421, west about 14 miles on Doolittle Road, on south side of road:

- Ap—0 to 10 inches; dark yellowish brown (10YR 4/4) silt loam; weak moderate and fine granular structure; very friable; common fine roots; few coarse fragments; neutral; abrupt smooth boundary.
- B1—10 to 18 inches; strong brown (10YR 5/6) silt loam; weak medium and fine subangular blocky structure; friable; few fine and medium roots; few sandstone fragments; slightly acid; clear smooth boundary.
- B2t—18 to 40 inches; strong brown (7.5YR 5/6) silty clay loam; moderate medium subangular blocky structure; firm; few patchy clay films; few rounded sandstone pebbles; medium acid; clear smooth boundary.
- B3—40 to 48 inches; brownish yellow (10YR 6/6) silt loam; common medium distinct light yellowish brown (10YR 6/4) mottles; weak medium subangular blocky structure; friable; few small brownish iron concretions; few small sandstone fragments; medium acid; clear smooth boundary.
- R—48 inches; sandstone bedrock.

The thickness of the solum ranges from 20 to 60 inches. Depth to bedrock ranges from 40 to 60 inches. Reaction ranges from medium acid to extremely acid unless lime has been added.

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

The B horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 8. Texture is silt loam, silty clay loam, sandy clay loam, loam, or clay loam that has more than 15 percent sand that is coarser than very fine sand. The B3 horizon is commonly mottled in shades of brown, red, yellow, and to a lesser extent, gray.

Some pedons have a C horizon that has colors and textures similar to those of the B horizon.

## Allegheny Series

The Allegheny series consists of deep, well drained, moderately permeable soils. They formed in loamy alluvium derived from acid sandstone and shale. These

soils are in areas that are rolling to hilly remnants of high stream terraces along major streams in Owsley County and eastern Jackson County. The slopes range from 4 to 12 percent.

The Allegheny soils are closely associated on the landscape with the Riney soils and are adjacent to Shelocta and Gilpin soils and to Sequoia soils to a lesser extent. The Riney soils have hue that is more red in the lower part of the B horizon, and they contain more sand in the control section than the Allegheny soils. The Gilpin soils are moderately deep and commonly contain more coarse fragments in the control section. The Shelocta soils formed in colluvial material on hillsides. Sequoia soils have a clayey particle-size control section.

Typical pedon of Allegheny silt loam, in an area of Riney-Allegheny complex, 4 to 12 percent slopes; about 6.4 miles south of McKee on U.S. Highway 421, east about 6.5 miles on Kentucky Highway 1071 to New Zion Church, north about 0.3 mile on unpaved road, northeast about 0.1 mile to high terrace position:

- Ap—0 to 8 inches; dark yellowish brown (10YR 4/4) silt loam; moderate fine and medium granular structure; very friable; many fine and medium roots; medium acid; abrupt smooth boundary.
- B1—8 to 17 inches; yellowish brown (10YR 5/6) silt loam; moderate medium subangular blocky structure; friable; few coarse and common fine roots; few fine rounded pebbles and sandstone fragments; strongly acid; clear smooth boundary.
- B21t—17 to 31 inches; yellowish brown (10YR 5/6) silty clay loam; moderate medium subangular and angular blocky structure; friable; few medium and fine roots; few fine pores; common thin patchy clay films; few fine reddish oxide concretions; few rounded pebbles; very strongly acid; clear smooth boundary.
- B22t—31 to 52 inches; strong brown (7.5YR 5/6) silty clay loam; common medium distinct light yellowish brown (10YR 6/4) and few medium prominent reddish brown (5YR 5/6) mottles; moderate medium subangular and angular blocky structure; friable; few fine roots; few patchy clay films; few small sandstone channers; very strongly acid; clear smooth boundary.
- C—52 to 62 inches; brownish yellow (10YR 6/6) loam; common medium distinct very pale brown (10YR 7/4) mottles; massive; firm; very strongly acid.

The thickness of the solum ranges from 30 to 60 inches or more. Depth to bedrock is more than 60 inches. Reaction ranges from strongly acid to extremely acid except where lime has been added.

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

The B horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 8. Texture is silt loam, silty clay

loam, sandy clay loam, loam, or clay loam that has more than 15 percent sand that is coarser than very fine sand. The lower part of the B horizon is commonly mottled in shades of brown, red, or yellow; some pedons have gray mottles.

The C horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 6 to 8. Texture is loam, clay loam, or fine sandy loam. The C horizon has mottles in shades of brown, red, blue, or gray in some pedons.

### Bethesda Series

The Bethesda series consists of deep, well drained soils that have been mined. Permeability is moderately slow. These soils are on benches and outslopes of strip mines and occur randomly throughout the survey area. The slopes range from 0 to 70 percent.

The Bethesda soils are in a complex with the Fairpoint soils. They are adjacent to the Cutshin, Rigley, and Shelocta soils on steep hillsides; to the Gilpin soils on steep hillsides and upper side slopes and ridges; to the Rayne soils on lower slopes of moderately steep and steep hillsides, and on upper side slopes and ridges; and to the Sequoia and Steinsburg soils on upper side slopes and ridges. The Fairpoint soils are medium acid to neutral. The Cutshin, Rigley, and Shelocta soils are deep, well drained, colluvial soils. The Gilpin soils are loamy and are less than 40 inches deep to bedrock. The Rayne soils are deep and well drained. The Sequoia soils are clayey. The Steinsburg soils are loamy and less than 40 inches deep to bedrock.

Typical pedon of Bethesda very channery loam, in an area of Bethesda-Fairpoint complex, steep, benched; about 1.4 miles north of McKee on Kentucky Highway 89, in Tamlers Hollow:

- C1—0 to 5 inches; gray (10YR 6/1) very channery loam; massive; friable; few fine roots; common fine and medium pores; 40 percent siltstone and sandstone fragments larger than 2 mm; very strongly acid; clear smooth boundary.
- C2—5 to 22 inches; very dark gray (10YR 3/1) and yellowish brown (10YR 5/6) very channery loam; massive; firm; few fine roots; 35 percent coarse fragments up to 4 inches across; extremely acid; clear wavy boundary.
- C3—22 to 60 inches; dark grayish brown (10YR 4/2) very channery loam; pockets of yellowish brown (10YR 5/6) and very dark gray (10YR 3/1); massive; firm; few voids; 40 percent rock fragments up to 5 inches across; extremely acid.

Depth to bedrock is more than 60 inches. Reaction ranges from strongly acid to extremely acid except where lime has been added. Coarse fragments, 2 millimeters to 6 inches across, range from 35 to 80 percent, by volume. Some stones and boulders are included.

The C horizon has hue of 7.5YR to 5Y, value of 3 to 6, and chroma of 1 to 8; or it is neutral and has value of 3 to 6. Texture is commonly very channery loam but can include silt loam, silty clay loam, or clay loam and the very channery or very gravelly analogs.

### Bledsoe Series

The Bledsoe series consists of deep, well drained soils. Permeability is moderately slow. These soils formed in colluvial material weathered mainly from limestone and limestone interbedded with sandstone, siltstone, and shale materials. Bledsoe soils are commonly below outcrops of limestone bedrock on steep hillsides in the northern and northwestern parts of Jackson County. The slopes range from 20 to 60 percent; the average slope is about 45 percent.

Bledsoe soils are in similar positions on the landscape as Gilpin and Shelocta soils. These soils are weathered from limestone material. Gilpin and Shelocta soils have a less clayey subsoil than Bledsoe soils, and permeability is moderate. The Gilpin soils are less than 40 inches to bedrock.

Typical pedon of Bledsoe silt loam, steep, very rocky; about 13.4 miles north of McKee on Kentucky Highway 89, about 500 feet south of where the highway crosses Station Camp Creek:

- O1—1.5 to 1 inches; recent litter from mixed hardwoods.
- O2—1 to 0 inches; partly decomposed organic matter.
- A1—0 to 4 inches; very dark grayish brown (10YR 3/2) silt loam; moderate fine granular structure; very friable; many fine and medium roots; 5 percent limestone and sandstone fragments up to 10 inches across; medium acid; abrupt wavy boundary.
- B21t—4 to 10 inches; dark brown (7.5YR 4/4) silty clay loam; moderate medium subangular blocky structure; friable; common medium roots; thin patchy clay films; brown (10YR 5/3) coatings; few coarse fragments; medium acid; gradual smooth boundary.
- B22t—10 to 18 inches; dark brown (7.5YR 4/4) silty clay loam; moderate fine and medium subangular and angular blocky structure; friable; few fine roots; thin patchy clay films; brown (10YR 5/3) coatings; 5 percent coarse fragments; strongly acid; gradual smooth boundary.
- B23t—18 to 30 inches; dark brown (7.5YR 4/4) silty clay loam; weak fine and medium subangular blocky structure; firm; few fine roots; brown (7.5YR 5/4) thin patchy clay films; few coarse fragments; strongly acid; gradual smooth boundary.
- B24t—30 to 38 inches; dark brown (7.5YR 4/4) silty clay loam; weak fine and medium subangular blocky structure; firm; few coarse fragments; very strongly acid; gradual smooth boundary.
- B25t—38 to 50 inches; dark brown (7.5YR 4/4) silty clay loam; few fine distinct pale brown (10YR 6/3)

mottles; weak medium subangular blocky structure; firm; thin patchy clay films; 10 percent coarse fragments; very strongly acid; gradual smooth boundary.

B26t—50 to 60 inches; dark brown (7.5YR 4/4) silty clay loam; few fine distinct light brownish gray (10YR 6/2) and strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; firm; 10 percent coarse fragments; medium acid.

The thickness of the solum ranges from 40 to 80 inches or more. Depth to bedrock is more than 60 inches. Coarse fragments of limestone, siltstone, and sandstone, 2 millimeters to 15 inches or more across, range from 0 to 25 percent to a depth of 40 inches and from 0 to 40 percent below that. The reaction ranges from medium acid to mildly alkaline in the A1 horizon and from very strongly acid to mildly alkaline in the Bt horizon.

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

The B horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. Texture is silty clay loam, silty clay, or clay, including the channery, gravelly, or flaggy analogs. Some pedons are mottled below a depth of 3 feet.

Some pedons have a C horizon that has colors and textures similar to those of the B horizon. In other places, the colluvial material is thin, particularly on lower slopes, and IIC horizons have formed in soft, clayey shale residuum. Colors may be gray, olive, or brown.

In this survey area, Bledsoe soils are strongly acid or very strongly acid in some parts of the Bt horizon and are considered to be taxadjuncts to the Bledsoe series. This difference does not affect the use, management, and behavior of the soils.

## Caneyville Series

The Caneyville series consists of moderately deep, well drained soils. Permeability is moderately slow. These soils formed in residuum from limestone. The slopes range from 12 to 60 percent; the average slope is about 30 percent.

Caneyville soils are in similar positions on the landscape as Bledsoe and Shelocta soils. Bledsoe soils formed in colluvium from mixed material and are deeper than 40 inches to bedrock. Shelocta soils formed in colluvial material, mainly of acid sandstone, siltstone, and shale.

Typical pedon of Caneyville silt loam, steep, very rocky; about 7.6 miles north of McKee on Kentucky Highway 89 to Foxtown, about 5.3 miles northeast to Cedar House Hollow:

O1—1 to 0 inches; recent leaf litter.

A1—0 to 4 inches; dark brown (10YR 4/3) silt loam; weak fine granular structure; very friable; many fine and medium roots; neutral; clear smooth boundary.

B21t—4 to 16 inches; yellowish red (5YR 5/6) silty clay; moderate fine blocky structure; firm; common medium and fine roots; many clay films; few subrounded and thin flat coarse fragments; medium acid; clear smooth boundary.

B22t—16 to 30 inches; yellowish red (5YR 4/6) silty clay; weak fine and very fine blocky structure; few channers; medium acid; clear smooth boundary.

C—30 to 36 inches; yellowish red (5YR 4/6) clay; massive; very firm; mildly alkaline.

R—36 inches; hard limestone bedrock.

Depth to bedrock ranges from 20 to 40 inches. Reaction ranges from very strongly acid to neutral in the upper part of the solum and from medium acid to mildly alkaline in the lower part. Coarse fragments range from 0 to 10 percent throughout.

The A horizon has hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 2 or 3. Cultivated areas have an Ap horizon 5 to 10 inches thick that has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 2 to 4. Texture is silt loam.

The B horizon has hue of 10YR to 2.5YR, value of 4 or 5, and chroma of 4 to 6. Texture is silty clay loam, silty clay, or clay. Some pedons have mottles in shades of red, brown, or yellow in the upper part, and in the lower part, mottles are in shades of gray.

The C horizon has colors similar to those in the lower part of the B horizon. Texture is silty clay or clay.

## Cutshin Series

The Cutshin series consists of soils that are deep and well drained. Permeability is moderate. These soils formed in mixed colluvial material derived mainly from sandstone, siltstone, and shale. The Cutshin soils are in the southern and eastern parts of Owsley County. They are in coves and on benches on north-facing hillsides that commonly receive debris from higher elevations. The slopes range from 20 to 50 percent or more; the average slope is about 40 percent.

The Cutshin soils are on similar landscapes as Gilpin and Shelocta soils. Sequoia and Steinsburg soils are commonly on ridges in higher positions on the landscape. None of these soils have a thick, dark surface layer. Gilpin, Sequoia, and Steinsburg soils are less than 40 inches deep to bedrock.

Typical pedon of Cutshin channery loam, in an area of Shelocta-Cutshin complex, steep; about 9.8 miles south of Booneville on Kentucky Highway 11 to Saxton Creek Road, west about 0.8 mile on Saxton Creek Road to Pole Cat Hollow, about 0.2 mile up Pole Cat Hollow:

- A1—0 to 11 inches; dark brown (10YR 3/3) channery loam; weak fine granular structure; very friable; many fine medium and coarse roots; 15 percent sandstone channers; medium acid; gradual wavy boundary.
- B21—11 to 26 inches; yellowish brown (10YR 5/6) channery loam; moderate fine and medium subangular blocky structure; friable; common fine, medium, and coarse roots; few fine pores and old root channels; 20 percent sandstone channers and flagstones; medium acid; gradual smooth boundary.
- B22—26 to 34 inches; yellowish brown (10YR 5/6) channery loam; moderate fine and medium subangular blocky structure; few fine and medium roots; 25 percent sandstone channers and flagstones; medium acid; gradual smooth boundary.
- B23—34 to 50 inches; yellowish brown (10YR 5/6) channery loam; moderate medium and coarse subangular blocky structure; few fine and medium roots; 25 percent sandstone channers and flagstones; medium acid; gradual smooth boundary.
- C—50 to 72 inches; yellowish brown (10YR 5/4) channery loam; massive; firm; 35 percent sandstone channers and flagstones; few fine manganese concretions; very strongly acid.

Depth to bedrock ranges from 40 to more than 80 inches. Coarse fragments, range from 10 to 35 percent in individual horizons.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 2 or 3. Texture is channery, flaggy, or gravelly analogs of loam, sandy loam, sandy clay loam, or clay loam. Reaction ranges from medium acid to neutral.

The B horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 to 6. Texture is channery, flaggy, or gravelly analogs of loam, sandy loam, clay loam, or sandy clay loam. Reaction ranges from very strongly acid to medium acid. Some pedons have a B1 or B3 horizon, or both.

The C horizon has colors and textures similar to those of the B horizon but with an increasing amount of channers and flagstones. Some pedons have a Cr horizon that is gray and brown soft siltstone.

### Fairpoint Series

The Fairpoint series consists of deep, well drained soils. Permeability is moderately slow. These soils are on benches and outcrops that formed as a result of coal strip mining, and the soils occur randomly throughout the survey area. The slopes range from 0 to 70 percent.

Fairpoint soils are in a complex with Bethesda soils and are adjacent to Cutshin and Shelocta soils on steep hillsides. They are closely associated on the landscape with Rayne and Gilpin soils. Bethesda soils are strongly acid to extremely acid. The Cutshin and Shelocta soils formed in deep, loamy, colluvial material. Rayne and Gilpin soils formed in deep and moderately deep, loamy,

residual material. Rayne soils are on ridges and lower slopes of hillsides, and Gilpin soils are on ridges and steep hillsides.

Typical pedon of Fairpoint channery silt loam, in an area of Bethesda-Fairpoint complex, steep, benched; in Owsley County, near the boundary between Jackson and Owsley Counties; about 10.6 miles east of McKee on Travis Creek Road:

- C1—0 to 11 inches; brownish yellow (10YR 6/6) and brown (10YR 4/3) channery silt loam; massive; firm; few fine roots; 20 percent sandstone channers; medium acid; clear wavy boundary.
- C2—11 to 18 inches; gray (N 5/0) very channery loam; massive; firm; few fine roots; 40 percent coarse siltstone fragments mostly less than 2 inches across; neutral; gradual wavy boundary.
- C3—18 to 30 inches; very dark gray (5Y 3/1) very channery loam; 45 percent soft siltstone fragments, interstices filled with very dark gray (5Y 3/1) very channery loam; neutral; gradual wavy boundary.
- C4—30 to 60 inches; gray (N 5/0) very channery loam; massive; firm; 40 percent siltstone fragments mostly less than 2 inches across; neutral.

Depth to bedrock is more than 60 inches. Reaction ranges from medium acid to neutral throughout. Rock fragments range from 20 to 80 percent, by volume, and average about 45 percent. Coarse fragments commonly range from 2 millimeters to 10 inches across, but stones and boulders are included.

The C horizon has hue of 7.5YR to 5Y, value of 3 to 6, and chroma of 1 to 8; or it is neutral and has value of 3 to 6. Texture is silt loam, loam, clay loam, or silty clay loam and the channery, very channery, gravelly, or very gravelly analogs. Some reclaimed areas have an A horizon of natural soil material that is 4 to 12 inches thick.

### Gilpin Series

The Gilpin series consists of moderately deep, well drained, moderately permeable soils. They formed in residual material from acid sandstone, siltstone, and shale. These soils are on steep hillsides and gently sloping ridgetops. The slopes range from 2 to 60 percent.

Gilpin soils are in complexes with Shelocta soils on steep hillsides, with Rayne soils on ridges, and with Rayne and Sequoia soils on hilly landscapes. Shelocta and Rayne soils are deeper than 40 inches to bedrock. Gilpin soils are closely associated on the landscape with Steinsburg and Lily soils, which are on narrow ridges. Steinsburg soils contain more sand and less clay in the control section than the Gilpin soils, and Lily soils are siliceous and have less silt in the B horizon.

Typical pedon of Gilpin channery silt loam, in an area of Shelocta-Gilpin channery silt loams, steep; 9.6 miles north of McKee on Kentucky Highway 89, near the access road to a farmstead:

- O1—4 to 2 inches; recent forest litter.  
 O2—2 to 0 inches; very dark grayish brown (10YR 3/2) partly decomposed organic matter.  
 A1—0 to 3 inches; dark brown (10YR 3/3) channery silt loam; weak fine granular structure; very friable; many fine and medium roots; 15 percent sandstone channers; strongly acid; clear smooth boundary.  
 B1—3 to 9 inches; yellowish brown (10YR 5/4) silt loam; moderate fine subangular blocky structure; many fine and coarse roots; few wormholes; few tubular pores; few old root channels; 10 percent sandstone fragments; strongly acid; clear wavy boundary.  
 B21t—9 to 22 inches; yellowish brown (10YR 5/6) channery loam; moderate fine and medium subangular blocky structure; firm; few small roots; few wormholes; few tubular pores and old root channels; common thin clay films; 15 percent thin flat sandstone fragments; strongly acid; gradual wavy boundary.  
 B22t—22 to 36 inches; yellowish brown (10YR 5/6) channery silty clay loam; moderate fine angular and subangular blocky structure; firm; few fine roots; few wormholes and tubular pores; 15 percent thin flat fragments; strongly acid; clear smooth boundary.  
 R—36 inches; hard sandstone bedrock.

The thickness of the solum ranges from 18 to 36 inches. Depth to bedrock is 20 to 40 inches. Coarse fragments of sandstone, siltstone, and shale make up 5 to 40 percent of individual horizons. Reaction ranges from strongly acid to extremely acid throughout unless lime has been added.

Undisturbed pedons have a thin, dark A horizon. The Ap horizon has hue of 10YR, value of 3 to 5, and chroma of 2 to 4. Texture is silt loam or loam and the channery analogs.

The B horizon has hue of 7.5YR to 2.5Y, value of 5, and chroma of 4 to 8. Texture is silt loam, loam, or silty clay loam and the channery analogs. Some pedons have a B3 horizon.

Some pedons have a C horizon. It has colors and textures similar to those of the B horizon.

## Grigsby Series

The Grigsby Series consists of deep, well drained soils. Permeability is moderate or moderately rapid. These soils formed in mixed alluvium derived mainly from sandstone, siltstone, and shale. They are nearly level, slightly convex soils on flood plains along tributary streams throughout the survey area. The slopes range from 0 to 4 percent.

Grigsby soils are associated with the Allegheny, Allegheny Variant, Huntington, Orrville Variant, and Rowdy soils on flood plains and terraces. Allegheny and Allegheny Variant soils are deep, well drained, and fine loamy and are on terraces above the flood plain.

Allegheny Variant soils are commonly less than 60 inches to bedrock. Huntington soils are on flood plains along the South Fork of the Kentucky River and have a thick and dark surface layer. Orrville Variant soils are deep, somewhat poorly drained and loamy and are on tributary streams. Rowdy soils are deep, well drained and loamy and are on low terraces.

Typical pedon of Grigsby fine sandy loam, 0 to 3 percent slopes, frequently flooded; about 15.3 miles south of McKee on U.S. Highway 421, about 7.4 miles west on Kentucky Highway 577 to Moores Creek School, south to Moores Creek:

- Ap—0 to 9 inches; dark yellowish brown (10YR 4/4) fine sandy loam; weak fine granular structure; very friable; many fine and few coarse roots; slightly acid; clear smooth boundary.  
 B21—9 to 17 inches; yellowish brown (10YR 5/4) fine sandy loam; weak medium subangular blocky structure parting to weak fine granular; very friable; few fine roots; few medium mixed pores; surface layer material in old channels; slightly acid; abrupt smooth boundary.  
 B22—17 to 30 inches; strong brown (7.5YR 5/6) loam; weak medium and fine subangular blocky structure; friable; few fine roots; few fine pores; medium acid; clear smooth boundary.  
 B23—30 to 44 inches; yellowish brown (10YR 5/4) loam; common medium distinct strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; friable; few fine roots; few dark concretions; medium acid; clear smooth boundary.  
 C1—44 to 60 inches; yellowish brown (10YR 5/4) and strong brown (7.5YR 5/6) sandy loam; massive; friable; few fine dark concretions; medium acid; abrupt smooth boundary.  
 R—60 inches; hard sandstone rock.

The solum ranges in thickness from 30 to 50 inches. Coarse fragments, mostly pebbles, range from 0 to 5 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 A horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. Texture is fine sandy loam, loam, silt loam, or sandy loam.

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

Texture of the C horizon is loam, fine sandy loam, sandy loam, loamy fine sand or the gravelly or very gravelly analogs. In places, the C horizon is stratified. It is massive or single grained and is friable, very friable, or loose.

## Huntington Series

The Huntington series consists of deep soils that are well drained. Permeability is moderate. These soils formed in river-deposited alluvium derived mainly from sandstone, limestone, and shale. These nearly level soils are on flood plains along the Middle Fork of the Kentucky River in Owsley County. The soils are subject to occasional flooding in winter and early in spring. The slopes range from 0 to 4 percent.

Huntington soils are adjacent to Allegheny, Grigsby, and Rowdy soils. Allegheny soils are on higher, older terraces and have an argillic horizon. Grigsby soils are coarse-loamy. Rowdy soils are on terraces slightly higher than Huntington soils. The associated soils do not have a thick, dark, surface layer.

Typical pedon of Huntington loam, 0 to 4 percent slopes, occasionally flooded; on nearly level flood plain in Owsley County; about 1.9 miles south of Booneville, 1,500 feet east of Kentucky Highway 11, to about the center of the flood plain:

- Ap—0 to 10 inches; dark brown (10YR 3/3) loam; weak medium granular structure; friable; many fine roots; few coarse fragments; medium acid; abrupt smooth boundary.
- A11—10 to 17 inches; very dark grayish brown (10YR 3/2) silty clay loam; weak medium granular and moderately coarse subangular blocky structure; friable; common fine roots; few coarse fragments; strongly acid; gradual smooth boundary.
- A12—17 to 24 inches; dark brown (10YR 3/3) clay loam; weak medium granular and moderate subangular blocky structure; friable; common fine roots; strongly acid; clear smooth boundary.
- B1—24 to 33 inches; brown (10YR 4/3) clay loam; weak fine and medium subangular blocky structure; friable; few fine roots; dark brown (10YR 3/3) organic coatings; strongly acid; clear smooth boundary.
- B21—33 to 42 inches; dark yellowish brown (10YR 4/4) silty clay loam; weak medium subangular blocky structure; friable; few fine roots; thin patchy brown (10YR 4/3) silt coatings; very strongly acid; gradual smooth boundary.
- B22—42 to 51 inches; dark brown (7.5YR 4/4) clay loam; weak medium subangular blocky structure; friable; few fine roots; few coarse fragments; very strongly acid; gradual smooth boundary.
- B23—51 to 64 inches; dark brown (7.5YR 4/4) clay loam; moderate coarse subangular blocky structure; few fine roots; thin continuous brown (10YR 4/3) silt and clay coatings; very strongly acid.

The solum is more than 40 inches thick. The mollic epipedon is 10 to 24 inches thick. Reaction ranges from very strongly acid to slightly acid. Coarse fragments are commonly absent but can be as much as 3 percent.

The Ap and A1 horizons have hue of 10YR or 7.5YR, value of 2 or 3, and chroma of 2 or 3. Texture is loam, silty clay loam, and clay loam with less than 15 percent fine or coarser sand in the particle-size control section.

The B horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. Texture is commonly silt loam, clay loam, or silty clay loam.

The Huntington soils are a taxadjunct to the Huntington series because base saturation is less than 50 percent in the control section, and the clay loam texture in the A and B horizons is not within the range of the Huntington series. These differences do not significantly affect the use, management, and behavior of the soils.

## Lily Series

The Lily series consists of moderately deep, well drained soils. Permeability is moderately rapid. These soils formed in residuum weathered from acid sandstone. They are on upland ridges and upper side slopes. The landscapes are commonly long and narrow, and slopes are concave. The slopes range from 6 to 25 percent.

Lily soils are near Gilpin, Rayne, Rigley, and Steinsburg soils on similar landscapes. Gilpin soils have mixed mineralogy. Rayne and Riney soils are deeper than 40 inches to bedrock and have mixed mineralogy. Steinsburg soils have mixed mineralogy and do not have an argillic horizon.

Typical pedon of Lily sandy loam, in an area of Lily and Gilpin soils, sloping; on Kentucky Highway 89, about 5.3 miles north of McKee, about 0.4 mile south of Highway 89, on Forest Service access road:

- A1—0 to 3 inches; very dark gray (10YR 3/1) sandy loam; strong fine granular structure; very friable; many fine and medium roots; few flat sandstone fragments mostly less than 2 inches across; extremely acid; abrupt smooth boundary.
- A2—3 to 10 inches; light yellowish brown (10YR 6/4) sandy loam; weak fine subangular blocky structure; friable; common fine roots; very strongly acid; clear smooth boundary.
- B21t—10 to 16 inches; brown (7.5YR 5/4) sandy loam; weak fine and medium subangular blocky structure; friable; common fine and few coarse roots; very strongly acid; clear smooth boundary.
- B22t—16 to 22 inches; strong brown (7.5YR 5/6) sandy clay loam; weak medium and fine subangular blocky structure; friable; few fine and coarse roots; 5 percent soft yellowish red (5YR 5/6) fragments; very strongly acid; clear smooth boundary.

B23t—22 to 29 inches; strong brown (7.5YR 5/6) sandy loam; weak fine and medium subangular blocky structure; friable; few fine roots; 10 percent soft yellowish red (5YR 5/6) fragments; very strongly acid.

R—29 inches; hard, strong brown sandstone bedrock.

The thickness of the solum and depth to sandstone bedrock range from 20 to 40 inches. Coarse fragments of sandstone range from 0 to 10 percent to a depth of about 2 feet and from 0 to 35 percent below that.

Reaction is very strongly acid or extremely acid.

The A1 horizon has hue of 10YR or 7.5YR, value of 2 to 5, and chroma of 1 to 3. Texture is sandy loam, loam, or fine sandy loam.

The Ap and A2 horizons have hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 2 to 4. Texture is similar to that of the A1 horizon. Some pedons have an A3 horizon that has colors and texture similar to that of the Ap horizon.

The B2t horizon has hue of 10YR and 7.5YR, value of 4 to 6, and chroma of 4 to 8. Some pedons have mottles in shades of red, brown, or yellow in the middle and lower parts of the B2t horizon. Texture is sandy loam, sandy clay loam, loam, or fine sandy loam that has more than 18 percent clay. Some pedons have a B3 or C horizon with colors and textures similar to the B2t horizon.

### Orrville Variant

The Orrville Variant consists of deep, somewhat poorly drained, moderately permeable soils. These soils are on nearly level flood plains. They formed in alluvium derived mainly from acid sandstone, siltstone, and shale, but they can include limestone and nonacid shale. These soils are subject to frequent flooding in winter and early in spring. A seasonal high water table is at a depth of 1 foot to 2 feet. The slopes range from 0 to 2 percent.

The Orrville Variant soils are in a complex with Grigsby soils, which are well drained and coarse loamy. The Orrville Variant soils are adjacent to the Rowdy soils on young terraces. The Rowdy soils are well drained.

Typical pedon of Orrville Variant silt loam, in an area of Grigsby-Orrville Variant complex, 0 to 3 percent slopes, frequently flooded; about 10.9 miles south of McKee on U.S. Highway 421, east on improved road, about 1,000 feet up a tributary of Laurel Fork:

A—0 to 3 inches; dark grayish brown (10YR 4/2) silt loam; moderate fine and medium granular structure; very friable; many fine and medium roots; common root channels that have dark reddish brown organic coatings; slightly acid; abrupt smooth boundary.

B21—3 to 14 inches; light olive brown (2.5Y 5/4) loam; common medium faint grayish brown (2.5Y 5/2) mottles; weak medium and coarse subangular blocky structure; very friable; common fine and

medium roots; common root channels that have dark reddish brown organic coatings; medium acid; gradual smooth boundary.

B22g—14 to 29 inches; grayish brown (2.5YR 5/2) loam; common medium distinct strong brown (7.5YR 5/6) mottles; coarse and medium prismatic structure parting to moderate coarse subangular blocky; friable; few fine roots; common fine tubular pores; common fine iron and manganese concretions; 5 percent shale fragments; medium acid; gradual wavy boundary.

C1g—29 to 38 inches; light brownish gray (10YR 6/2) clay loam; common medium distinct yellowish brown (10YR 5/6), light yellowish brown (10YR 6/4), and light gray (10YR 6/1) mottles; massive; firm; few fine roots; common medium manganese and iron concretions; 12 percent small channers; medium acid; clear smooth boundary.

C2g—38 to 48 inches; light brownish gray (10YR 6/2) gravelly clay loam; common medium distinct yellowish brown (10YR 5/6) mottles and light yellowish brown (10YR 6/4) mottles; massive; firm; few fine roots; common medium iron and manganese concretions; 22 percent gravel and small shale channers; medium acid; clear smooth boundary.

R—48 inches; hard fissile shale.

The solum ranges in thickness from 24 to 50 inches. The content of coarse fragments, mainly gravel and shale, ranges from 0 to 15 percent in the B horizon and from 0 to 25 percent in the C horizon.

The A horizon has hue of 10YR or 2.5Y, value of 3 or 4, and chroma of 2. Texture is commonly silt loam or loam or less commonly fine sandy loam or sandy loam. Reaction is slightly acid to strongly acid unless lime has been added.

The matrix of the B horizon has hue of 10YR to 5Y, value of 4 to 6, and chroma of 2 to 4. A subhorizon is within 10 to 30 inches of the surface and has chroma of 3 or more. Texture is commonly loam or clay loam. In some pedons, the texture of the control section is relatively uniform; in other pedons, it can be stratified and variable. Reaction ranges from slightly acid to strongly acid.

The C horizon has hue of 10YR to 5Y, value of 4 to 7, chroma of 1 to 6; or it is neutral and has value of 4 to 7. It has common to many mottles. Texture is silt loam, loam, sandy loam, silty clay loam, or clay loam, or the gravelly analogs. In some pedons, the C horizon is stratified. Reaction ranges from neutral to medium acid.

### Rayne Series

The Rayne series consists of deep, well drained, and moderately permeable soils. These soils formed in residuum from thin bedded shale, siltstone, and some

fine grained sandstone. They are on gently sloping to steep ridgetops and hillsides. The slopes range from 2 to 35 percent.

Rayne soils are on landscapes similar to those of the Gilpin and Shelocta soils. Gilpin soils are less than 40 inches deep to bedrock. Shelocta soils formed in colluvium on hillsides.

Typical pedon of Rayne silt loam, in an area of Gilpin-Rayne silt loams, 2 to 6 percent slopes; about 1.4 miles south of McKee on Kentucky Highway 290, about 0.2 mile southwest on a gravel road:

- O1—1 to 0 inches; recent forest litter.
- A1—0 to 2 inches; brown (10YR 4/3) silt loam; weak fine granular structure; very friable; many very fine and fine, and common medium roots; strongly acid; clear smooth boundary.
- B1—2 to 6 inches; yellowish brown (10YR 5/6) silt loam; weak fine and medium subangular blocky structure; friable; many very fine and fine, and few medium roots; few wormholes; few thin flat sandstone fragments; strongly acid; clear smooth boundary.
- B21t—6 to 13 inches; strong brown (7.5YR 5/8) silty clay loam; moderate medium and fine subangular blocky structure; friable; common very fine, medium, and coarse roots; few old root channels; few small tubular pores; thin patchy clay films; few thin flat sandstone fragments; strongly acid; clear wavy boundary.
- B22t—13 to 19 inches; strong brown (7.5YR 5/6) silty clay loam; weak medium and fine subangular and angular blocky structure; firm; few fine and coarse roots; common thin clay films; few small rounded sandstone fragments; strongly acid; clear wavy boundary.
- B23t—19 to 37 inches; strong brown (7.5YR 5/6) silty clay loam; common medium prominent red (2.5YR 5/8) and reddish yellow (7.5YR 6/8) mottles in the lower part; moderate medium and fine subangular blocky structure; firm; few medium roots; common thin clay films; few thin sandstone fragments mostly less than 10 millimeters across; strongly acid; gradual wavy boundary.
- B24t—37 to 46 inches; variegated reddish yellow (7.5YR 6/8), light red (2.5YR 6/8), and light gray (10YR 7/2) channery silty clay loam; weak medium and coarse subangular and angular blocky structure; firm; few medium roots; thick clay films on ped faces; 15 percent thin siltstone fragments; strongly acid; gradual wavy boundary.
- Cr—46 to 60 inches; dominantly gray with red and brown variegations; horizontally bedded relict shale structure; massive; firm; extremely acid.

The thickness of the solum ranges from 40 to 60 inches. Depth to bedrock ranges from 40 to 72 inches. Reaction is strongly acid or very strongly acid unless lime has been added.

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

The B1 horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 8. Texture is silt loam, loam, or silty clay loam. The B2t horizon has hue of 10YR, 7.5YR, or 5YR, value of 5 or 6, and chroma of 4 to 8 and is mottled. Texture is silt loam, loam, silty clay loam, or the channery analogs. Coarse fragments of shale, siltstone, or sandstone range from 0 to 30 percent. In some pedons, red and gray colors in the lower part of the B2t horizon are from unweathered shale.

Some pedons have a C horizon that has hue of 2.5Y to 7.5YR, value of 4 to 7, and chroma of 2 to 8, or colors may be variegated or mottled in shades of gray, yellow, brown, or red. Texture ranges from loam to silty clay loam and the channery analogs. Coarse fragments from thin bedded siltstone, sandstone, and shale range from 15 to 35 percent.

### Rigley Series

The Rigley series consists of deep, well drained soils. Permeability is moderately rapid. These soils formed in colluvium mainly from sandstone, but also from siltstone and shale. They are on hillsides below sandstone outcrops and are commonly in the western and northern parts of Jackson County. The slopes range from 20 to 60 percent.

The Rigley soils are adjacent to Gilpin, Lily, Shelocta, and Steinsburg soils. Gilpin, Lily, and Steinsburg soils are less than 40 inches to bedrock. In addition, Gilpin soils contain more silt and less sand than Rigley soils, and Steinsburg soils contain less clay. Shelocta soils contain less sand and more silt.

Typical pedon of Rigley loam in an area of Rigley-Rock outcrop association, steep, in Jackson County; about 3.8 miles southwest of McKee on Kentucky Highway 89, about 1.3 miles northwest on Indian Creek-Sandgap Road, about 1.7 miles west on 5 Tree Tower Road, about 3.4 miles on Forest Service access road, on a ridgetop overlooking Horse Lick Creek to the north:

- O1—4 to 2 inches; recent forest litter from hardwoods and pines.
- O2—2 to 0 inches; very dark gray (10YR 3/1) partly decomposed organic matter.
- A1—0 to 6 inches; brown (10YR 5/3) loam; weak fine granular and subangular blocky structure; very friable; many coarse and fine, and few medium roots; 10 percent sandstone fragments; very strongly acid; clear smooth boundary.
- A2—6 to 14 inches; yellowish brown (10YR 5/4) sandy loam; moderate and medium subangular blocky structure; friable; common fine and medium roots; common fine tubular pores; 5 percent sandstone fragments; very strongly acid; clear wavy boundary.

- B21t—14 to 28 inches; strong brown (7.5YR 5/6) channery loam; moderate medium subangular blocky structure; friable; common fine and medium roots; few fine tubular pores; continuous thin clay films; 30 percent angular sandstone fragments; very strongly acid; gradual wavy boundary.
- B22t—28 to 47 inches; strong brown (7.5YR 5/6) very channery loam; moderate medium subangular blocky structure; firm; few medium and fine roots; few fine tubular pores; many thin clay films; 33 percent sandstone fragments; very strongly acid; clear smooth boundary.
- B23t—47 to 62 inches; brown (7.5YR 5/4) channery sandy loam; weak medium and fine subangular blocky structure; firm; few fine roots; common fine and medium pores; 15 percent sandstone fragments mostly less than 1 inch across; strongly acid; clear smooth boundary.
- C—62 to 72 inches; strong brown (7.5YR 5/8) very channery sandy loam; massive; firm; 50 percent sandstone fragments; very strongly acid.

Depth to bedrock is more than 60 inches. Sandstone fragments, more than 2 millimeters across, make up from 5 to 35 percent of individual horizons of the solum and 20 to 70 percent of the C horizon. The reaction ranges from very strongly acid to neutral in the A horizon and from extremely acid to neutral in the B and C horizons.

The A horizon has hue of 10YR, value of 3 to 5, and chroma of 2 to 6. Texture is loam or sandy loam.

The B horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 8. It is loam or sandy loam and the gravelly or channery analogs. Some pedons have mottles in shades of brown or yellow in the lower part of the B horizon.

The C horizon has the same color range as the B horizon. Texture is sandy loam, loam, sandy clay loam, and the gravelly, cobbly, channery, very channery, or extremely channery analogs.

## Riney Series

The Riney series consists of deep, well drained soils. Permeability is moderately rapid. Riney soils formed in old, high river terraces that are on gently sloping to rolling landscapes. The slopes range from 4 to 12 percent.

Riney soils are closely associated on the landscape with Allegheny and Shelocta soils. Allegheny soils are not as red in the B horizon as Riney soils and contain less sand. Shelocta soils formed in colluvium on hillsides and contain more coarse fragments than Riney soils.

Typical pedon of Riney loam, in an area of Riney-Allegheny complex, 4 to 12 percent slopes; about 0.4 mile west of Booneville, about 0.3 mile south of Kentucky Highway 30 on "The Sag Road," east to top of ridge:

- Ap—0 to 5 inches; dark yellowish brown (10YR 4/4) loam; weak medium and fine granular structure; many fine and medium roots; strongly acid; clear smooth boundary.
- B1—5 to 13 inches; yellowish brown (10YR 5/6) loam; moderate fine and medium subangular blocky structure; friable; many fine and medium roots and few coarse roots; few fine pores; few wormholes; strongly acid; clear wavy boundary.
- B21t—13 to 22 inches; yellowish red (5YR 5/8) sandy clay loam; moderate fine and medium subangular blocky structure; friable; common medium and fine roots; many fine pores; few rounded coarse fragments; very strongly acid; clear wavy boundary.
- B22t—22 to 44 inches; red (2.5YR 4/8) sandy clay loam; moderate medium subangular blocky structure; friable; few fine roots; common clay films; very strongly acid; clear wavy boundary.
- B3—44 to 62 inches; red (2.5YR 4/8) sandy loam; weak coarse subangular blocky structure; friable; common thin clay films; 10 percent pebbles and sandstone fragments; very strongly acid.

The thickness of the solum ranges from 40 to 80 inches. Depth to bedrock is 60 inches or more.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. Texture is loam or fine sandy loam. Reaction ranges from very strongly acid to neutral.

The B1 horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. Texture is commonly loam or fine sandy loam. Reaction ranges from very strongly acid to neutral.

The B2t horizon has hue of 5YR or 2.5YR, value of 4 or 5, and chroma of 6 or 8. Texture is loam, clay loam, or sandy clay loam. Pebbles and sandstone fragments range from 0 to 20 percent. Reaction is very strongly acid or strongly acid.

The B3 horizon has colors similar to the B2t horizon. Texture is sandy loam, sandy clay loam, or fine sandy loam. Reaction is very strongly acid or strongly acid.

Some pedons have a C horizon that has colors similar to the B2t horizon. Texture is sandy clay loam, sandy loam, fine sandy loam, or loamy sand. Pebbles and sandstone fragments range from 0 to 20 percent. Reaction is very strongly acid or strongly acid.

## Rowdy Series

The Rowdy series consists of deep, well drained, moderately permeable soils. These soils are on young terraces along the North Fork of the Kentucky River and tributary streams. They formed in loamy alluvium derived mainly from sandstone, siltstone, and shale. The Rowdy soils on low stream terraces are subject to occasional flooding for brief periods late in winter and early in spring. The slopes range from 0 to 4 percent.

Rowdy soils are closely associated on the landscape with the Allegheny Variant, Grigsby, and Orrville Variant soils. Allegheny Variant soils have an argillic horizon and are commonly on higher terraces than Rowdy soils. Grigsby and Orrville Variant soils are on flood plains. Grigsby soils are well drained and Orrville Variant soils are somewhat poorly drained.

Typical pedon of Rowdy silt loam, 0 to 4 percent slopes, occasionally flooded, in a meadow; about 1.4 miles south of Booneville, 1,000 feet east of Kentucky Highway 11:

- Ap—0 to 10 inches; dark brown (10YR 4/3) silt loam; weak fine granular structure; friable; many fine roots; few sandstone fragments; strongly acid; abrupt smooth boundary.
- B1—10 to 17 inches; dark yellowish brown (10YR 4/4) loam; weak medium subangular blocky structure; common fine roots; dark brown (10YR 4/3) organic coatings; strongly acid; clear smooth boundary.
- B21—17 to 26 inches; strong brown (7.5YR 5/6) loam; moderate medium subangular blocky structure; friable; few fine roots; dark brown (7.5YR 4/4) coatings on ped faces and brown (10YR 4/3) organic coatings; strongly acid; gradual smooth boundary.
- B22—26 to 36 inches; yellowish brown (10YR 5/6) loam; moderate medium subangular blocky structure; friable; few fine roots; thin patchy dark yellowish brown ped coatings; strongly acid; clear wavy boundary.
- B3—36 to 53 inches; yellowish brown (10YR 5/6) loam; few fine distinct strong brown (7.5YR 5/8) and pale brown (10YR 6/3) mottles; weak, medium subangular blocky structure; few concretions; strongly acid; gradual wavy boundary.
- C—53 to 65 inches; brownish yellow (10YR 6/6) loam; common fine distinct strong brown (7.5YR 5/6) and light brownish gray (10YR 6/2) mottles; massive; friable; few fine roots; few coarse fragments mostly less than 3 inches across; strongly acid.

The thickness of the solum ranges from 40 to 60 inches or more. Depth to bedrock is more than 60 inches. Reaction ranges from very strongly acid to neutral except where lime has been added. Coarse fragments, mostly pebbles, make up 0 to 30 percent of the solum and 0 to 60 percent of the C horizon.

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

The B horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 or 6. Texture is loam, silt loam, or sandy clay loam or the gravelly analogs. In some pedons, the lower part of the B horizon has mottles in shades of brown or gray.

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

loam, sandy loam, clay loam, or the gravelly or very gravelly analogs.

## Sequoia Series

The Sequoia series consists of moderately deep, well drained soils. Permeability is moderately slow. These soils formed in residuum from acid shale. They are on moderately steep and steep landscapes. The slopes dominantly range from 12 to 25 percent.

Sequoia soils are closely associated on the landscape with the Gilpin and Rayne soils and are adjacent to the Lily, Shelocta, and Steinsburg soils. Gilpin, Rayne, Lily, and Shelocta soils have a fine-loamy particle-size control section. In addition, Rayne and Shelocta soils have a solum that is more than 40 inches thick. Steinsburg soils have a coarse-loamy particle-size control section.

Typical pedon of Sequoia silt loam, in an area of Gilpin-Rayne-Sequoia silt loams, 12 to 25 percent slopes; about 7.6 miles south of McKee on Kentucky Highway 290, west on Kentucky Highway 2003 to Pine Flat, north 0.4 mile on Forest Service access road, about 0.5 mile west on abandoned road:

- O1—2.5 to 1 inches; recent pine and hardwood litter.
- O2—1 to 0 inches; partly decomposed forest litter.
- A1—0 to 2 inches; dark grayish brown (10YR 4/2) silt loam; weak fine granular structure; many fine roots; few sandstone channers; strongly acid; clear smooth boundary.
- A2—2 to 5 inches; yellowish brown (10YR 5/4) silt loam; weak fine and medium granular structure; common fine and medium roots; few sandstone channers; very strongly acid; clear smooth boundary.
- B1—5 to 10 inches; yellowish brown (10YR 5/6) silty clay loam; weak fine and medium subangular blocky structure; common fine and medium roots; common fine pores; very strongly acid; gradual wavy boundary.
- B21t—10 to 16 inches; strong brown (7.5YR 5/8) silty clay; moderate fine and medium subangular and angular blocky structure; firm; few fine roots; few fine and medium pores; common thin clay films; very strongly acid; clear wavy boundary.
- B22t—16 to 29 inches; strong brown (7.5YR 5/8) silty clay; common medium distinct red (2.5YR 4/8) mottles; moderate fine and medium angular blocky structure; few fine and medium roots; many thin clay films; very strongly acid; gradual wavy boundary.
- Cr—29 to 60 inches; red (2.5YR 4/8) clayey shale; common medium prominent very pale brown (10YR 7/4), brownish yellow (10YR 6/8), and light gray (10YR 7/2) mottles; massive; firm; very strongly acid.

The thickness of the solum and depth to soft shale range from 20 to 40 inches. Depth to hard shale is

commonly more than 5 feet. The content of coarse fragments in the solum ranges from 0 to about 15 percent. Reaction is strongly acid or very strongly acid except where lime has been added.

In forested areas, pedons have A1 and A2 horizons. The A1 horizon generally has hue of 10YR, value of 4, and chroma of 2 but can be darker or lighter. The A2 horizon has hue of 10YR, value of 4 to 6, and chroma of 4 to 6. Cultivated areas have an Ap horizon that has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. Texture of the A horizon is silt loam.

The B1 horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 8. Texture is silt loam or silty clay loam.

The B2 horizon has hue of 7.5YR or 5YR, and rarely 2.5YR, value of 5, and chroma of 6 to 8. The clay content is 35 percent or more, and the texture is silty clay loam, silty clay, or clay.

Some pedons have a B3 horizon that has colors and textures similar to the B2 horizon, or it may be mottled in shades of yellow, brown, red, and gray.

The Cr or C horizon is weathered clayey shale, silty clay, or silty clay loam if texture can be determined and is massive and platy.

### Shelocta Series

The Shelocta series consists of deep, well drained soils that are moderately permeable. These soils formed in colluvium from sandstone, siltstone, and shale. They are on steep hillsides throughout the survey area. The slopes range from 12 to 60 percent.

Shelocta soils are closely associated on the landscape with Allegheny, Bledsoe, Caneyville, Cutshin, Gilpin, Lily, Rayne, and Steinsburg soils. Allegheny soils are on the lower, benched landscapes of stream terraces. They are alluvial and contain few coarse fragments. Bledsoe soils have a fine particle-size control section, and they formed in colluvium. Caneyville soils have a fine particle-size control section, and they formed in limestone residuum. Cutshin soils have concave slopes and are in coves and on benches. They have a thick, dark surface layer. Gilpin, Lily, and Steinsburg soils are less than 40 inches to bedrock. Rayne soils formed in residuum from thin-bedded, residual material on hilly landscapes.

Typical pedon of Shelocta channery silt loam, in an area of Shelocta-Gilpin channery silt loams, steep; about 10.5 miles southwest of McKee on Kentucky Highway 89 to Flat Top Church, 0.4 mile north along Renfro Branch, on an unimproved road:

- A1—0 to 2 inches; dark brown (10YR 3/3) channery silt loam; weak fine granular structure; very friable; many fine and medium roots; 30 percent sandstone channers; very strongly acid; clear smooth boundary.
- B1—2 to 6 inches; yellowish brown (10YR 5/6) channery silt loam; weak fine subangular blocky structure; friable; many fine and medium roots; 25 percent

sandstone channers; very strongly acid; clear wavy boundary.

B21t—6 to 13 inches; yellowish brown (10YR 5/6) channery silt loam; moderate medium subangular blocky structure; friable; many fine and medium roots; few old root channels; 15 percent sandstone and siltstone channers; very strongly acid; clear wavy boundary.

B22t—13 to 24 inches; yellowish brown (10YR 5/8) channery silt loam; moderate medium subangular blocky structure; friable; few fine and medium roots; common fine and medium pores; few old root channels; few thin clay films; 25 percent sandstone channers; very strongly acid; clear wavy boundary.

B23t—24 to 49 inches; yellowish brown (10YR 5/6) and strong brown (7.5YR 5/6) channery silt loam; moderate medium subangular blocky structure; friable; few fine roots; common thin clay films; 25 percent siltstone and sandstone channers; very strongly acid; clear smooth boundary.

C—49 to 60 inches; yellowish brown (10YR 5/6) channery loam; massive; firm; 30 percent sandstone channers; very strongly acid.

The thickness of the solum ranges from 40 to more than 60 inches. Depth to hard bedrock is 48 to more than 120 inches. Coarse fragments, 2 millimeters to 15 inches across, range from 5 to 35 percent in the A and B horizons and from 5 to 60 percent in the C horizon. Reaction is strongly acid or very strongly acid.

The A1 horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. Texture is silt loam or loam and the channery or gravelly analogs.

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

The C horizon has texture and colors similar to those of the B horizon.

### Steinsburg Series

The Steinsburg series consists of moderately deep, well drained soils. Permeability is moderately rapid. These soils formed in residuum from acid sandstone. They are on the highest points and on steep upper side slopes that have gradients that range from about 6 to as much as 60 percent.

Steinsburg soils are closely associated on the landscape with the Gilpin, Lily, Rigley, Sequoia, and Shelocta soils and Rock outcrop. Gilpin, Lily, and Sequoia soils contain more clay and less sand in their particle-size control sections than Steinsburg soils. Rigley and Shelocta soils are more than 40 inches to bedrock and contain more clay in the particle-size control section.

Typical pedon of Steinsburg loam, in an area of Steinsburg and Gilpin soils and Rock outcrop, steep; on

a ridgetop, about 6.6 miles east of Booneville on Kentucky Highway 30, south on an unimproved road at the confluence of Split Poplar Fork and Poletown Fork, about 0.38 mile south to top of ridge:

- A1—0 to 3 inches; dark yellowish brown (10YR 4/4) loam; moderate fine and medium granular structure; very friable; many fine roots; few coarse fragments; very strongly acid; clear smooth boundary.
- B1—3 to 10 inches; yellowish brown (10YR 5/6) channery fine sandy loam; moderate fine and medium subangular blocky structure; friable; many fine and medium roots; 15 percent coarse fragments; very strongly acid; clear wavy boundary.
- B2—10 to 23 inches; yellowish brown (10YR 5/6) channery loam; moderate fine and medium subangular blocky structure; friable; common fine to coarse roots; 15 percent coarse fragments; strongly acid; clear wavy boundary.
- C—23 to 33 inches; yellowish brown (10YR 5/6) channery sandy loam; massive; friable; few fine

roots; 25 percent coarse fragments mostly less than 2 inches across; strongly acid.

R—33 inches; thin bedded sandstone and shale.

The thickness of the solum ranges from 10 to 20 inches. Depth to bedrock ranges from 24 to 40 inches. Quartzite pebbles and fragments of sandstone commonly increase with depth. They make up 0 to 20 percent of the solum and about 20 to 60 percent of the C horizon. Reaction is very strongly acid or strongly acid throughout.

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

The B horizon has hue of 10YR to 5YR, value of 4 or 5, and chroma of 3 to 6. Texture is loam, sandy loam, or fine sandy loam.

The C horizon has colors similar to those of the B horizon. Texture is sandy loam or loamy sand or the channery, gravelly, or very gravelly analogs.



# Formation of the Soils

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This section discusses the factors of soil formation, relates them to soils in the survey area, and explains the processes of soil formation.

## Factors of Soil Formation

The characteristics of a soil at any given point depend on the physical and chemical composition of parent material and on climate, relief, plant and animal life, and time. Soils form by the interaction of these five factors. The relative importance of each factor differs from one soil to another. In some areas, one factor may dominate the formation of soil characteristics, and in other areas, another factor may dominate. In Jackson and Owsley Counties, climate and plant and animal life are not likely to vary greatly, but there are differences in relief and parent material.

Because the interrelationships between the five factors are so complex, the effect of any one factor is hard to determine.

The following is a brief narrative on some of the ways in which these factors have influenced soil formation in Jackson and Owsley Counties.

### Parent Material

Parent material is the unconsolidated mass from which soils form, and it is a product of the weathering or degrading of rocks and minerals contained in the rocks. Parent material influences the physical, mineral, and chemical properties of the soil and to a large extent the rate at which soil formation takes place. In Jackson and Owsley Counties, soils formed mainly in colluvial deposits on hillsides; fluvial deposits along rivers and streams, and some high level fluvial deposits along the South Fork of the Kentucky River; and in residuum weathered from bedrock. Shelocta soils, for example, formed in colluvium on hillsides. Grigsby and Rowdy soils formed in fluvial deposits along low-lying flood plains of tributary streams. Allegheny and Riney soils formed in fluvial deposits or terraces. Caneyville and Steinsburg soils are examples of soils formed in residuum from bedrock weathered in place.

Most of the surface rock formations in Jackson and Owsley Counties consist of interbedded sandstone, siltstone, and shale, interspersed with coal seams of the Pennsylvanian age. Shelocta, Gilpin, and Sequoia soils are examples of soils formed from the weathering of

these interbedded materials. In the northwestern and northern parts of Jackson County, interbedded limestone, shale, and siltstone of the Mississippian age are exposed, commonly on steep hillsides. The Caneyville soils formed in residuum from limestone. The Bledsoe soils formed in colluvial material weathered from a mixture of parent materials.

### Climate

Climate affects the physical, chemical, and biological relationships in the soil. It influences the kind and number of plants and animals, weathering and decomposition of rocks and minerals, the amount of soil erosion, and the rate of soil formation.

The climate in Jackson and Owsley Counties is humid and moderate. The average annual precipitation is 50 inches, and the mean annual air temperature is 38 degrees F. The soils are almost never completely dry, and leaching occurs throughout the year. The soluble bases have been mostly leached out of the surface layer and upper part of the subsoil. As a result, most of the soils have a leached acid surface layer and a subsoil that has a finer texture than the surface layer. Gilpin and Allegheny soils are strongly leached.

### Relief

The relief of the landscape influences soil formation mainly through its effect on drainage and erosion. Differences in landscape position also influence variations in exposure to sun, wind, drainage, soil temperature, and plant cover.

The topography of Jackson and Owsley Counties is mainly ridge and valley. The ridges are long, narrow, and sloping, and the hillsides are steep. The nearly level valleys are long and narrow and often subject to flooding. On steep slopes, soils developed in colluvial material transported downslope by gravity or water, or both. Bledsoe, Shelocta, and Cutshin soils formed in this way. Soils on ridges generally are less than 40 inches to bedrock, mainly because of rapid geologic erosion. Steinsburg, Gilpin, and Lily soils are on ridgetops. Soils on steep slopes generally have fewer, less distinct horizons than soils formed in less sloping areas because water runoff is much greater on steep landscapes. In less sloping areas, more rain penetrates the surface and the horizons are more distinct.

In some nearly level areas, the soil shows evidence of wetness, such as mottling in the subsoil. On some nearly level concave landscapes, the soils are saturated for extended periods of time. These soils are commonly gray and mottled in the subsoil. Orrville Variant soils are somewhat poorly drained and are on the flood plains.

### Plant and Animal Life

Plants affect soil formation mainly by adding organic matter. Animals, bacteria, and fungi contribute to soil formation by converting the remains of plants to organic matter and plant nutrients. The organic matter imparts a dark color to the soil material, and the humus, or decomposed organic matter, aids in the formation of the soil structure.

Most soils in Jackson and Owsley Counties formed under hardwood forests. These soils are characterized by a thin, dark surface layer and a brighter color subsoil.

Local differences in drainage, parent material, elevation, aspect, and other features contribute to forest density, composition of plant species, and the kinds of associated ground cover. Variations in the soils reflect these differences. Cutshin soil, for example, has a thick, dark color surface layer and is only on north-facing slopes. North-facing slopes receive less direct sunlight. They have slightly lower soil temperature and have more favorable moisture conditions. These sites produce more understory and overstory vegetation, and the decaying leaf litter causes a thicker and darker surface layer to form.

Man has greatly altered the surface layer and the soil environment by clearing the forest and plowing the soil (fig. 11). He has mixed the soil layers, moved soil from place to place, added fertilizers and lime, and introduced new plant species. In places, as a result of accelerated erosion, most of the original surface layer has been removed, exposing the less productive subsoil.

### Time

The nature of the soil is strongly influenced by the length of time that parent material has been exposed to the active forces that cause its degradation. A long period of time is required for distinct soil profiles to develop. The length of time required depends mainly on the nature of the parent material and the topography.

In this survey area, relatively young soils are on flood plains and young terraces, or in coves and on north-facing, concave slopes. These soils have only weakly developed subsoil horizons. Examples are the Cutshin, Grigsby, Huntington, and Rowdy soils. In addition, the Cutshin and Huntington soils have developed a thick, dark surface layer.

Some of the soils on old, high terraces and ridgetops and hillsides have been in place long enough to have well developed subsoil horizons that have a significant accumulation of illuvial clay. Some examples are Allegheny, Gilpin, Rigley, Riney, and Shelocta soils.

## Processes of Horizon Differentiation

The results of the soil-forming factors are evident in the different layers of soil horizons in a soil profile. The soil profile extends from the surface layer to material that is little altered by soil-forming processes.

Most soils contain three major horizons, the A, B, and C horizons. Soils under forest vegetation commonly have an O (organic) horizon at the surface. This horizon is an accumulation of organic material, such as leaves and twigs, or humidified organic material, with little mixture of mineral material. Lower case letters and numbers are used to indicate differences within the major horizons. The Bt horizon, for example, represents the part of the B horizon that has an accumulation of clay from overlying horizons. The Shelocta soils have a Bt horizon. Numbers after the letter subscript indicate vertical subdivision within the horizon, such as B21t or B22t.

The A1 horizon is a mineral surface layer darkened by humified organic matter. The designation Ap is used for the plow layer in cultivated soils. An A2 horizon often underlies the A1 horizon. Both the A1 and A2 horizons are layers of maximum leaching and eluviation of clay, iron, and exchangeable bases. The A2 horizon is not darkened by organic matter as is the A1 horizon. The A2 horizon is normally the lightest color horizon in the profile.

The B horizon normally underlies the A1 or A2 horizon and is called the subsoil. It is the horizon of maximum accumulation or illuviation of clay, iron, aluminum, and other compounds leached from the surface and subsurface layers. In some soils, such as the Steinsburg soil, the B horizon is formed mainly by the in-place alteration of the original parent material rather than by additions of clay, iron, and aluminum through illuviation. The alteration can be caused by the weathering of the parent material and release of iron, which can give brown or red colors, the development of soil structure, or both. The B horizon commonly has a blocky or prismatic structure. This horizon generally is finer in texture than the A horizon and of a stronger color than the C horizon or the A horizon. The C horizon is below the A or B horizon. The C horizon consists of materials that are little altered by the soil-forming processes, but it may be modified by weathering.

In young soils, such as those formed in man-deposited fills, the B horizon is often absent and the C horizon may immediately underlie an A horizon or be at the surface.

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



Figure 11.—In the 1920's, some soils in Jackson County were altered forever by the harvesting of large tracts of virgin timber.

The accumulation and incorporation of organic matter occurs as plant residue and applied organic material decompose and are added to the soil. These additions darken the mineral soil material and are responsible for forming the A horizon. Forest vegetation adds organic material mainly to the soil surface as leaf litter with little deep mixing into the soil. Prairie vegetation, however, incorporates organic matter deep into the soil and can result in a thick, dark A horizon from 1 foot to several feet thick.

Most soils on the uplands in the survey area have well developed soil horizons as a result of weathering and eluviation-illuviation processes. Leaching of lime or other

soluble constituents from the A horizon is necessary for clay illuviation to occur. Clay in the A horizon is then easily dispersed and translocated in suspension to lower layers as water percolates down through the soil profile. Upon desiccation or encountering a layer rich in lime or basic cations, the suspended clay is deposited as "clay films" on mineral grains, in pores, and on ped surfaces. Clay can also form in places in the B horizon by the interaction of dissolved silicon and aluminum leached from overlying horizons. The result of these processes is the concentration of sand- and silt-size quartz grains in the A1 and A2 horizons, and enrichment of the B horizon in clay.

Leaching has been sufficient to remove most of the exchangeable bases from the B horizon in soils on uplands in the survey area. Such soils are classed as Ultisols. Bledsoe and Caneyville are Alfisols. These soils retain a greater supply of plant nutrients, such as calcium and magnesium, and are not so acid as the more highly weathered and leached Ultisols. Eluviation-illuviation processes are retarded in soils formed on flood plains because of continued addition of sediment

during stream overflow. Such minimally developed soils are termed Entisols or Inceptisols.

Iron released during weathering of primary minerals forms iron oxides, which coat soil particles and give the red and brown colors typical of the B horizon in well drained soils on uplands in the survey area. Iron is reduced and translocated in periodically saturated soils, such as the Orrville Variant soil on bottom lands. The result is gray colors and mottling in the subsoil.

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# Glossary

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

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

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

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

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

	<i>Inches</i>
Very low.....	0 to 3
Low.....	3 to 6
Moderate.....	6 to 9
High.....	9 to 12
Very high.....	more than 12

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

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

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

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

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

**Cation-exchange capacity.** The total amount of exchangeable cations that can be held by the soil,

expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

**Channery soil.** A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a fragment.

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

**Clay film.** A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels, i.e., 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.

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

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

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

**Compressible** (in tables). The volume of soft soil decreases excessively under load.

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

**Consistence, soil.** The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—*Loose.*—Noncoherent when dry or moist; does not hold together in a mass.

*Friable.*—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

*Firm.*—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

*Plastic.*—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a “wire” when rolled between thumb and forefinger.

*Sticky.*—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

*Hard.*—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

*Soft.*—When dry, breaks into powder or individual grains under very slight pressure.

*Cemented.*—Hard; little affected by moistening.

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

**Corrosive.** High risk of corrosion to uncoated steel or deterioration of concrete.

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

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

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

**Drainage class** (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

*Excessively drained.*—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

*Somewhat excessively drained.*—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

*Well drained.*—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons.

Well drained soils are commonly medium textured. They are mainly free of mottling.

*Moderately well drained.*—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

*Somewhat poorly drained.*—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

*Poorly drained.*—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

*Very poorly drained.*—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

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

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

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

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

*Erosion* (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the

activities of man or other animals or of a catastrophe in nature, such as fire, that exposes the surface.

- Excess fines** (in tables). Excess silt and clay are in the soil. The soil is not a source of gravel or sand for construction purposes.
- Fast intake** (in tables). The movement of water into the soil is rapid.
- 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 oven-dry 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, and clay.
- First bottom.** The normal flood plain of a stream, subject to frequent or occasional flooding.
- 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.
- Fragipan.** A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.
- Gleyed soil.** Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.
- Gravel.** Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.
- Gravelly soil material.** Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.
- Ground water** (geology). Water filling all the unblocked pores of underlying material below the water table.
- Gully.** A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.
- Horizon, soil.** A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major

horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual*. The major horizons of mineral soil are as follows:

*O horizon.*—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

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

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

*B horizon.*—The mineral horizon below an O, A, or E horizon. The B horizon is, in part, a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics, such as accumulation of clay, sesquioxides, humus, or a combination of these; prismatic or blocky structure; redder or browner colors than those in the A horizon; or a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

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

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

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

**Hydrologic soil groups.** Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of

the acreage is artificially drained and part is undrained.

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

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

**Large stones** (in tables). Rock fragments that are 3 inches (7.5 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.

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

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

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

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

**Neutral soil.** A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

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

**Outwash plain.** A landform of mainly sandy or coarse-textured material of glaciofluvial origin. An outwash

plain is commonly smooth; where pitted, it is generally low in relief.

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

**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 to move through the profile. Permeability is measured as the number of inches per hour that water moves through the saturated soil. Terms describing permeability are:

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

**Phase, soil.** A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

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

**Piping** (in tables). Subsurface tunnels or pipelike cavities are formed by water moving through the soil.

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

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

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

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

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

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

	pH
Extremely acid.....	below 4.5
Very strongly acid.....	4.5 to 5.0
Strongly acid.....	5.1 to 5.5
Medium acid.....	5.6 to 6.0
Slightly acid.....	6.1 to 6.5
Neutral.....	6.6 to 7.3
Mildly alkaline.....	7.4 to 7.8
Moderately alkaline.....	7.9 to 8.4

Strongly alkaline.....8.5 to 9.0  
 Very strongly alkaline.....9.1 and higher

**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.

**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). There is a 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-size particles.

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

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

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

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

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

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

a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

**Slippage** (in tables). The soil mass is susceptible to movement downslope when loaded, excavated, or wet.

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

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

**Small stones** (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

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

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

	<i>Millimeters</i>
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 underlying material. The living roots and plant and animal activities are largely confined to the solum.

**Stones.** Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

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

**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 A2 horizon. Generally refers to a leached horizon lighter in color and lower in organic matter content than the overlying surface layer.

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

**Taxadjuncts.** Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

**Terrace.** An embankment, or ridge, constructed on the contour or at a slight angle to the contour across sloping soils. The terrace intercepts surface runoff, so that water soaks into the soil or flows slowly to a prepared outlet.

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

**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."

**Till plain.** An extensive flat to undulating area underlain by glacial till.

**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.

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

**Variant, soil.** A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.

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

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

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

# Tables

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TABLE 1.--TEMPERATURE AND PRECIPITATION  
 [Data recorded in the period 1951-80 at Heidelberg Lock, Kentucky]

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have--		Average number of growing degree days*	Average	2 years in 10 will have--		Average number of days with 0.10 inch or more	Average snowfall
				Maximum temperature higher than--	Minimum temperature lower than--			Less than--	More than--		
	<u>°F</u>	<u>°F</u>	<u>°F</u>	<u>°F</u>	<u>°F</u>	<u>Units</u>	<u>In</u>	<u>In</u>	<u>In</u>		<u>In</u>
January----	46.9	24.3	35.6	71	-12	82	3.87	2.19	5.36	8	5.3
February---	51.0	25.8	38.4	73	-4	110	3.54	1.60	5.19	8	4.6
March-----	59.8	32.7	46.3	84	10	265	4.76	2.66	6.62	10	2.4
April-----	71.7	41.2	56.5	89	22	495	4.24	2.30	5.93	8	0.0
May-----	79.1	50.4	64.8	92	29	769	4.06	2.66	5.32	8	0.0
June-----	85.0	58.9	72.0	95	42	960	4.04	2.25	5.61	8	0.0
July-----	87.6	63.3	75.5	96	49	1,101	5.28	3.47	6.92	9	0.0
August-----	86.4	62.3	74.4	95	48	1,066	3.87	2.03	5.47	6	0.0
September--	81.1	55.7	68.4	93	36	852	3.38	1.61	4.90	6	0.0
October----	71.6	42.8	57.2	87	21	533	2.32	0.94	3.48	5	0.0
November---	59.3	32.8	46.1	80	11	201	3.46	2.02	4.74	7	1.0
December---	49.6	27.0	38.3	73	-2	128	3.78	1.65	5.58	8	2.3
Yearly:											
Average--	69.1	43.1	56.1	---	---	---	---	---	---	---	---
Extreme--	---	---	---	97	-12	---	---	---	---	---	---
Total----	---	---	---	---	---	6,562	46.60	39.95	52.97	91	15.6

\* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50 °F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Data recorded in the period 1951-80  
at Heidelberg Lock, 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--	April 14	April 28	May 17
2 years in 10 later than--	April 10	April 23	May 10
5 years in 10 later than--	April 1	April 13	April 28
First freezing temperature in fall:			
1 year in 10 earlier than--	October 22	October 14	October 2
2 years in 10 earlier than--	October 27	October 18	October 6
5 years in 10 earlier than--	November 4	October 26	October 14

TABLE 3.--GROWING SEASON

[Data recorded in the period 1951-80  
at Heidelberg Lock, Kentucky]

Probability	Daily minimum temperature during growing season		
	Higher than 24 °F	Higher than 28 °F	Higher than 32 °F
	<u>Days</u>	<u>Days</u>	<u>Days</u>
9 years in 10	199	181	147
8 years in 10	204	186	154
5 years in 10	216	196	168
2 years in 10	227	205	182
1 year in 10	233	210	189

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

Map symbol	Soil name	Jackson County Acres	Owsley County Acres	Total--	
				Area Acres	Extent Pct
AvB	Allegheny Variant silt loam, 2 to 6 percent slopes-----	643	444	1,087	0.3
AvD	Allegheny Variant silt loam, 6 to 20 percent slopes-----	67	822	889	0.3
BfF	Bethesda-Fairpoint complex, steep, benched-----	1,174	2,212	3,386	1.0
BsF	Bledsoe silt loam, steep, very rocky-----	7,710	0	7,710	2.2
CaF	Caneyville silt loam, steep, very rocky-----	10,834	0	10,834	3.1
GnC	Gilpin silt loam, 6 to 12 percent slopes-----	12,097	818	12,915	3.7
GpB	Gilpin-Rayne silt loams, 2 to 6 percent slopes-----	5,517	309	5,826	1.7
GrD	Gilpin-Rayne-Sequoia silt loams, 12 to 25 percent slopes---	14,379	2,485	16,864	4.8
Gs	Grigsby fine sandy loam, 0 to 3 percent slopes, frequently flooded-----	2,836	598	3,434	1.0
Gv	Grigsby-Orrville Variant complex, 0 to 3 percent slopes, frequently flooded-----	2,482	29	2,511	0.7
Hu	Huntington loam, 0 to 4 percent slopes, occasionally flooded-----	0	856	856	0.3
LyC	Lily and Gilpin soils, sloping-----	1,994	0	1,994	0.6
LyD	Lily and Gilpin soils, moderately steep-----	6,071	0	6,071	1.7
RCF	Rigley-Rock outcrop association, steep-----	18,789	0	18,789	5.4
ReC	Riney-Allegheny complex, 4 to 12 percent slopes-----	0	658	658	0.2
Ro	Rowdy silt loam, 0 to 4 percent slopes, occasionally flooded-----	1,418	4,822	6,240	1.8
SaF	Shelocta and Caneyville soils and Rock outcrop, steep-----	2,925	0	2,925	0.8
ScF	Shelocta-Cutshin complex, steep-----	943	17,038	17,981	5.2
SqF	Shelocta-Gilpin channery silt loams, steep-----	127,584	65,319	192,903	55.3
SrF	Steinsburg and Gilpin soils and Rock outcrop, steep-----	4,099	30,534	34,633	9.9
	Water-----	249	0	249	*
	Total-----	221,811	126,944	348,755	100.0

\* Less than 0.1 percent.

TABLE 5.--LAND CAPABILITY CLASSES 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]

Map symbol and soil name	Land capability	Corn	Soybeans	Wheat	Tobacco	Grass-legume hay	Pasture
		Bu	Bu	Bu	Lbs	Tons	AUM*
AvB----- Allegheny Variant	IIe	115	40	45	3,000	3.5	7.0
AvD----- Allegheny Variant	IVe	90	30	35	2,400	3.0	6.0
BfF----- Bethesda- Fairpoint	VIIe	---	---	---	---	---	---
BsF----- Bledsoe	VIIIs	---	---	---	---	---	---
CaF----- Caneyville	VIIIs	---	---	---	---	---	---
GnC----- Gilpin	IIIe	85	---	35	2,400	3.0	7.0
GpB----- Gilpin-Rayne	IIe	98	---	40	2,600	3.5	7.5
GrD----- Gilpin-Rayne- Sequoia	IVe	---	---	---	2,200	3.0	6.0
Gs----- Grigsby	IIw	110	40	45	3,000	3.0	6.0
Gv----- Grigsby- Orrville Variant	IIw	105	40	45	3,000	3.7	6.5
Hu----- Huntington	IIw	130	45	50	3,000	3.5	8.0
LyC----- Lily and Gilpin	IIIe	85	---	35	2,400	3.0	6.0
LyD----- Lily and Gilpin	IVe	75	---	---	2,000	2.5	5.0
RCF: Rigley-----	VIIe	---	---	---	---	---	---
Rock outcrop---	VIIIs	---	---	---	---	---	---
ReC----- Riney-Allegheny	IIIe	95	30	40	2,500	3.0	6.5
Ro----- Rowdy	IIe	120	40	45	3,000	3.5	6.5
SaE: Shelocta-----	VIe	---	---	---	---	---	5.5
Chaneyville----	VIe	---	---	---	---	---	5.5

TABLE 5.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Map symbol and soil name	Land capability	Corn	Soybeans	Wheat	Tobacco	Grass-legume hay	Pasture
		<u>Bu</u>	<u>Bu</u>	<u>Bu</u>	<u>Lbs</u>	<u>Tons</u>	<u>AUM*</u>
SaE: Rock outcrop---	VIIIIs	---	---	---	---	---	---
ScF----- Shelocta- Cutshin	VIIe	---	---	---	---	---	---
SgF----- Shelocta-Gilpin	VIIe	---	---	---	---	---	---
SrF: Stiensburg----	VIIe	---	---	---	---	---	---
Gilpin-----	VIIe	---	---	---	---	---	---
Rock outcrop---	VIIIIs	---	---	---	---	---	---

\* 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. Dashes indicate no acreage]

Class	Total acreage	Major management concerns		
		Erosion [e]	Wetness [w]	Soil problem [s]
		<u>Acres</u>	<u>Acres</u>	<u>Acres</u>
I:				
Jackson County-----	---	---	---	---
Owsley County-----	---	---	---	---
II:				
Jackson County-----	12,896	7,578	5,318	---
Owsley County-----	7,058	5,575	1,483	---
III:				
Jackson County-----	14,091	14,091	---	---
Owsley County-----	1,476	1,476	---	---
IV:				
Jackson County-----	20,517	20,517	---	---
Owsley County-----	3,307	3,307	---	---
V:				
Jackson County-----	---	---	---	---
Owsley County-----	---	---	---	---
VI:				
Jackson County-----	2,632	2,632	---	---
Owsley County-----	0	0	---	---
VII:				
Jackson County-----	166,883	148,339	---	18,544
Owsley County-----	111,439	111,439	---	---
VIII:				
Jackson County-----	4,543	---	---	4,543
Owsley County-----	3,664	---	---	3,664

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]

Map symbol and soil name	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Common trees	Site index	Productivity * cu. ft/ ac/yr	
AvB, AvD----- Allegheny Variant	9A	Slight	Slight	Slight	Severe	Shortleaf pine-----	80	130	Eastern white pine, yellow-poplar, black walnut, shortleaf pine, white ash, white oak, 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-----	---	---							
BfF: Bethesda-----	6R	Severe	Severe	Moderate	Moderate	Loblolly pine-----	69	91	Eastern white pine, white oak, shortleaf pine.
						Eastern cottonwood--	---	---	
						Black oak-----	73	55	
						Black locust-----	---	---	
						Sweetgum-----	---	---	
Shortleaf pine-----	---	---							
Fairpoint-----	8R	Severe	Severe	Moderate	Moderate	Loblolly pine-----	82	114	Eastern white pine, white oak, shortleaf pine.
						Sweetgum-----	---	---	
						Black locust-----	---	---	
						Shortleaf pine-----	---	---	
BsF----- Bledsoe (North aspect)	8R	Severe	Severe	Slight	Severe	Yellow-poplar-----	104	114	Yellow-poplar, northern red oak, white ash, white oak.
						Black walnut-----	---	---	
						Slippery elm-----	---	---	
						White ash-----	---	---	
						Sugar maple-----	---	---	
Black cherry-----	---	---							
BsF----- Bledsoe (South aspect)	6R	Severe	Severe	Moderate	Severe	Yellow-poplar-----	85	81	White ash, white oak, northern red oak.
						Virginia pine-----	---	---	
						Pignut hickory-----	74	---	
						Sassafras-----	---	---	
						Black locust-----	---	---	
Blackgum-----	---	---							
CaF----- Caneyville (North aspect)	4R	Severe	Severe	Slight	Moderate	Black oak-----	71	53	White oak, yellow-poplar, white ash, eastern white pine, northern red oak.
						White oak-----	64	47	
						Sugar maple-----	---	---	
						Hickory-----	---	---	
						White ash-----	72	54	
						Eastern redcedar-----	46	---	
Yellow-poplar-----	90	90							
CaF----- Caneyville (South aspect)	3R	Severe	Severe	Moderate	Slight	Scarlet oak-----	53	34	Virginia pine, eastern redcedar.
						Hickory-----	---	---	
						Eastern redcedar-----	36	58	
						Chinkapin oak-----	51	35	
Sugar maple-----	---	---							

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Map symbol and soil name	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Common trees	Site index	Productivity * cu. ft./ac/yr	
GnC----- Gilpin	6A	Slight	Slight	Slight	Moderate	Yellow-poplar-----	92	93	Northern red oak, eastern white pine, white oak, yellow-poplar, shortleaf pine.
						Hickory-----	---	---	
						Red maple-----	---	---	
						White oak-----	76	58	
						American beech-----	---	---	
						Black oak-----	78	60	
Northern red oak----	80	62							
Scarlet oak-----	76	58							
GpB: Gilpin-----	6A	Slight	Slight	Slight	Moderate	Yellow-poplar-----	92	93	Eastern white pine, white oak, northern red oak, yellow-poplar, shortleaf pine.
						Hickory-----	---	---	
						Red maple-----	---	---	
						White oak-----	76	58	
						American beech-----	---	---	
Black oak-----	78	60							
Rayne-----	4A	Slight	Slight	Slight	Severe	Northern red oak----	80	62	Eastern white pine, yellow-poplar, white oak, northern red oak, shortleaf pine.
						Yellow-poplar-----	90	90	
						Eastern white pine--	90	166	
						Virginia pine-----	75	115	
						Shortleaf pine-----	75	120	
GrD: Gilpin-----	6R	Moderate	Moderate	Slight	Moderate	Yellow-poplar-----	92	93	Eastern white pine, yellow-poplar, white oak, northern red oak, shortleaf pine.
						Hickory-----	---	---	
						Red maple-----	---	---	
						White oak-----	76	58	
						American beech-----	---	---	
Black oak-----	78	60							
Rayne-----	4R	Moderate	Moderate	Slight	Severe	Northern red oak----	80	62	Eastern white pine, northern red oak, yellow-poplar, white oak, shortleaf pine.
						Yellow-poplar-----	90	90	
						Eastern white pine--	90	166	
						Virginia pine-----	75	115	
						Shortleaf pine-----	75	120	
Sequoia-----	4A	Moderate	Moderate	Slight	Moderate	Northern red oak----	70	52	Shortleaf pine, white oak, eastern white pine, northern red oak.
						Shortleaf pine-----	63	95	
						Virginia pine-----	71	110	
Gs----- Grigsby	9A	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-----	---	---	

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Map symbol and soil name	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Common trees	Site index	Productivity * cu. ft/ ac/yr	
Gv: Grigsby-----	9A	Slight	Slight	Slight	Severe	Yellow-poplar----- Northern red oak---- White oak----- Black walnut----- American sycamore--- Sweetgum----- Red maple----- Hickory-----	110 85 85 --- --- --- --- ---	124 67 67 --- --- --- --- ---	Yellow-poplar, black walnut, eastern white pine, shortleaf pine, white oak, northern red oak, white ash.
Orrville Variant-----	4A	Slight	Slight	Slight	Severe	Sugar maple----- Black willow----- Yellow-poplar----- American sycamore--- White oak----- River birch----- Black cherry----- Green ash----- Red maple----- Boxelder-----	80 --- 90 --- --- --- --- --- --- ---	--- --- 90 --- --- --- --- --- --- ---	Eastern white pine, yellow-poplar, white oak, green ash, sweetgum.
Hu----- Huntington	7A	Slight	Slight	Slight	Severe	Yellow-poplar----- Northern red oak----	95 85	98 67	Yellow-poplar, black walnut, white oak, white ash, eastern white pine, northern red oak.
LyC: Lily-----	7A	Slight	Slight	Slight	Moderate	Shortleaf pine----- Virginia pine----- Black oak----- White oak----- Hickory----- Red maple----- Southern red oak---- Scarlet oak----- Chestnut oak----- Yellow-poplar----- Blackgum----- American beech-----	63 72 --- 69 --- --- 65 64 74 89 --- ---	95 112 --- 51 --- --- 47 47 56 88 --- ---	Shortleaf pine, white oak, eastern white pine, yellow-poplar, northern red oak.
Gilpin-----	6A	Slight	Slight	Slight	Moderate	Yellow-poplar----- Hickory----- Red maple----- White oak----- American beech----- Black oak-----	92 --- --- 76 --- ---	93 --- --- 58 --- 60	Eastern white pine, white oak, northern red oak, yellow-poplar, shortleaf pine.

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Map symbol and soil name	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Common trees	Site index	Productivity * cu. ft/ ac/yr	
LyD: Lily----- (North aspect)	7R	Moderate	Moderate	Slight	Moderate	Shortleaf pine----- Virginia pine----- Black oak----- White oak----- Hickory----- Red maple----- Southern red oak---- Scarlet oak----- Chestnut oak----- Blackgum----- American beech-----	63 72 --- 69 --- --- 65 64 74 --- ---	95 112 --- 51 --- --- 47 47 56 --- ---	Shortleaf pine, white oak, eastern white pine, northern red oak.
Gilpin----- (North aspect)	6R	Moderate	Moderate	Slight	Moderate	Yellow-poplar----- Hickory----- Red maple----- White oak----- American beech----- Black oak-----	92 --- --- 76 --- 78	93 --- --- 58 --- 60	Northern red oak, eastern white pine, white oak, yellow-poplar, shortleaf pine.
LyD: Lily----- (South aspect)	7R	Moderate	Moderate	Slight	Moderate	Shortleaf pine----- Virginia pine----- Black oak----- White oak----- Hickory----- Red maple----- Southern red oak---- Scarlet oak----- Chestnut oak----- Blackgum----- American beech-----	63 72 --- 69 --- --- 65 64 74 --- ---	95 112 --- 51 --- --- 47 47 56 --- ---	Shortleaf pine, white oak, eastern white pine, northern red oak.
Gilpin----- (South aspect)	4R	Moderate	Moderate	Moderate	Slight	Scarlet oak----- White oak----- Hickory----- Chestnut oak----- Red maple----- Black oak-----	72 58 --- 62 --- 66	54 41 --- 45 --- 48	White oak, shortleaf pine.
RCF: Rigley----- (North aspect)	9R	Severe	Severe	Slight	Moderate	Shortleaf pine----- White oak----- Black oak----- Northern red oak---- Yellow-poplar----- American beech----- Hickory-----	80 75 78 --- 94 --- ---	130 57 60 --- 97 --- ---	White oak, northern red oak, yellow-poplar, eastern white pine, shortleaf pine.
Rock outcrop.									

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Map symbol and soil name	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Common trees	Site index	Productivity* cu. ft./ac/yr	
RCF: Rigley----- (South aspect)	3R	Severe	Severe	Moderate	Moderate	White oak----- Black oak----- Hickory----- Scarlet oak----- American beech----- Shortleaf pine-----	65 --- --- --- --- ---	47 --- --- --- --- ---	Eastern white pine, shortleaf pine, white oak.
Rock outcrop. ReC: Riney-----	7A	Slight	Moderate	Slight	Severe	Yellow-poplar----- White oak----- Red maple----- Chinkapin oak----- Black oak-----	93 78 --- 74 80	95 60 --- 56 62	Yellow-poplar, white ash, eastern white pine, white oak, shortleaf pine, black walnut.
Allegheny-----	9A	Slight	Moderate	Slight	Severe	Shortleaf pine----- Yellow-poplar----- Virginia pine----- Sugar maple----- White ash----- Northern red oak----- American elm----- Red maple----- Pignut hickory----- Black oak----- White oak----- Eastern redcedar----- Black cherry-----	80 93 72 --- --- --- --- --- --- 78 70 --- ---	130 95 112 --- --- --- --- --- --- 60 52 --- ---	Eastern white pine, yellow-poplar, black walnut, shortleaf pine, white oak, white ash, northern red oak.
Ro----- Rowdy	8A	Slight	Slight	Slight	Severe	Yellow-poplar----- American sycamore----- Black walnut----- River birch----- White oak----- American elm----- Sweetgum----- Boxelder-----	100 --- --- --- --- --- --- ---	107 --- --- --- --- --- --- ---	Yellow-poplar, black walnut, eastern white pine, shortleaf pine, white ash, white oak, northern red oak.
SaE: Shelocta----- (North aspect)	9R	Moderate	Moderate	Slight	Severe	Shortleaf pine----- Yellow-poplar----- Cucumbertree----- American beech----- White oak----- Red maple----- Black oak-----	77 99 --- --- 72 --- 77	124 105 --- --- 54 --- 59	Yellow-poplar, black walnut, eastern white pine, shortleaf pine, white ash, white oak, northern red oak.

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Map symbol and soil name	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Common trees	Site index	Productivity * cu. ft/ ac/yr	
SaE: Caneyville----- (North aspect)	4R	Severe	Moderate	Slight	Moderate	Black oak----- White oak----- Sugar maple----- Hickory----- White ash----- Eastern redcedar---- Yellow-poplar-----	71 64 --- --- 72 46 90	53 47 --- --- --- 54 90	White oak, yellow-poplar, white ash, eastern white pine, northern red oak.
Rock outcrop. SaE: Shelocta----- (South aspect)	3R	Moderate	Moderate	Moderate	Moderate	Black oak----- White oak----- Scarlet oak----- Yellow-poplar----- American beech----- Blackgum----- Red maple-----	70 65 70 --- --- --- ---	47 52 52 --- --- --- ---	Shortleaf pine, white oak, eastern white pine.
Caneyville----- (South aspect)	3R	Severe	Moderate	Moderate	Slight	Black oak----- Sugar maple----- Hickory----- Eastern redcedar---- Chinkapin oak----- Scarlet oak----- White oak-----	65 --- --- 36 51 53 52	47 --- --- 38 35 37 36	Virginia pine, eastern redcedar.
Rock outcrop. ScF: Shelocta-----	9R	Severe	Severe	Slight	Severe	Shortleaf pine----- Yellow-poplar----- Cucumbertree----- American beech----- White oak----- Red maple----- Black oak-----	77 99 --- --- 72 --- 77	124 105 --- --- 54 --- 59	Yellow-poplar, black walnut, eastern white pine, shortleaf pine, white ash, white oak, northern red oak.
Cutshin-----	8R	Severe	Severe	Slight	Severe	Yellow-poplar----- Northern red oak---- American beech----- Black walnut----- Cucumbertree----- Sweet birch----- Sugar maple----- American basswood--- Red maple----- White oak----- Black oak----- White ash----- Blackgum----- Eastern hemlock---- Hickory-----	108 --- --- --- --- --- --- --- --- 78 83 --- --- --- ---	121 --- --- --- --- --- --- --- --- 60 65 --- --- --- ---	Yellow-poplar, black walnut, white ash, shortleaf pine, eastern white pine, northern red oak, white oak.

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Map symbol and soil name	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Common trees	Site index	Productivity* cu. ft./ac/yr	
SgF: Shelocta----- (North aspect)	9R	Severe	Severe	Slight	Severe	Shortleaf pine-----	77	124	Yellow-poplar, black walnut, eastern white pine, shortleaf pine, white ash, white oak, northern red oak.
						Yellow-poplar-----	99	105	
						Cucumber tree-----	---	---	
						American beech-----	---	---	
						White oak-----	72	54	
						Red maple-----	---	---	
Black oak-----	77	59							
Gilpin----- (North aspect)	6R	Severe	Severe	Slight	Moderate	Yellow-poplar-----	92	93	Northern red oak, eastern white pine, white oak, yellow-poplar, shortleaf pine.
						Hickory-----	---	---	
						Red maple-----	---	---	
						White oak-----	76	58	
						American beech-----	---	---	
Black oak-----	78	60							
SgF: Shelocta----- (South aspect)	3R	Severe	Severe	Moderate	Severe	White oak-----	65	47	Shortleaf pine, white oak, eastern white pine.
						Black oak-----	70	52	
						Scarlet oak-----	70	52	
						Yellow-poplar-----	---	---	
						American beech-----	---	---	
						Black gum-----	---	---	
Red maple-----	---	---							
Gilpin----- (South aspect)	4R	Severe	Severe	Moderate	Slight	Northern red oak----	70	52	Shortleaf pine, white oak.
						Yellow-poplar-----	90	90	
Rock outcrop.									
SrF: Steinsburg----- (North aspect)	8R	Severe	Severe	Slight	Moderate	Virginia pine-----	70	109	Eastern white pine, shortleaf pine, white oak.
						Black oak-----	70	52	
						Scarlet oak-----	64	47	
						White oak-----	68	50	
						Pignut hickory-----	---	---	
						Chestnut oak-----	72	54	
						Shortleaf pine-----	61	90	
						Shagbark hickory-----	---	---	
Gilpin----- (North aspect)	6R	Severe	Severe	Slight	Moderate	Yellow-poplar-----	92	93	Northern red oak, eastern white pine, white oak, yellow-poplar.
						Hickory-----	---	---	
						Red maple-----	---	---	
						White oak-----	76	58	
						American beech-----	---	---	
Black oak-----	78	60							
Rock outcrop.									
SrF: Steinsburg----- (South aspect)	3R	Severe	Severe	Severe	Moderate	Black oak-----	67	49	Shortleaf pine, white oak.
						White oak-----	65	47	
						Hickory-----	---	---	
						Scarlet oak-----	62	45	
						Chestnut oak-----	---	---	
Virginia pine-----	---	---							

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Map symbol and soil name	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Common trees	Site index	Productivity *	
SrF: Gilpin----- (South aspect)	4R	Severe	Severe	Severe	Moderate	Scarlet oak-----	72	54	Shortleaf pine, white oak.
						White oak-----	58	41	
						Hickory-----	---	---	
						Chestnut oak-----	62	45	
						Black oak-----	66	48	

\* Productivity is the yield in cubic feet per year calculated at the age of culmination of mean annual increment for fully stocked natural stands.

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]

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
AvB----- Allegheny Variant	Slight-----	Slight-----	Moderate: slope, small stones.	Slight-----	Slight.
AvD----- Allegheny Variant	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight-----	Moderate: slope.
BfF: Bethesda-----	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
Fairpoint-----	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, erodes easily.	Severe: slope.
BsF----- Bledsoe	Moderate: slope, large stones.	Moderate: slope, large stones.	Severe: slope, small stones.	Severe: erodes easily.	Severe: slope.
CaF----- Caneyville	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope, erodes easily.	Severe: slope.
GnC----- Gilpin	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight-----	Moderate: slope, thin layer.
GpB: Gilpin-----	Slight-----	Slight-----	Moderate: small stones, slope.	Slight-----	Moderate: thin layer.
Rayne-----	Slight-----	Slight-----	Severe: small stones.	Slight-----	Slight.
GrD: Gilpin-----	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Rayne-----	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Sequoia-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
Gs----- Grigsby	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
Gv: Grigsby-----	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
Orrville Variant----	Severe: flooding, wetness.	Moderate: flooding, wetness.	Severe: wetness, flooding.	Moderate: wetness, flooding.	Severe: flooding.
Hu----- Huntington	Severe: flooding.	Slight-----	Moderate: slope, flooding.	Slight-----	Moderate: flooding.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
LyC: Lily-----	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight-----	Moderate: slope, depth to rock.
Gilpin-----	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight-----	Moderate: slope, depth to rock.
LyD: Lily-----	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Gilpin-----	Severe: slope.	Severe: slope.	Severe: small stones, slope.	Moderate: slope.	Severe: slope.
RCF----- Rigley	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop.					
ReC: Riney-----	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight-----	Moderate: slope.
Allegheny-----	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight-----	Moderate: slope.
Ro----- Rowdy	Severe: flooding.	Slight-----	Moderate: slope, flooding.	Slight-----	Moderate: flooding.
SaE: Shelocta-----	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Caneyville-----	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.	Severe: erodes easily.	Severe: slope, depth to rock.
Rock outcrop.					
ScF: Shelocta-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Cutshin-----	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
SgF: Shelocta-----	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
SgF: Gilpin-----	Severe: slope.	Severe: slope.	Severe: small stones, slope.	Severe: slope.	Severe: slope.
SrF: Steinsburg-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Gilpin-----	Severe: slope.	Severe: slope.	Severe: small stones, slope.	Severe: slope.	Severe: slope.
Rock outcrop.					

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]

Map symbol and soil name	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Hard- wood trees	Conif- erous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
AvB----- Allegheny Variant	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
AvD----- Allegheny Variant	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
BfF: Bethesda-----	Very poor.	Very poor.	Poor	Poor	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.
Fairpoint-----	Very poor.	Very poor.	Poor	Poor	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.
BsF----- Bledsoe	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
CaF----- Caneyville	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
GnC----- Gilpin	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
GpB: Gilpin-----	Fair	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
Rayne-----	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
GrD: Gilpin-----	Poor	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Rayne-----	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Sequoia-----	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Gs----- Grigsby	Fair	Fair	Fair	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
Gv: Grigsby-----	Fair	Fair	Fair	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
Orrville Variant--	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Hu----- Huntington	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
LyC: Lily-----	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.



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; it does not eliminate the need for onsite investigation]

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
AvB----- Allegheny Variant	Moderate: depth to rock.	Slight-----	Moderate: depth to rock.	Moderate: slope.	Slight-----	Slight.
AvD----- Allegheny Variant	Moderate: depth to rock, slope.	Moderate: slope.	Moderate: depth to rock, slope.	Severe: slope.	Moderate: slope.	Moderate: slope.
BfF: Bethesda-----	Severe: slope, slippage.	Severe: slope, slippage.	Severe: slope, slippage.	Severe: slope, slippage.	Severe: slope, slippage.	Severe: droughty, slope.
Fairpoint-----	Severe: slope, slippage.	Severe: slope, slippage.	Severe: slope, slippage.	Severe: slope, slippage.	Severe: slope, slippage.	Severe: small stones, droughty, slope.
BsF----- Bledsoe	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
CaF----- Caneyville	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: low strength, slope, depth to rock.	Severe: slope, depth to rock.
GnC----- Gilpin	Moderate: slope, depth to rock.	Moderate: slope.	Moderate: slope, depth to rock.	Severe: slope.	Moderate: slope.	Moderate: slope, depth to rock.
GpB: Gilpin-----	Moderate: depth to rock.	Slight-----	Moderate: depth to rock.	Moderate: slope.	Slight-----	Moderate: depth to rock.
Rayne-----	Slight-----	Slight-----	Slight-----	Moderate: slope.	Moderate: low strength.	Slight.
GrD: Gilpin-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rayne-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Sequoia-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Gs----- Grigsby	Moderate: flooding, wetness.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
Gv: Grigsby-----	Moderate: flooding, wetness.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.



TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
SgF: Gilpin-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
SrF: Steinsburg-----	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.
Rock outcrop.						

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; it does not eliminate the need for onsite investigation]

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
AvB----- Allegheny Variant	Moderate: depth to rock, percs slowly.	Moderate: seepage, depth to rock, slope.	Severe: depth to rock.	Moderate: depth to rock.	Fair: depth to rock, too clayey.
AvD----- Allegheny Variant	Moderate: depth to rock, percs slowly, slope.	Severe: slope.	Severe: depth to rock.	Moderate: depth to rock, slope.	Fair: depth to rock, too clayey, slope.
BfF: Bethesda-----	Severe: percs slowly, slope, unstable fill.	Severe: slope, unstable fill.	Severe: slope, unstable fill.	Severe: slope, unstable fill.	Poor: small stones, slope.
Fairpoint-----	Severe: percs slowly, slope, unstable fill.	Severe: slope, unstable fill.	Severe: slope, unstable fill.	Severe: slope, unstable fill.	Poor: small stones, slope.
BsF----- Bledsoe	Severe: percs slowly, slope.	Severe: slope.	Severe: too clayey, slope.	Severe: slope.	Poor: too clayey, hard to pack, slope.
CaF----- Caneyville	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: too clayey, slope, depth to rock.
GnC----- Gilpin	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: thin layer, depth to rock.
GpB: Gilpin-----	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, thin layer.
Rayne-----	Moderate: depth to rock, percs slowly.	Moderate: seepage, depth to rock, slope.	Severe: depth to rock.	Moderate: depth to rock.	Fair: small stones, thin layer.
GrD: Gilpin-----	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Poor: slope, thin layer, depth to rock.
Rayne-----	Severe: slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: slope.

TABLE 11.--SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
GrD: Sequoia-----	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: too clayey, hard to pack, depth to rock.
Gs----- Grigsby	Severe: flooding.	Severe: flooding, seepage.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage.	Good.
Gv: Grigsby-----	Severe: flooding.	Severe: flooding, seepage.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage.	Good.
Orrville Variant---	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, wetness, depth to rock.	Severe: flooding, wetness.	Poor: wetness.
Hu----- Huntington	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Good.
LyC: Lily-----	Severe: depth to rock.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Poor: depth to rock.
Gilpin-----	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: thin layer, depth to rock.
LyD: Lily-----	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: slope, depth to rock.
Gilpin-----	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Poor: slope, thin layer, depth to rock.
RCF----- Rigley	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: slope.
Rock outcrop.					
ReC: Riney-----	Moderate: depth to rock, slope.	Severe: seepage, slope.	Severe: depth to rock, seepage.	Severe: seepage.	Fair: too clayey, slope.
Allegheny-----	Moderate: slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.

TABLE 11.--SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Ro----- Rowdy	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding, seepage.	Severe: flooding.	Fair: small stones.
SaE: Shelocta-----	Severe: slope.	Severe: seepage, slope.	Severe: depth to rock, seepage, slope.	Severe: slope.	Poor: slope.
Caneyville-----  Rock outcrop.	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: too clayey, slope, depth to rock.
ScF: Shelocta-----	Severe: slope.	Severe: seepage, slope.	Severe: depth to rock, seepage, slope.	Severe: slope.	Poor: slope.
Cutshin-----	Severe: slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: small stones, slope.
SgF: Shelocta-----	Severe: slope.	Severe: seepage, slope.	Severe: depth to rock, seepage, slope.	Severe: slope.	Poor: slope.
Gilpin-----	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Poor: slope, thin layer, depth to rock.
SrF: Steinsburg-----	Severe: slope, depth to rock.	Severe: slope, depth to rock, seepage.	Severe: slope, depth to rock, seepage.	Severe: slope, seepage, depth to rock.	Poor: slope, depth to rock, thin layer.
Gilpin-----	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Poor: slope, depth to rock,

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; it does not eliminate the need for onsite investigation]

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
AvB----- Allegheny Variant	Fair: depth to rock, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
AvD----- Allegheny Variant	Fair: depth to rock, thin layer, slope.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
BfF: Bethesda-----	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
Fairpoint-----	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
BsF----- Bledsoe	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
CaF----- Caneyville	Poor: depth to rock, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope, thin layer.
GnC----- Gilpin	Poor: thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
GpB: Gilpin-----	Poor: thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Rayne-----	Fair: thin layer, depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
GrD: Gilpin-----	Poor: thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
Rayne-----	Fair: depth to rock, thin layer, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Sequoia-----	Poor: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Gs----- Grigsby	Good-----	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
Gv: Grigsby-----	Good-----	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim.
Orrville Variant-----	Fair: wetness, area reclaim, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Good.
Hu----- Huntington	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
LyC: Lily-----	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones.
Gilpin-----	Poor: thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
LyD: Lily-----	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Gilpin-----	Poor: thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
RCF----- Rigley	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Rock outcrop.				
ReC: Riney-----	Fair: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, slope.
Allegheny-----	Good-----	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim, slope.
Ro----- Rowdy	Good-----	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.
SaE: Shelocta-----	Fair: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Caneyville-----	Poor: area reclaim, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope, thin layer.
Rock outcrop.				

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
ScF: 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.
SgF: 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.
SrF: Steinsburg-----	Poor: slope, area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
Gilpin-----	Poor: thin layer, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
Rock outcrop.				

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; it does not eliminate the need for onsite investigation]

Map symbol and soil name	Limitations for--		Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Terraces and diversions	Grassed waterways
AvB----- Allegheny Variant	Moderate: seepage, depth to rock.	Severe: piping.	Deep to water----	Favorable-----	Favorable.
AvD----- Allegheny Variant	Moderate: slope, seepage.	Severe: piping.	Deep to water----	Slope-----	Slope.
BfF: Bethesda-----	Severe: slope.	Severe: seepage, piping.	Deep to water----	Slope, large stones, slippage.	Large stones, slope.
Fairpoint-----	Severe: slope.	Severe: piping.	Deep to water----	Slope, large stones, erodes easily.	Large stones, slope, erodes easily.
BsF----- Bledsoe	Severe: slope.	Moderate: hard to pack.	Deep to water----	Large stones, erodes easily.	Large stones.
CaF----- Caneyville	Severe: slope, depth to rock.	Severe: thin layer, hard to pack.	Deep to water----	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
GnC----- Gilpin	Moderate: seepage, depth to rock.	Severe: thin layer.	Deep to water----	Slope, depth to rock, large stones.	Slope, depth to rock, large stones.
GpB: Gilpin-----	Moderate: seepage, depth to rock.	Severe: thin layer.	Deep to water----	Depth to rock, large stones.	Depth to rock, large stones.
Rayne-----	Moderate: seepage, depth to rock.	Severe: piping.	Deep to water----	Favorable-----	Favorable.
GrD: Gilpin-----	Moderate: seepage, depth to rock.	Severe: thin layer.	Deep to water----	Slope, depth to rock, large stones.	Slope, depth to rock, large stones.
Rayne-----	Moderate: seepage, depth to rock.	Severe: piping.	Deep to water----	Slope-----	Slope.
Sequoia-----	Moderate: depth to rock.	Severe: hard to pack.	Deep to water----	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Gs----- Grigsby	Severe: seepage.	Severe: piping.	Deep to water----	Favorable-----	Favorable.

TABLE 13.--WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for--		Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Terraces and diversions	Grassed waterways
Gv: Grigsby-----	Severe: seepage.	Severe: piping.	Deep to water----	Favorable-----	Favorable.
Orrville Variant-	Moderate: seepage, depth to rock.	Severe: piping, wetness.	Flooding-----	Erodes easily, wetness.	Wetness, erodes easily.
Hu----- Huntington	Moderate: seepage.	Severe: piping.	Deep to water----	Favorable-----	Favorable.
LyC, LyD: Lily-----	Severe: seepage.	Severe: piping.	Deep to water----	Slope, depth to rock.	Slope, depth to rock.
Gilpin-----	Moderate: depth to rock, seepage.	Severe: thin layer.	Deep to water----	Slope, depth to rock, large stones.	Slope, depth to rock, large stones.
RCF----- Rigley	Severe: seepage, slope.	Severe: piping.	Deep to water----	Slope-----	Slope.
Rock outcrop.					
ReC: Riney-----	Severe: seepage.	Severe: piping.	Deep to water----	Slope-----	Slope.
Allegheny-----	Moderate: seepage.	Severe: piping.	Deep to water----	Slope-----	Slope.
Ro----- Rowdy	Moderate: seepage.	Severe: piping.	Deep to water----	Favorable-----	Favorable.
SaE: Shelocta-----	Severe: slope.	Severe: piping.	Deep to water----	Slope-----	Slope.
Caneyville-----	Severe: slope, depth to rock.	Severe: thin layer.	Deep to water----	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Rock outcrop.					
ScF: Shelocta-----	Severe: slope.	Severe: piping.	Deep to water----	Slope-----	Slope.
Cutshin-----	Severe: slope.	Severe: piping.	Deep to water----	Slope, large stones.	Large stones, slope.
SgF: Shelocta-----	Severe: 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.

TABLE 13.--WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for--		Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Terraces and diversions	Grassed waterways
SrF: Steinsburg-----	Severe: seepage, slope.	Severe: thin layer, piping, seepage.	Deep to water----	Depth to rock, slope.	Slope, droughty, depth to rock.
Gilpin-----	Severe: slope.	Severe: thin layer.	Deep to water----	Slope, depth to rock, large stones.	Slope, depth to rock, large stones.
Rock outcrop.					

TABLE 14.--ENGINEERING INDEX PROPERTIES

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated. Some soils have Unified classifications and USDA textures that are supplementary to those shown. In general, the dominant classifications and textures are shown and the others are inferred]

Map symbol and soil name	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
AvB----- Allegheny Variant	0-10	Silt loam-----	ML, CL, CL-ML	A-4	0	90-100	80-100	65-100	55-95	<35	NP-10
	10-40	Silty clay loam, clay loam, silt loam.	ML, CL, SC, SM	A-4, A-6	0	90-100	80-100	65-95	35-80	<35	NP-15
	40-48	Silt loam, loam, clay loam.	ML, SM, CL, SC	A-4, A-6, A-2, A-1	0-5	65-100	55-100	35-95	20-75	<35	NP-15
	48	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
AvD----- Allegheny Variant	0-10	Silt loam-----	ML, CL, CL-ML	A-4	0	90-100	80-100	65-100	55-95	<35	NP-10
	10-40	Silty clay loam, clay loam, silt loam.	ML, CL, SC, SM	A-4, A-6	0	90-100	80-100	65-95	35-80	<35	NP-15
	40-48	Silt loam, loam, clay loam.	ML, SM, CL, SC	A-4, A-6, A-2, A-1	0-5	65-100	55-100	35-95	20-75	<35	NP-15
	48	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
BfF: Bethesda-----	0-5	Very 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
	5-60	Very channery loam, very gravelly silty clay loam.	GM, GC, ML, CL	A-4, A-6, A-7, A-2	10-30	40-80	25-65	20-65	18-60	24-50	3-23
Fairpoint-----	0-11	Channery silt loam.	CL, CL-ML, SC, GC	A-4, A-6, A-2	5-15	55-90	45-85	40-85	30-75	20-40	4-18
	11-60	Gravelly clay loam, very channery loam, channery silty clay loam.	GC, CL, CL-ML, SC	A-4, A-6, A-7, A-2	15-30	55-75	25-65	20-65	15-60	25-50	4-24
BsF----- Bledsoe	0-4	Silt loam-----	CL, CL-ML	A-4, A-6	0-5	85-95	80-95	70-90	50-90	20-35	5-15
	4-50	Silty clay, silty clay loam, gravelly silty clay.	CH, CL	A-7, A-6	0-15	65-97	65-95	60-90	50-90	35-60	15-35
	50-60	Gravelly silty clay loam, silty clay, clay.	CH, CL, GC, SC	A-7, A-6	0-25	50-100	50-100	40-90	35-90	35-60	15-40
CaF----- Caneyville	0-4	Silt loam-----	ML, CL, CL-ML	A-4, A-6	0-3	90-100	85-100	75-100	60-95	20-35	2-12
	4-30	Silty clay, clay, silty clay loam.	CH, CL	A-7	0-3	90-100	85-100	75-100	65-100	42-70	20-45
	30-36 36	Clay, silty clay Unweathered bedrock.	CH ---	A-7 ---	0-3 ---	90-100 ---	85-100 ---	75-100 ---	65-100 ---	50-75 ---	30-45 ---





TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Frag-ments > 3 inches Pct	Percentage passing sieve number--				Liquid limit Pct	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
LyC: Gilpin-----	<u>In</u>										
	0-9	Silt loam-----	CL, CL-ML	A-4, A-6	0-5	80-95	75-90	70-85	65-80	20-40	4-15
	9-22	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
	22-36	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
	36	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
LyD: Lily-----	0-10	Sandy loam-----	SM	A-4, A-2	0-5	90-100	85-100	55-80	25-50	<20	NP-4
	10-22	Clay loam, sandy clay loam, loam.	SM, SC, ML, CL	A-4, A-6	0-5	90-100	85-100	75-100	30-80	<35	NP-15
	22-29	Sandy clay loam, clay loam, gravelly sandy clay loam.	SM, SC, ML, CL	A-4, A-2, A-6, A-1-B	0-10	65-100	50-100	40-95	20-75	<35	NP-15
	29	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Gilpin-----	0-9	Channery silt loam.	GC, SC, CL, CL-ML	A-2, A-4, A-6	0-30	50-90	45-85	35-75	30-70	20-40	4-15
	9-22	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
	22-36	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
	36	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
RCF----- Rigley	0-14	Loam, sandy loam	SM, ML, SM-SC, CL-ML	A-2, A-4	0-10	80-95	75-90	55-80	25-65	<30	NP-7
	14-62	Channery sandy loam, channery loam, sandy loam.	SM, ML, GM, GM-GC	A-2, A-4, A-1	0-10	65-95	60-90	40-75	20-60	<30	NP-7
	62-72	Very channery sandy loam, gravelly loam, gravelly clay loam.	GM, GC, SM, SC	A-2, A-1, A-4, A-6	0-20	55-80	45-70	30-60	15-50	<35	NP-15
Rock outcrop.											
ReC: Riney-----	0-13	Loam-----	CL, ML, SM, SC	A-4	0	90-100	85-100	65-80	35-75	<30	NP-10
	13-44	Clay loam, sandy clay loam.	ML, CL, SC, SM-SC	A-6, A-2, A-4	0	80-100	70-100	70-85	25-75	20-35	2-15
	44-62	Sandy loam, sandy clay loam, loamy sand.	SC, SM, ML, CL	A-4, A-6, A-2, A-1	0	80-100	70-100	40-80	15-55	<35	NP-15

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
ReC: Allegheny-----	0-8	Silt loam-----	ML, CL	A-4	0	90-100	80-100	65-100	55-95	<35	NP-10
	8-52	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
	52-62	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
Ro----- Rowdy	0-10	Silt loam-----	ML, SC, CL, SM	A-4	0	80-100	80-100	70-100	40-75	<30	NP-10
	10-53	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
	53-65	Loam, clay loam, gravelly sandy loam.	ML, GM-GC, SM-SC, CL	A-4, A-2, A-6, A-1-B	0-25	30-100	30-100	25-100	20-75	<30	NP-15
SaE: Shelocta-----	0-6	Channery silt loam.	ML, GM, SM	A-4	0-5	55-95	50-80	40-70	36-65	<35	NP-10
	6-49	Silty clay loam, silt loam, channery silt loam.	CL, CL-ML, GC, SC	A-6, A-4	0-10	55-95	50-95	45-95	40-90	25-40	4-15
	49-60	Channery 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
Caneyville-----	0-4	Silt loam-----	ML, CL, CL-ML	A-4, A-6	0-3	90-100	85-100	75-100	60-95	20-35	2-12
	4-30	Silty clay, clay, silty clay loam.	CH, CL	A-7	0-3	90-100	85-100	75-100	65-100	42-70	20-45
	30-36 36	Clay, silty clay Unweathered bedrock.	CH ---	A-7 ---	0-3 ---	90-100 ---	85-100 ---	75-100 ---	65-100 ---	50-75 ---	30-45 ---
Rock outcrop.											
ScF: Shelocta-----	0-6	Channery silt loam.	ML, GM, SM	A-4	0-5	55-95	50-80	40-70	36-65	<35	NP-10
	6-49	Silty clay loam, silt loam, channery silt loam.	CL, CL-ML, GC, SC	A-6, A-4	0-10	55-95	50-95	45-95	40-90	25-40	4-15
	49-60	Channery 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-----	0-11	Channery 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
	11-72	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





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

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	G/cc	In/hr	In/in	pH				Pct
Gs-----	0-9	5-10	1.20-1.50	2.0-6.0	0.08-0.14	5.6-7.3	Low-----	0.28	5	1-4
Grigsby	9-44	5-18	1.20-1.50	0.6-6.0	0.10-0.20	5.6-7.3	Low-----	0.28		
	44-60	5-10	1.20-1.50	2.0-6.0	0.03-0.16	5.1-7.3	Low-----	0.28		
Gv:										
Grigsby-----	0-9	5-10	1.20-1.50	2.0-6.0	0.08-0.14	5.6-7.3	Low-----	0.28	5	1-4
	9-44	5-18	1.20-1.50	0.6-6.0	0.10-0.20	5.6-7.3	Low-----	0.28		
	44-60	5-10	1.20-1.50	2.0-6.0	0.03-0.16	5.1-7.3	Low-----	0.28		
Orrville Variant	0-3	12-27	1.25-1.45	0.6-2.0	0.18-0.22	5.1-6.5	Low-----	0.37	5	2-4
	3-29	12-30	1.30-1.50	0.6-2.0	0.15-0.19	5.1-6.5	Low-----	0.37		
	29-48	7-35	1.20-1.40	0.6-6.0	0.08-0.15	5.6-7.3	Low-----	0.37		
	48	---	---	---	---	---	-----	---		
Hu-----	0-10	12-27	1.10-1.30	0.6-2.0	0.18-0.24	4.5-6.5	Low-----	0.28	5	3-6
Huntington	10-64	15-30	1.30-1.50	0.6-2.0	0.16-0.22	4.5-6.5	Low-----	0.32		
LyC:										
Lily-----	0-10	5-20	1.20-1.40	2.0-6.0	0.09-0.16	3.6-5.5	Low-----	0.28	3	.5-4
	10-22	18-35	1.25-1.35	2.0-6.0	0.12-0.18	3.6-5.5	Low-----	0.28		
	22-29	20-35	1.25-1.35	2.0-6.0	0.08-0.17	3.6-5.5	Low-----	0.17		
	29	---	---	---	---	---	-----	---		
Gilpin-----	0-9	15-27	1.20-1.40	0.6-2.0	0.12-0.18	3.6-5.5	Low-----	0.32	3	.5-4
	9-22	18-35	1.20-1.50	0.6-2.0	0.12-0.16	3.6-5.5	Low-----	0.24		
	22-36	15-35	1.20-1.50	0.6-2.0	0.08-0.12	3.6-5.5	Low-----	0.24		
	36	---	---	---	---	---	-----	---		
LyD:										
Lily-----	0-10	5-20	1.20-1.40	2.0-6.0	0.09-0.16	3.6-5.5	Low-----	0.28	3	.5-4
	10-22	18-35	1.25-1.35	2.0-6.0	0.12-0.18	3.6-5.5	Low-----	0.28		
	22-29	20-35	1.25-1.35	2.0-6.0	0.08-0.17	3.6-5.5	Low-----	0.17		
	29	---	---	---	---	---	-----	---		
Gilpin-----	0-9	15-27	1.20-1.40	0.6-2.0	0.12-0.16	3.6-5.5	Low-----	0.24	3	.5-4
	9-22	18-35	1.20-1.50	0.6-2.0	0.12-0.16	3.6-5.5	Low-----	0.24		
	22-36	15-35	1.20-1.50	0.6-2.0	0.08-0.12	3.6-5.5	Low-----	0.24		
	36	---	---	---	---	---	-----	---		
RCF-----	0-14	7-18	1.20-1.40	2.0-6.0	0.09-0.15	4.5-7.3	Low-----	0.24	4	.5-3
Rigley	14-62	7-18	1.30-1.60	2.0-6.0	0.09-0.15	3.6-5.5	Low-----	0.17		
	62-72	7-40	1.30-1.60	2.0-6.0	0.07-0.15	3.6-5.5	Low-----	0.17		
Rock outcrop.										
ReC:										
Riney-----	0-13	10-25	1.20-1.40	2.0-6.0	0.12-0.18	4.5-7.3	Low-----	0.28	4	.5-3
	13-44	20-35	1.20-1.50	2.0-6.0	0.13-0.17	4.5-5.5	Low-----	0.28		
	44-62	10-35	1.20-1.50	2.0-6.0	0.05-0.14	4.5-5.5	Low-----	0.28		
Allegheny-----	0-8	15-27	1.20-1.40	0.6-2.0	0.12-0.22	3.6-5.5	Low-----	0.32	4	1-4
	8-52	18-35	1.20-1.50	0.6-2.0	0.13-0.18	3.6-5.5	Low-----	0.28		
	52-62	10-35	1.20-1.40	0.6-2.0	0.08-0.17	3.6-5.5	Low-----	0.28		
Ro-----	0-10	10-25	1.20-1.40	0.6-2.0	0.11-0.21	4.5-7.3	Low-----	0.32	5	1-3
Rowdy	10-53	18-30	1.20-1.50	0.6-2.0	0.09-0.21	4.5-6.0	Low-----	0.28		
	53-65	10-30	1.20-1.50	0.6-6.0	0.07-0.18	4.5-6.0	Low-----	0.28		
SaE:										
Shelocta-----	0-6	10-25	1.15-1.30	0.6-2.0	0.16-0.22	4.5-5.5	Low-----	0.32	4	.5-5
	6-49	18-34	1.30-1.55	0.6-2.0	0.10-0.20	4.5-5.5	Low-----	0.28		
	49-60	15-34	1.30-1.55	0.6-6.0	0.08-0.16	4.5-5.5	Low-----	0.17		



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]

Map symbol and soil name	Hydro-logic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					Ft						In
AvB, AvD----- Allegheny Variant	B	None-----	---	---	>6.0	---	---	40-60	Hard	Low-----	High.
BfF: Bethesda-----	C	None-----	---	---	>6.0	---	---	>60	---	Moderate	High.
Fairpoint-----	C	None-----	---	---	>6.0	---	---	>60	---	High-----	Moderate.
BsF----- Bledsoe	C	None-----	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
CaF----- Caneyville	C	None-----	---	---	>6.0	---	---	20-40	Hard	High-----	Moderate.
GnC----- Gilpin	C	None-----	---	---	>6.0	---	---	20-40	Soft	Low-----	High.
GpB: Gilpin-----	C	None-----	---	---	>6.0	---	---	20-40	Soft	Low-----	High.
Rayne-----	B	None-----	---	---	>6.0	---	---	>40	Soft	Low-----	High.
GrD: Gilpin-----	C	None-----	---	---	>6.0	---	---	20-40	Soft	Low-----	High.
Rayne-----	B	None-----	---	---	>6.0	---	---	>40	Soft	Low-----	High.
Sequoia-----	C	None-----	---	---	>6.0	---	---	20-40	Soft	High-----	Moderate.
Gs----- Grigsby	B	Frequent----	Very brief to brief.	Dec-May	3.5-6.0	Apparent	Jan-Apr	>60	---	Low-----	Low.
Gv: Grigsby-----	B	Frequent----	Very brief to brief.	Dec-May	3.5-6.0	Apparent	Jan-Apr	>60	---	Low-----	Low.
Orrville Variant-	C	Frequent----	Very brief to brief.	Nov-May	1.0-2.0	Apparent	Nov-Jun	40-60	Hard	High-----	Moderate.
Hu----- Huntington	B	Occasional	Brief-----	Dec-May	>6.0	---	---	>60	---	Low-----	Moderate.
LyC, LyD: Lily-----	B	None-----	---	---	>6.0	---	---	20-40	Hard	Moderate	High.
Gilpin-----	C	None-----	---	---	>6.0	---	---	20-40	Soft	Low-----	High.
RCF----- Rigley	B	None-----	---	---	>6.0	---	---	>60	---	Low-----	High.
Rock outcrop.											
ReC: Riney-----	B	None-----	---	---	>6.0	---	---	>60	Soft	Moderate	High.
Allegheny-----	B	None-----	---	---	>6.0	---	---	>60	---	Low-----	High.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Map symbol and soil name	Hydro-logic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					<u>Ft</u>			<u>In</u>			
Ro----- Rowdy	B	Occasional	Brief-----	Jan-Apr	>6.0	---	---	>60	---	Moderate	Moderate.
SaE: Shelocta-----	B	None-----	---	---	>6.0	---	---	>48	Hard	Low-----	High.
Caneyville----- Rock outcrop.	C	None-----	---	---	>6.0	---	---	20-40	Hard	High-----	Moderate.
ScF: Shelocta-----	B	None-----	---	---	>6.0	---	---	>48	Hard	Low-----	High.
Cutshin-----	B	None-----	---	---	>6.0	---	---	>40	Soft	Low-----	Low.
SgF: Shelocta-----	B	None-----	---	---	>6.0	---	---	>48	Hard	Low-----	High.
Gilpin-----	C	None-----	---	---	>6.0	---	---	20-40	Soft	Low-----	High.
SrF: Steinsburg-----	C	None-----	---	---	>6.0	---	---	24-40	Soft	Low-----	High.
Gilpin----- Rock outcrop.	C	None-----	---	---	>6.0	---	---	20-40	Soft	Low-----	High.

TABLE 17.--PHYSICAL ANALYSES OF SELECTED SOILS

Soil name, report number, horizon, and depth (in inches)	Total		Size class and particle diameter (mm)								Coarse fragments			
	Sand (2- 0.05)	Silt (0.05- 0.002)	Int. IV Clay ( 0.002)	Sand					Sand coarser than very fine (2-0.1)	Very fine sand plus silt (0.1- 0.002)	Textural class	<2 mm	2-19 mm	19-76 mm
				Very coarse (2.1)	Coarse (1-0.5)	Medium (0.5- 0.25)	Fine (0.25- 0.1)	Very fine (0.1- 0.05)						
Bledsoe silt loam: <u>1/</u> (81KY-109-2)														
A1 - - - - - 0-4	22.4	56.4	21.2	3.2	1.3	0.6	2.4	14.9	7.5	71.3	sil	11	6	5
B21t - - - - - 4-10	13.5	52.7	33.8	1.9	0.9	0.5	1.9	8.3	5.2	61.0	sic1	2	2	---
B22t - - - - - 10-18	7.8	52.3	39.9	1.2	0.9	0.4	1.6	3.7	4.1	56.0	sic1	12	11	1
B23t - - - - - 18-30	13.6	63.7	32.7	2.7	0.8	0.3	1.3	8.2	5.1	71.9	sic1	3	3	---
B24t - - - - - 30-38	11.7	50.0	38.3	1.4	0.6	0.3	1.4	8.0	3.7	58.0	sic1	8	5	2
B25t - - - - - 38-50	13.8	51.7	34.5	1.6	1.1	0.5	1.6	9.0	4.8	60.7	sic1	14	10	4
B26t - - - - - 50-60	9.8	56.4	33.8	---	---	---	---	---	---	---	sic1	13	5	8
Huntington loam: <u>1/</u> (81KY-189-1)														
Ap - - - - - 0-10	37.5	45.6	17.0	0.1	0.1	0.1	7.4	29.8	7.7	75.4	l	---	---	---
A11 - - - - - 10-17	19.3	52.2	28.5	0.1	0.1	0.1	4.2	14.8	4.5	67.0	sic1	---	---	---
A12 - - - - - 17-24	29.5	42.6	27.9	0.1	0.1	0.2	6.1	23.0	6.5	65.6	cl	---	---	---
B1 - - - - - 24-33	23.6	48.4	28.0	0.1	0.2	0.3	4.5	18.5	5.1	66.9	cl	5	5	---
B21 - - - - - 33-42	12.6	58.9	28.5	0.1	0.1	0.2	1.5	10.7	1.9	69.6	sic1	---	---	---
B22 - - - - - 42-51	25.3	47.4	27.3	0.1	0.1	0.2	1.8	23.1	2.2	70.5	cl	5	5	---
B23 - - - - - 51-64	21.0	49.5	29.5	0.1	0.2	0.1	1.2	19.4	1.6	68.9	cl	---	---	---
Lily sandy loam: <u>1/</u> (81KY-109-3)														
A1 - - - - - 0-3	59.3	31.7	9.0	0.4	1.9	3.1	46.7	7.2	52.1	38.9	sl	4	1	3
A2 - - - - - 3-10	59.8	27.2	13.0	0.1	0.5	2.0	48.6	8.6	51.2	35.8	sl	1	1	---
B21t - - - - - 10-16	60.1	22.1	17.8	0.3	0.4	1.4	49.7	8.3	51.8	30.4	sl	1	1	---
B22t - - - - - 16-22	63.6	16.3	20.1	0.3	0.2	1.2	54.8	7.1	56.5	23.4	sc1	---	---	---
B23t - - - - - 22-29	66.7	13.6	19.7	0.6	0.2	1.4	56.9	7.6	59.1	21.3	sl	2	1	1
Rigley loam: <u>1/ 2/</u> (81KY-109-4)														
A1 - - - - - 0-6	44.7	40.3	15.0	3.4	2.5	2.4	21.0	15.4	29.3	55.7	l	14	13	<1
A2 - - - - - 6-14	55.4	35.5	9.1	11.3	4.1	2.3	17.4	20.3	35.1	55.8	sl	11	7	3
B21t - - - - - 14-28	50.7	38.3	11.0	7.3	4.4	3.9	22.4	12.7	38.0	51.0	l	40	17	22
B22t - - - - - 28-38	55.6	31.0	13.4	5.8	5.1	5.6	26.8	12.3	43.3	43.3	sl	50	12	37
B22t - - - - - 38-47	50.4	35.4	14.2	6.9	4.9	4.1	22.0	12.5	37.9	47.9	l	46	18	27
B23t - - - - - 47-62	69.2	16.5	14.3	9.1	5.5	5.1	30.9	18.3	50.6	34.8	sl	19	17	2
C - - - - - 62-72	58.3	30.3	11.4	6.1	5.6	5.9	29.4	11.3	47.0	41.6	sl	67	24	43

See footnotes at end of table.

TABLE 17.--PHYSICAL ANALYSES OF SELECTED SOILS--Continued

Soil name, report number, horizon, and depth (in inches)	Total			Size class and particle diameter (mm)								Coarse fragments		
	Sand (2- 0.05)	Silt (0.05- 0.002)	Int. IV Clay ( 0.002)	Sand					Sand coarser than very fine (2-0.1)	Very fine sand plus silt (0.1- 0.002)	Textural class	<2 mm	2-19 mm	19-76 mm
				Very coarse (2.1)	Coarse (1-0.5)	Medium (0.5- 0.25)	Fine (0.25- 0.1)	Very fine (0.1- 0.05)						
<b>Rowdy silt loam: 1/</b> (81KY-189-3)														
Ap - - - - - 0-10	22.8	53.2	24.0	0.1	0.3	1.0	9.2	12.2	10.6	65.4	sil	---	---	---
B1 - - - - - 10-17	32.7	42.3	25.0	0.2	0.5	1.3	13.7	17.0	15.7	59.3	1	---	---	---
B21 - - - - - 17-26	33.8	42.8	23.4	0.5	0.8	1.6	16.9	14.0	19.8	56.8	1	1	1	---
B22 - - - - - 26-36	38.9	38.0	23.1	1.1	1.0	1.8	17.0	18.0	20.9	56.0	1	---	---	---
B3 - - - - - 36-53	41.7	36.1	22.2	0.7	1.7	2.2	18.5	18.6	23.1	54.7	1	---	---	---
C - - - - - 53-65	37.7	41.0	21.3	1.1	1.7	2.0	17.9	15.0	22.7	56.0	1	5	5	---
<b>Sequoia loam: 3/</b> (81KY-109-1)														
A1 - - - - - 0-2	48.3	39.3	12.4	2.2	2.9	2.6	18.1	22.5	25.8	61.8	1	9	3	6
A2 - - - - - 2-9	49.0	31.8	19.2	1.0	1.0	1.0	16.2	29.8	19.2	61.6	1	1	1	---
B21t - - - - - 9-18	32.3	32.1	35.6	0.5	0.4	0.4	11.0	20.0	12.3	52.1	cl	1	1	---
B22t - - - - - 18-27	17.8	34.6	47.6	0.2	0.1	0.2	6.3	11.0	6.8	45.6	c	1	1	---
B23t - - - - - 27-37	9.0	39.3	51.7	1.2	0.5	0.5	4.2	2.6	6.4	41.9	c	2	2	---
B3 - - - - - 37-45	7.3	40.3	52.4	4.3	1.1	0.4	0.8	0.7	6.6	41.0	slc	1	1	---
C - - - - - 45-56	4.0	43.7	52.3	1.5	0.7	0.3	0.8	0.7	3.3	44.4	slc	3	3	---
<b>Shelocta loam: 4/</b> (81KY-109-5)														
A1 - - - - - 0-2	37.9	44.0	17.7	8.4	5.5	4.4	10.3	9.3	28.6	53.7	1	14	12	1
B1 - - - - - 2-7	35.5	44.1	20.4	7.5	4.4	3.3	9.5	10.8	24.7	54.9	1	13	12	1
B21t - - - - - 7-16	28.0	44.7	27.3	7.4	3.7	2.1	5.6	9.2	18.8	53.9	cl	22	8	15
B22t - - - - - 16-26	31.9	43.3	24.8	10.3	5.0	2.5	6.3	7.8	24.1	51.0	1	29	17	11
B23t - - - - - 26-34	32.6	39.4	28.0	8.9	4.9	2.4	5.8	10.6	22.0	50.0	cl	20	13	8
B24t - - - - - 34-51	30.6	40.7	28.7	7.3	4.7	2.5	6.3	9.9	20.7	50.6	cl	20	13	6
B3 - - - - - 51-60	29.6	42.9	27.5	5.8	4.6	2.9	8.2	8.1	21.5	51.0	cl	15	12	4
C - - - - - 60-75	33.5	37.6	28.9	6.9	5.1	3.2	7.9	10.4	23.1	48.0	cl	19	13	6

1/ Sample site is same as that of typical pedon given in "Soil Series and Their Morphology."

2/ The B22t horizon was divided for sampling purposes.

3/ About 2.6 miles south of McKee on Highway 290 and 1.5 miles southwest of U.S. Forest Service Road No. 19, and northeast 0.3 mile on private road to head of hollow. This pedon is a taxadjunct to the Sequoia series; the thickness of the solum and depth to soft shale is more than 40 inches. It is a component of the GrD map unit.

4/ About 3.8 miles southwest of McKee on Whetstone Branch, 0.75 mile west of junction of Kentucky Highway 89 and Indian Creek Road-Sand Gap Road, 200 feet south of Indian Creek Road-Sand Gap Road.

TABLE 18.--CHEMICAL ANALYSES OF SELECTED SOILS

[A dash indicates the element was not detected. The symbol &lt; means less than]

Soil name, report number, horizon, and depth (in inches)	Reaction		Extractable bases					Cation- exchange capacity		Ex- tract- able acid- ity	Ex- change- able alumi- num	Base saturation		Organic matter	Calcium car- bonate equiv- alent	Phos- phorus
	H <sub>2</sub> O (1:1)	KCl 1N (1:1)	Ca	Mg	K	Na	Total	Ammonium acetate	Sum of cations			Ammonium acetate	Sum of cations			
	pH	pH	-----Milliequivalents per 100 grams of soil-----										Pct	Pct	Pct	Pct
Bledsoe silt loam: 1/ (81KY-109-2)																
A1 - - - - 0-4	6.0	5.6	13.1	1.2	0.5	0.1	14.9	16.4	18.9	4.0	0.2	90.9	78.8	4.8	0.1	3.0
B21t - - - - 4-10	5.9	4.9	10.8	1.0	0.5	0.1	12.4	14.4	18.6	6.2	0.1	86.1	66.6	0.8	0.1	1.5
B22t - - - - 10-18	5.5	4.4	12.4	1.0	0.4	0.1	13.9	17.2	20.1	6.2	0.1	80.8	69.2	0.7	0.3	1.5
B23t - - - - 18-30	5.1	3.9	12.2	1.2	0.5	0.1	14.0	24.6	23.6	9.6	0.4	56.9	59.3	0.6	0.1	1.0
B24t - - - - 30-38	4.8	3.7	11.8	1.2	0.5	0.1	13.6	26.4	27.2	13.6	0.8	51.5	50.0	0.6	0.1	1.5
B25t - - - - 38-50	4.8	3.7	11.7	0.9	0.5	0.1	13.2	22.1	24.0	10.8	0.5	59.5	55.0	0.5	0.3	1.5
B26t - - - - 50-60	5.6	4.5	18.1	0.9	0.4	0.3	19.7	23.9	27.3	7.6	0.1	82.4	72.1	0.6	0.1	1.5
Huntington loam: 1/ (81KY-189-1)																
Ap - - - - 0-10	5.6	4.9	4.3	0.8	0.3	0.1	5.5	8.9	11.8	6.3	0.1	62.0	46.6	2.2	0.3	11.0
A11 - - - - 10-17	5.5	4.7	5.8	1.3	0.2	0.1	7.4	11.9	15.8	8.4	0.1	62.1	46.6	3.0	0.4	1.5
A12 - - - - 17-24	5.5	4.5	4.8	1.1	0.1	0.3	6.3	10.4	16.0	9.7	0.1	61.0	39.3	2.0	0.3	2.0
B1 - - - - 24-33	5.2	4.2	3.0	0.8	0.1	0.1	4.0	9.9	17.0	13.0	0.3	40.4	23.5	1.7	0.3	2.5
B21 - - - - 33-42	5.0	4.0	2.6	0.9	0.1	0.2	3.8	8.2	14.2	10.4	0.2	46.0	26.7	0.9	0.3	2.5
B22 - - - - 42-51	5.0	4.0	2.5	1.1	0.1	0.1	3.8	7.2	12.1	8.3	0.3	52.7	31.4	0.2	0.3	2.0
B23 - - - - 51-64	5.0	4.0	2.8	1.2	0.1	0.1	4.2	9.3	12.4	8.2	0.3	45.2	33.9	0.7	0.3	3.5
Lily sandy loam: 1/ (81KY-109-3)																
A1 - - - - 0-3	4.4	3.6	0.9	0.2	0.3	0.1	1.5	12.0	16.6	15.1	0.6	12.5	9.0	6.9	0.6	6.0
A2 - - - - 3-10	4.5	4.2	0.2	<0.1	0.1	0.1	0.4	4.7	7.0	6.6	0.1	8.5	5.7	1.1	0.4	2.0
B21t - - - - 10-16	4.5	4.1	0.2	0.1	0.1	0.1	0.5	5.4	9.9	9.4	0.1	9.2	5.9	0.6	0.1	1.5
B22t - - - - 16-22	4.6	4.0	0.2	0.1	0.1	0.1	0.5	6.1	7.8	7.3	0.2	8.2	6.4	0.4	0.1	1.0
B23t - - - - 22-29	4.7	3.8	0.3	0.3	0.1	0.1	0.8	6.2	8.5	7.7	1.1	12.9	9.4	0.4	0.5	1.0
Rigley loam: 1/ 2/ (81KY-109-4)																
A1 - - - - 0-6	4.7	4.1	0.2	0.1	0.1	0.1	0.5	6.3	11.7	11.2	---	7.9	4.2	1.6	0.4	3.0
A2 - - - - 6-14	4.6	4.2	0.2	---	0.1	0.1	0.4	4.5	7.6	7.2	0.1	8.9	5.3	0.4	0.2	2.0
B21t - - - - 14-28	4.6	4.1	0.2	---	0.2	0.1	0.5	10.8	6.6	6.1	---	4.6	7.6	0.2	0.5	2.5
B22t - - - - 28-38	5.0	3.9	0.2	1.1	0.2	0.1	1.6	5.4	9.4	7.8	---	29.6	17.0	0.1	0.4	1.0
B22t - - - - 38-47	5.0	3.9	0.1	1.3	0.2	0.1	1.7	7.0	9.9	8.2	---	24.3	17.1	0.1	0.5	0.5
B23t - - - - 47-62	5.2	3.9	0.1	1.0	0.2	0.1	1.4	4.9	8.5	7.1	0.4	28.6	16.5	0.1	0.5	1.5
C - - - - 62-72	5.0	4.0	0.2	0.7	0.1	0.1	1.1	4.9	8.3	7.2	0.2	22.4	13.2	0.1	0.6	1.5

See footnotes at end of table.

TABLE 18.--CHEMICAL ANALYSES OF SELECTED SOILS--Continued

Soil name, report number, horizon, and depth (in inches)	Reaction		Extractable bases					Cation- exchange capacity		Ex- tract- able acid- ity	Ex- change- able alumi- num	Base saturation		Organic matter	Calcium car- bonate equiv- alent	Phos- phorus	
	H <sub>2</sub> O (1:1)	KCl 1N (1:1)	Ca	Mg	K	Na	Total	Ammonium acetate	Sum of cations			Ammonium acetate	Sum of cations				
	pH	pH	-----Milliequivalents per 100 grams of soil-----										Pct	Pct	Pct	Pct	Ppm
Rowdy silt loam: 1/ (81KY-189-3)																	
Ap - - - - 0-10	5.1	4.2	2.2	0.3	0.2	0.1	2.8	8.9	19.6	16.8	0.4	31.5	14.3	2.3	0.1	11.5	
B1 - - - - 10-17	5.2	4.2	2.1	0.4	0.2	0.1	2.7	6.7	11.8	9.1	0.2	40.3	22.9	0.6	0.2	5.5	
B21 - - - - 17-26	5.1	4.0	1.8	0.5	0.2	0.2	2.7	6.5	12.2	9.5	0.2	41.5	22.1	0.3	0.3	2.5	
B22 - - - - 26-36	5.1	3.9	0.7	0.7	0.1	0.1	1.6	7.1	12.7	11.1	0.2	22.5	12.6	0.1	0.1	2.0	
B3 - - - - 36-53	5.1	3.9	0.6	1.1	0.1	0.1	1.9	6.8	13.4	11.5	0.1	27.4	14.2	0.4	0.1	2.0	
C - - - - 53-65	5.1	3.9	0.7	0.9	0.1	0.1	1.8	6.8	14.6	12.8	0.1	26.5	12.3	0.4	0.4	2.0	
Sequoia loam: 3/ (81KY-109-1)																	
A1 - - - - 0-2	4.5	3.8	1.7	0.2	0.1	0.1	2.1	8.6	15.7	13.6	0.5	24.4	13.4	3.8	0.1	5.0	
A2 - - - - 2-9	4.7	3.9	0.2	0.1	0.1	0.1	0.5	5.7	10.0	9.5	0.2	8.8	5.0	1.4	0.1	3.0	
B21t - - - - 9-18	4.6	3.7	0.3	0.2	0.2	0.1	0.8	11.7	14.0	11.2	0.8	6.8	5.7	0.6	0.1	2.0	
B22t - - - - 18-27	4.6	3.5	0.3	0.2	0.2	0.1	0.8	17.5	21.4	20.6	1.0	4.5	3.7	0.4	0.1	1.5	
B23t - - - - 27-37	4.4	3.6	0.2	0.2	0.3	0.1	0.8	23.2	22.3	21.5	2.0	3.4	3.6	0.7	0.1	2.0	
B3 - - - - 37-45	4.5	3.6	0.2	0.1	0.3	0.1	0.7	18.2	19.8	19.1	1.5	3.8	3.5	0.3	0.1	2.0	
C - - - - 45-56	4.5	3.5	0.2	0.2	0.3	0.1	0.8	15.6	21.1	20.3	1.3	5.1	3.8	0.4	0.4	1.5	
Shelocta loam: 4/ (81KY-109-5)																	
A1 - - - - 0-2	4.6	4.0	0.2	0.7	0.3	0.1	1.3	15.8	19.4	18.1	0.5	8.2	6.7	4.9	0.5	5.5	
B1 - - - - 2-7	4.7	4.0	0.4	0.4	0.2	0.1	1.1	8.6	12.9	11.8	0.2	12.8	8.5	2.0	1.0	2.5	
B21t - - - - 7-16	5.0	4.0	0.4	1.4	0.2	0.1	2.1	9.8	14.3	12.2	0.1	21.4	14.7	0.8	0.2	1.5	
B22t - - - - 16-26	5.1	4.0	0.3	2.0	0.2	0.1	2.6	8.2	10.1	7.5	0.1	31.7	25.7	0.7	0.1	1.5	
B23t - - - - 26-34	5.0	4.1	0.3	2.3	0.2	0.1	2.9	9.1	13.0	10.1	0.2	31.9	22.3	0.6	0.1	2.0	
B24t - - - - 34-51	5.0	4.0	0.2	1.8	0.2	0.1	2.3	10.6	13.2	10.9	0.0	21.7	17.4	0.4	0.1	1.0	
B3 - - - - 51-60	4.9	3.9	0.2	1.7	0.2	0.1	2.2	10.5	11.2	9.0	0.1	21.0	19.6	0.4	0.1	1.5	
C - - - - 60-75	4.9	3.9	0.1	1.6	0.2	0.1	2.0	9.5	11.7	9.7	0.3	21.1	17.1	0.6	0.1	1.5	

1/ Sample site is same as that of typical pedon given in "Soil Series and Their Morphology."

2/ The B22t horizon was divided for sampling purposes.

3/ About 2.6 miles south of McKee on Highway 290 and 1.5 miles southwest of U.S. Forest Service Road No. 19, and northeast 0.3 mile on private road to head of hollow. This pedon is a taxadjunct to the Sequoia series; the thickness of the solum and depth to soft shale is more than 40 inches. It is a component of the GrD map unit.

4/ About 3.8 miles southwest of McKee on Whetstone Branch, 0.75 mile west of the junction of Kentucky Highway 89 and Indian Creek Road-Sand Gap Road, 200 feet south of Indian Creek-Sand Gap Road.

TABLE 19.--ENGINEERING INDEX TEST DATA

[Dashes indicate data were not available. NP means nonplastic]

Soil name, report number, horizon and depth (in inches)	Classification		Grain-size distribution										Liquid limit	Plasticity index	Moisture density		Specific gravity	
	AASHTO	Unified	Percentage passing sieve--							Percentage smaller than--					Pct	Lb/ft <sup>3</sup>		Pct
			2	3/4	3/8	No.	No.	No.	No.	.02	.005	.002						
			inch	inch	inch	4	10	40	200	mm	mm	mm						
Bledsoe silt loam: <u>1/</u> (81KY-109-2) B25t - - - - 38-50	A-7-6(16)	CL	100	98	98	97	86	84	81	59	37	30	42	19	105	20	2.75	
Huntington loam: <u>2/</u> (81KY-189-1) A11 - - - - 10-17 B23 - - - - 51-64	A-6(13) A-6(13)	ML ML	100 100	100 100	100 100	100 100	100 100	100 100	93 100	56 63	34 37	15 22	40 38	12 11	102 104	20 19	2.80 2.75	
Lily sandy loam: <u>3/</u> (81KY-109-3) B22t - - - - 16-22	A-2-4(0)	SM	100	100	99	99	99	96	34	26	23	14	---	NP	115	14	2.69	
Sequoia loam: <u>4/</u> (81KY-109-1) B21t - - - - 9-18	A-7-6(15)	CL	100	99	97	96	76	74	71	52	38	22	45	23	102	21	2.72	

1/ Bledsoe silt loam: 2 miles south of Estill County and 500 feet southwest of point where Kentucky Highway 89 crosses South Fork Creek. This soil is a taxadjunct to the Bledsoe series; the B horizon is more acid than is typical for soils of the Bledsoe series.

2/ Huntington loam: About 1.9 miles south of Booneville and 1,500 feet due east of Kentucky Highway 11, and in center of flood plain. This pedon is a taxadjunct to the Huntington series; the B horizon contains more sand than is typical for the Huntington series, and the base saturation is less than 50 percent in the control section.

3/ Lily sandy loam: About 5.3 miles north of McKee on Highway 89, 0.8 mile west of intersection of Lake Creek Road, and 2,000 feet south of Highway.

4/ Sequoia loam: About 2.6 miles south of McKee on Highway 290 and 1.5 miles southwest of U.S. Forest Service Road No. 19, and northeast 0.3 mile on private road to head of hollow. This pedon is a taxadjunct to the Sequoia series; the thickness of the solum and depth to soft shale is more than 40 inches. It is a component of the GrD map unit.

TABLE 20.--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
Allegheny Variant-----	Fine-loamy, mixed, mesic Typic Hapludults
Bethesda-----	Loamy-skeletal, mixed, acid, mesic Typic Udorthents
*Bledsoe-----	Fine, mixed, mesic Typic Hapludalfs
Caneyville-----	Fine, mixed, mesic Typic Hapludalfs
Cutshin-----	Fine-loamy, mixed, mesic Typic Haplumbrepts
Fairpoint-----	Loamy-skeletal, mixed, nonacid, mesic Typic Udorthents
Gilpin-----	Fine-loamy, mixed, mesic Typic Hapludults
Grigsby-----	Coarse-loamy, mixed, mesic Dystric Fluventic Eutrochrepts
*Huntington-----	Fine-silty, mixed, mesic Fluventic Hapludolls
Lily-----	Fine-loamy, siliceous, mesic Typic Hapludults
Orrville Variant-----	Fine-loamy, mixed, nonacid, mesic Aeric Fluvaquents
Rayne-----	Fine-loamy, mixed, mesic Typic Hapludults
Rigley-----	Coarse-loamy, mixed, mesic Typic Hapludults
Riney-----	Fine-loamy, siliceous, mesic Typic Hapludults
Rowdy-----	Fine-loamy, mixed, mesic Fluventic Dystrochrepts
Sequoia-----	Clayey, mixed, mesic Typic Hapludults
Shelocta-----	Fine-loamy, mixed, mesic Typic Hapludults
Steinsburg-----	Coarse-loamy, mixed, mesic Typic Dystrochrepts



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