United States Department of Agriculture

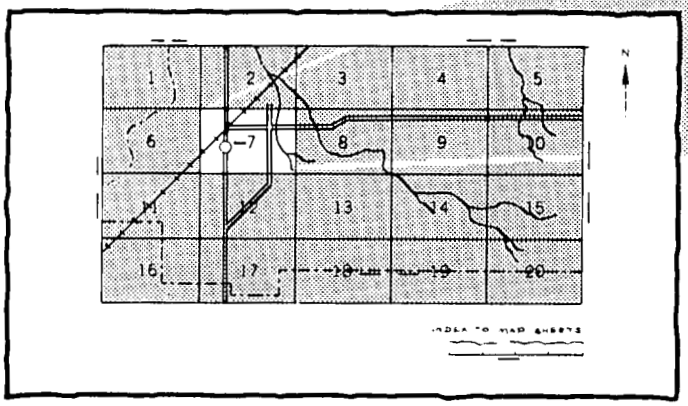
Soil Conservation Service

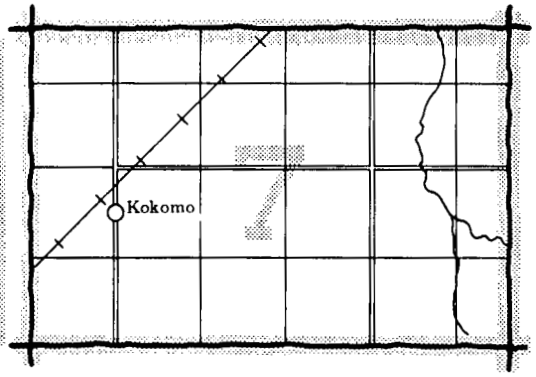
In cooperation with United States Department of Agriculture, Forest Service, and Arkansas Agricultural Experiment Station

Soil Survey of Newton County, Arkansas

HOW TO USE

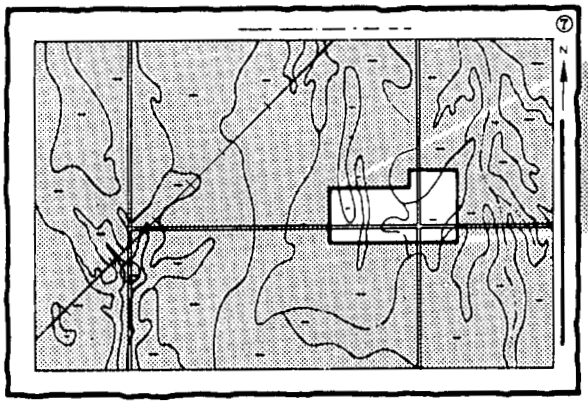
1. Locate your area of interest on the "Index to Map Sheets."

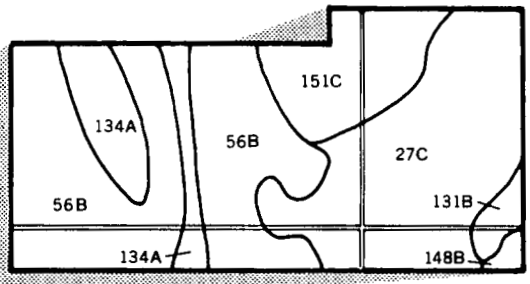




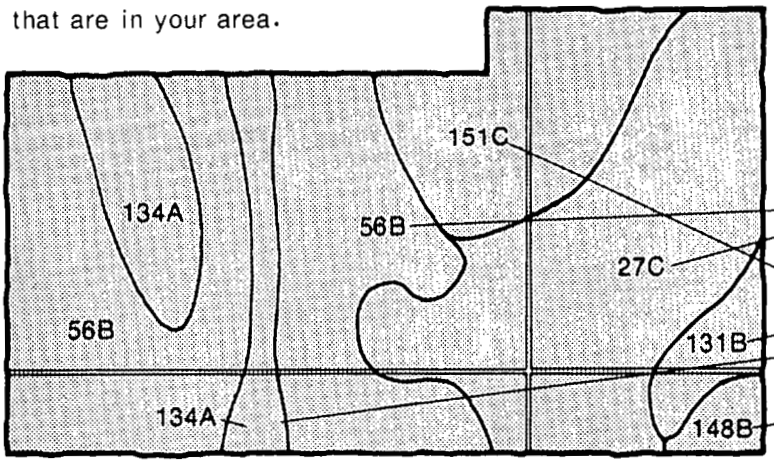
2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.





4. List the map unit symbols that are in your area.

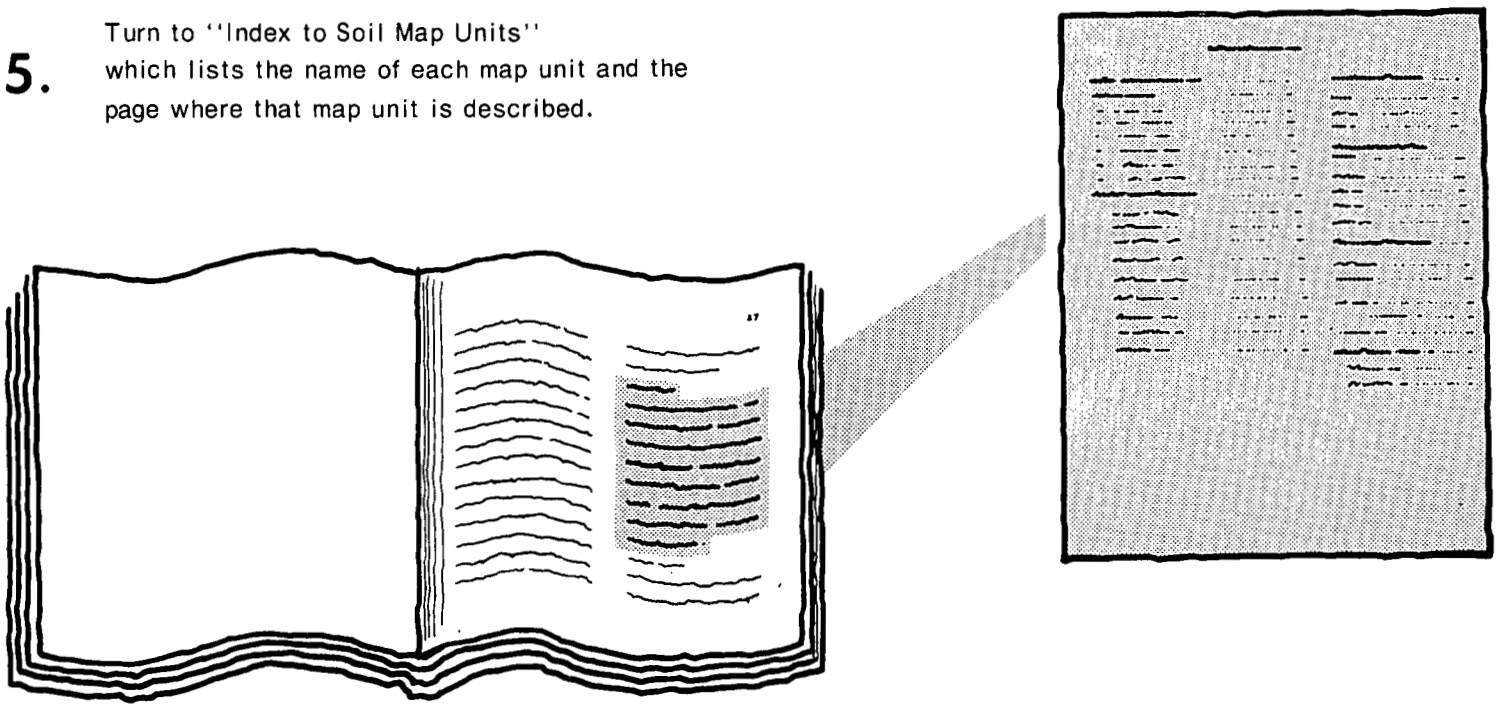


Symbols

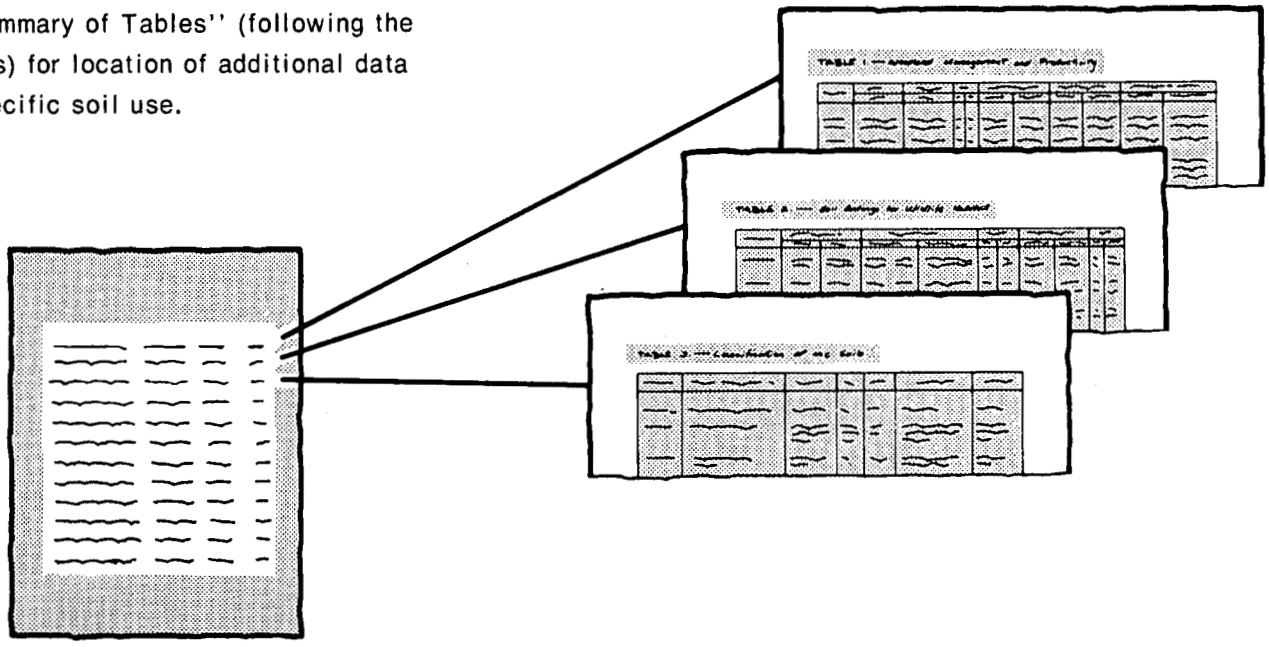
27C
56B
131B
134A
148B
151C

THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; for specialists in wildlife management, waste disposal, or pollution control.

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. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was completed in 1983. Soil names and descriptions were approved in 1984. 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 Forest Service, and the Arkansas Agricultural Experiment Station. It is part of the technical assistance furnished to the Newton County Soil and Water 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.

Cover: Spring-fed streams furnish water for livestock and wildlife. This spring is in an area of Ceda-Kenn complex, frequently flooded.

Contents

Soil Series

Issued March 1988

Index to Map Units

Summary of Tables

Foreword

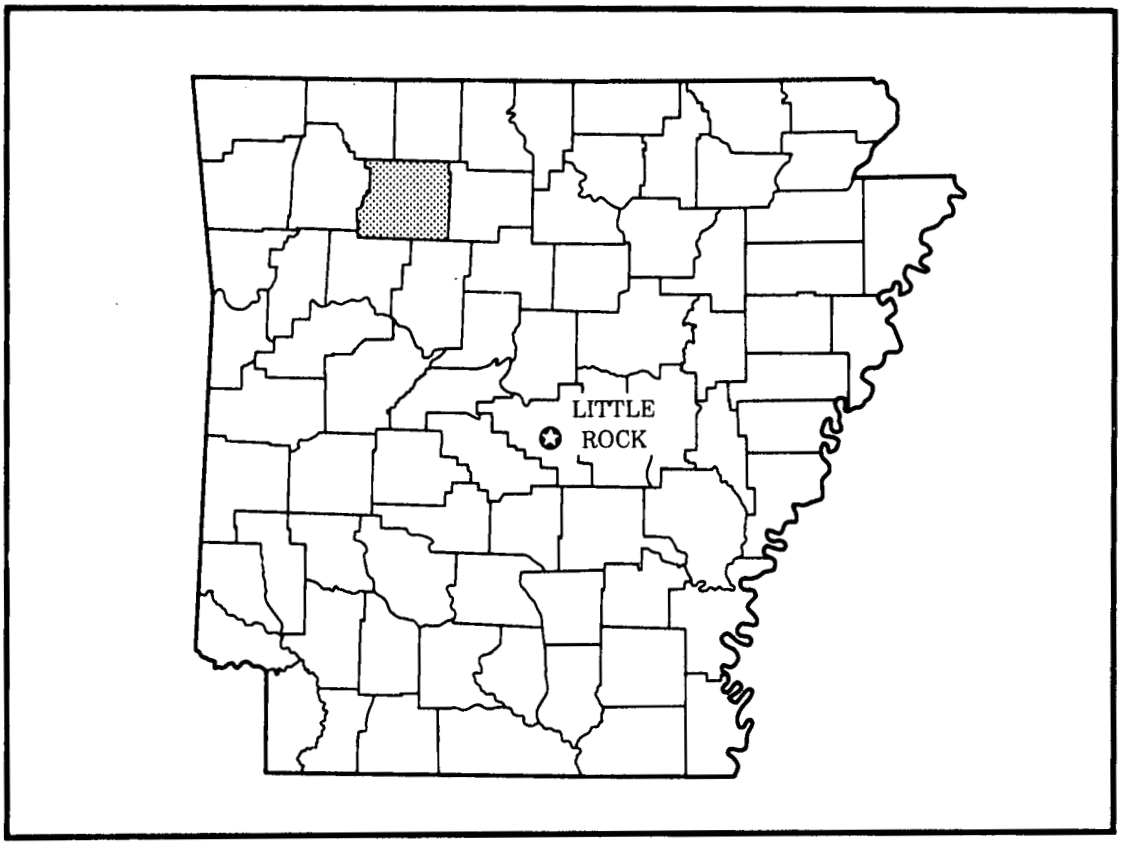
This soil survey contains information that can be used in land-planning programs in Newton County. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact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

This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to 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.

Albert E. (Gene) Sullivan
State Conservationist
Soil Conservation Service



Location of Newton County in Arkansas.

Soil Survey of Newton County, Arkansas

By David H. Fowlkes, Richard T. McCright, and J. Sidney Lowrance,
Soil Conservation Service

Fieldwork by David H. Fowlkes, Richard T. McCright, J. Sidney Lowrance,
and William W. Phillips, Soil Conservation Service,
and Suzanne A. Krieger and Emanuel Hudson, Forest Service

United States Department of Agriculture,
Soil Conservation Service and Forest Service
In cooperation with the Arkansas Agricultural Experiment Station

NEWTON COUNTY is in the northwest part of Arkansas. It is about 27 miles from north to south and about 30 miles from east to west. The county is bordered on the north by Boone and Carroll Counties, on the west by Madison and Johnson Counties, on the south by Johnson and Pope Counties, and on the east by Searcy County.

The approximate land area of Newton County, according to the 1981 Census of Agriculture, is 526,713 acres, or about 823 square miles. This includes bodies of water of less than 40 acres and streams of less than one-eighth of a mile wide.

In 1980, the population of the county was 7,756. Jasper, with a population of 519, is the county seat and is the largest town in Newton County.

The economy of the county is based mainly on tourism, forestry, and livestock production. Newton County attracts a large number of tourists. The numerous attractions include scenic Arkansas State Highway 7, the Buffalo River, (fig. 1), and the Ozark National Forest.

General Nature of the County

This section describes briefly the farming, physiography and drainage, and climate factors of Newton County.

Farming

The first settlers in Newton County were mostly subsistence farmers. They cleared and farmed small scattered areas on flood plains and on the gently sloping uplands where the soil was deep and had little gravel and few stones. As roads were built and markets developed, they produced cotton, fruit, and grain and raised livestock for cash sale. They also cut and sold the virgin hardwood timber. In the early days, Newton County, with its abundant supply of excellent hardwoods, became the center of the cooperage industry and a leading manufacturer of wagons.

This trend continued until about 1930. From 1930 through the 1950's, numerous farms were abandoned. On most farms, land use changed from cultivated crops to pasture or meadow. Most of the cleared upland acreage is used for pasture and forage crops. The steep soils are mostly in low-grade trees.

The bottom land, mainly along the Buffalo River, Little Buffalo River, and Big Creek is used for pasture and forage crops. A few isolated areas are used for cultivated crops.

According to the 1978 Census of Agriculture, about 19 percent of Newton County is in farms. The average size of a farm is 178 acres. The remaining acreage is taken up by cities, towns, and rural subdivisions, federally-owned land, transportation and utility facilities, and unimproved woodland.

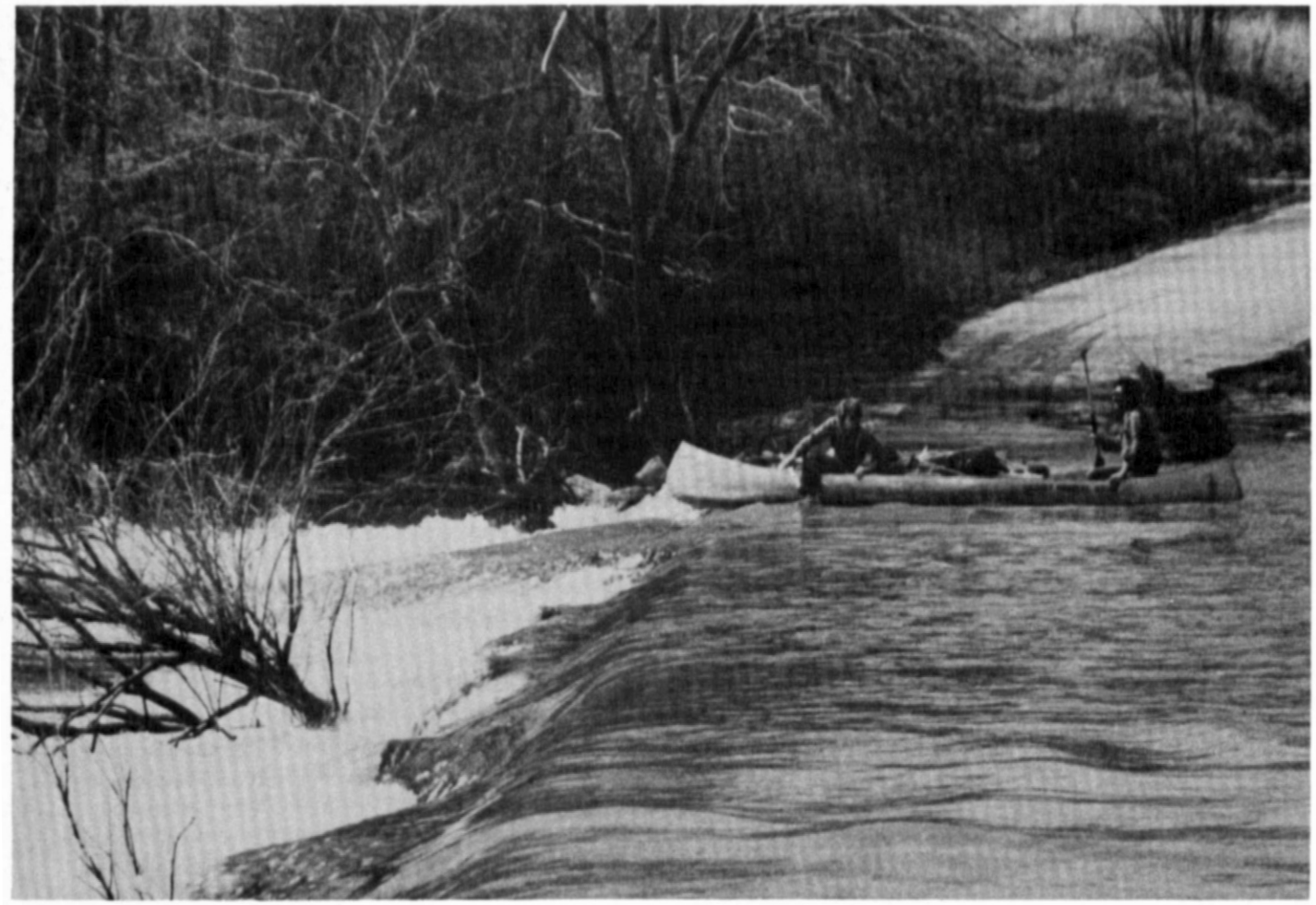


Figure 1.—The Buffalo River provides recreation for canoeing enthusiasts from all over the country.

Most farm income is from livestock, mainly beef cattle. The cattle industry consists mainly of cow-calf operations. Most calves are sold as feeders or as stockers the following year. Beef cattle are raised on cool- and warm-season pasture plants and are given mineral and protein supplements. Generally, grain and hay are fed to them only during the winter. Most cattle produced in the county are of good grade and are sold to midwestern feedlots. Table 1 gives the number of livestock in Newton County in selected years.

The sale of forest products is also a source of farm income. Most of the woodland is on steep, stony, or shallow soils, which are poor sites for commercial production of wood crops; however, woodland is the best use of these soils. Most privately-owned woodland is in low-grade upland hardwoods or mixed stands of oak and shortleaf pine. Most of the southern one-half of Newton County is in the Ozark National Forest. This area is managed for multiple use, including timber production. Most of the hardwood timber sold in the county is taken by truck to mills in Harrison or Fort Smith where it is used for furniture stock and other wood products, railroad ties, pallets, handles, and fence posts, or for making charcoal (fig. 2). A large part of the pine timber in the county is sold as pulpwood and shipped to paper mills in southern Arkansas. The shallow soils of the Salem Plateau in the northern part of Newton County produce cedar trees that are used as posts, lumber, furniture, and novelties.

The number of farms has increased slightly since 1974, while the average-size farm has decreased. This is because of the number of retired people that are moving to Newton County. Many of these new residents desire a small acreage in a rural area; hence, much of the

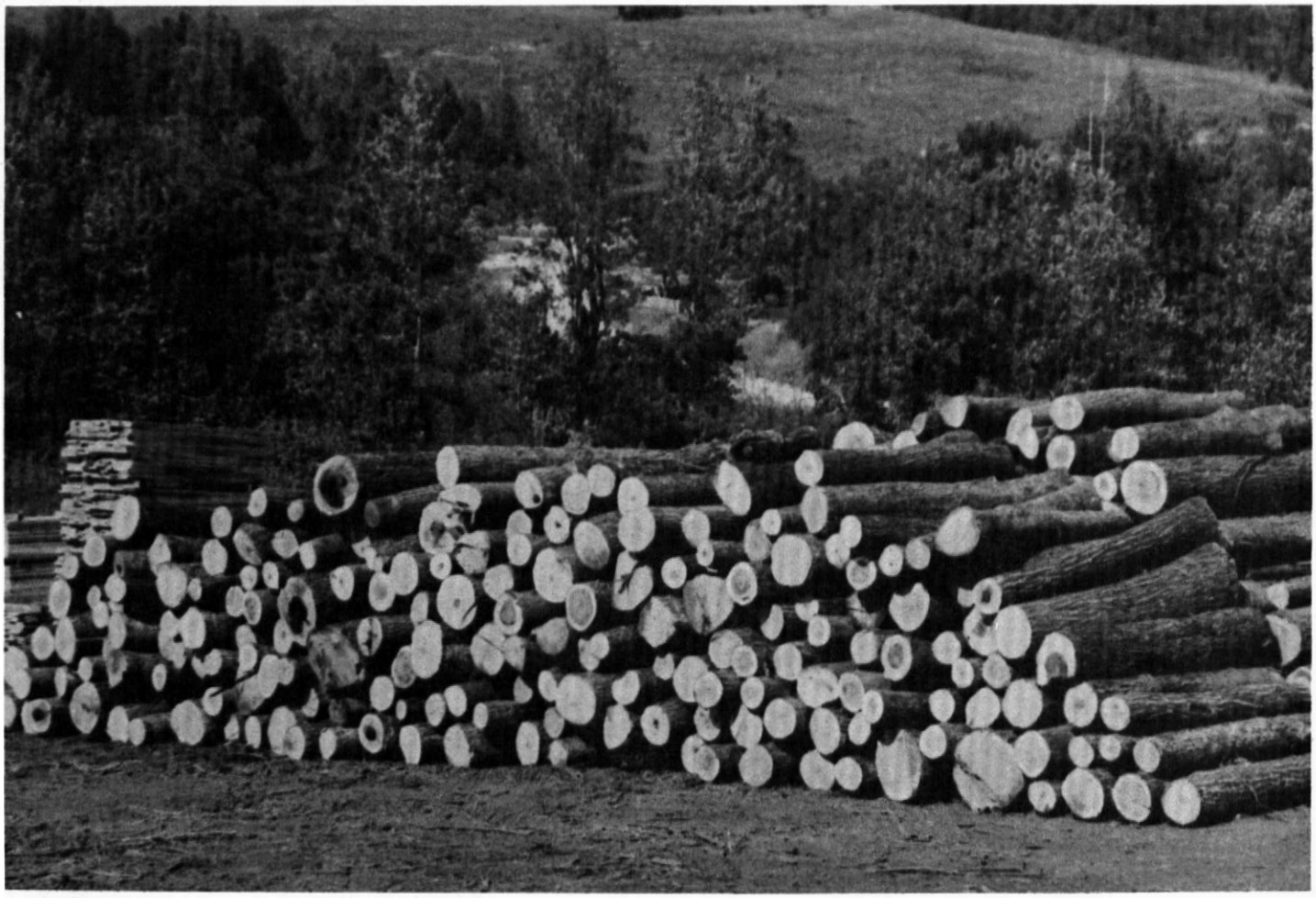


Figure 2.—The soils in Newton County are mainly in woodland. These hardwood logs are ready for transporting to a wood products mill in Harrison or Fort Smith.

population of the county is in rural areas or small towns. Most farms are small enough for a family to do most of the work. Only about one-third of Newton County farm owners are full-time operators.

Physiography and Drainage

Newton County is within three physiographic areas of the Ozark Highlands. The Salem Plateau is the lowest, oldest, and northernmost of the three step-like plateau surfaces. The north and northeast part of the county is in the Springfield Plateau. The western and southern part of the county is in the Boston Mountain Plateau, which is the youngest and highest of the three surfaces.

The Salem Plateau is characterized by rolling uplands and steep, stony side slopes that have outcrops of sandstone and dolomite. It roughly parallels the Buffalo River from the west part of the county to the east part. The area has been intricately dissected by streams.

The elevation is about 680 to 1,100 feet above sea level. Arkana, Moko, Lily, Estate, and Portia soils formed in this area.

The Springfield Plateau is adjacent to and is higher in elevation than the Salem Plateau. This surface is younger than the Salem Plateau and has been strongly dissected by streams that form a dendritic pattern. The area is characterized by steep, V-shaped valleys that are separated by gently sloping to rolling, long, narrow, winding ridges. The hillsides on the plateau have gradients of 12 to 50 percent. The elevation is about 1,100 to 1,400 feet above sea level. Clarksville, Nixa, and Noark soils formed in this area.

The Boston Mountains rise above the Springfield Plateau across the southern three-fourths of Newton County. This plateau is characterized by broad, gently

sloping to rolling mountaintops and steep and very steep mountainsides. The mountaintops are capped with hard sandstone (fig. 3). The mountainsides are made up of interbedded sandstone and shale and have gradients of 12 to about 60 percent. The elevation is about 1,400 feet to 2,560 feet above sea level. Nella, Enders, Leesburg, Steprock, Mountainburg, and Linker soils formed in this area.

Roughly paralleling the base of the Boston Mountain escarpment is a moderately sloping to very steep surface with outcrops of calcareous shale and limestone. The Eden and Newnata soils formed in this area.

Stream valleys are entrenched and range in width from a few hundred feet in the Springfield Plateau to about one-half of a mile along the Buffalo River and Little Buffalo River in the Salem Plateau and Boston Mountains. Most flood plains in the area are 100 to 1,000 feet wide. Ceda, Kenn, Spadra, Razort, and Wideman soils formed in these valleys. Several small streams and a few large ones are in the county. The natural drainage system consists of many streams in a dendritic pattern in the upper reaches of several watersheds. Springs that are common in some areas contribute substantially to summer and fall stream flow.

The northwest part of the county is drained north by Osage Creek and Kenner Creek, which empty into the Kings River. The very northeastern part of Newton County is drained by intermittent streams that flow north to Clear Creek. The central part of the county is drained by many intermittent and perennial streams which flow north and south to the Buffalo River and Little Buffalo River. The main tributaries that flow into the Little Buffalo River are East Fork of the Little Buffalo River, Thomas Creek, and Henson Creek. The streams that flow into the Buffalo River include Main Prong Big Buffalo Creek, Sneed Creek, Steel Creek, Mill Creek, Davis Creek, Cave Creek, Richard Creek, Hurricane Creek, Big Creek, and the Little Buffalo River. The southern part of the county

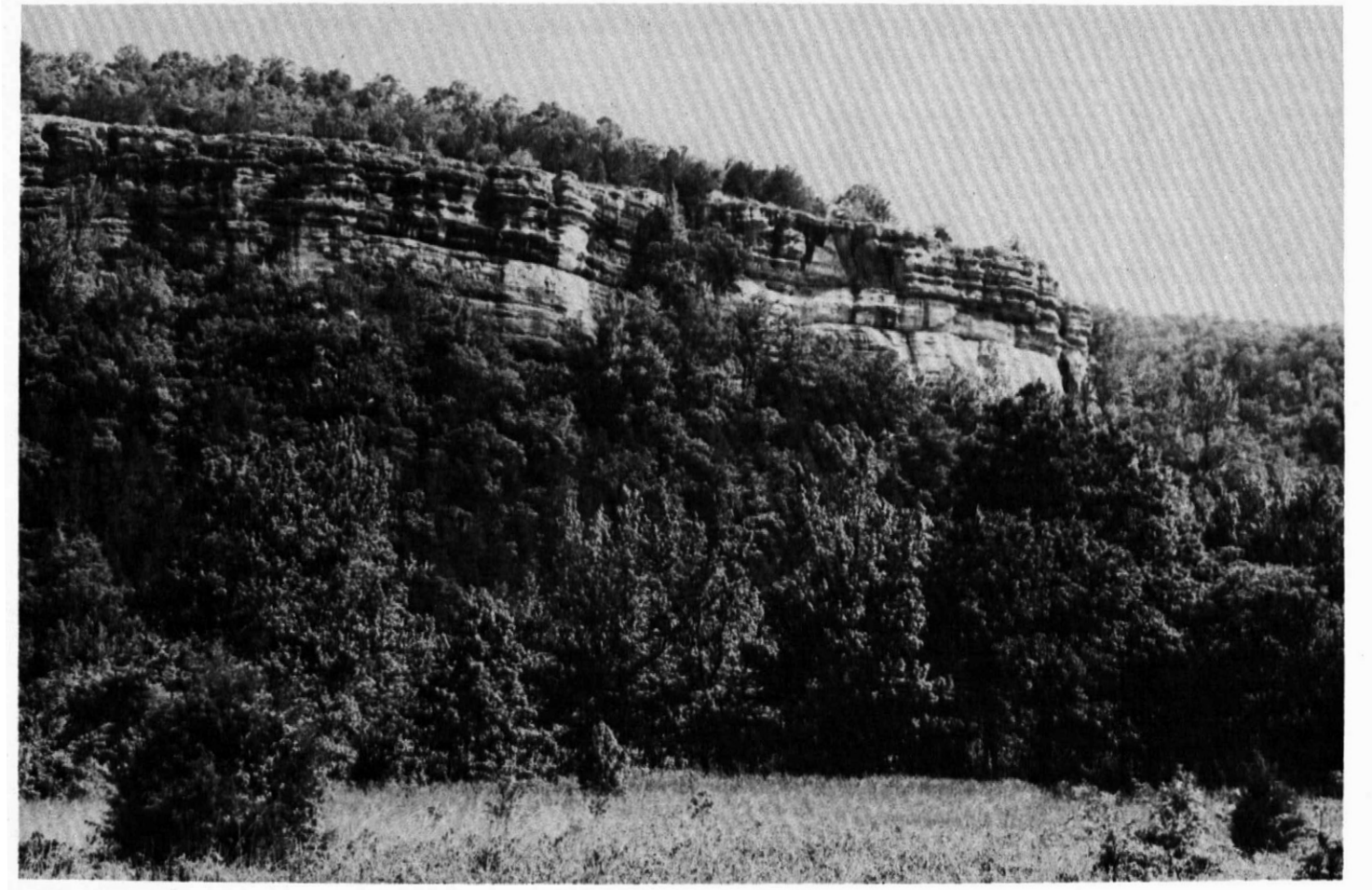


Figure 3.—Massive sandstone escarpments are a prominent feature of the Boston Mountains.

is drained south by Panther Creek, Piney Creek, and Hurricane Creek, which empty into the Arkansas River to the south.

Domestic water supplies mainly come from drilled and dug wells, or in some places from springs. Jasper, Deer, Mt. Sherman, Mt. Judea, Compton, Western Grove, and Mockingbird Hill have public water systems. Water for livestock is mainly from farm ponds and creeks.

Climate

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

Newton County, Arkansas, is hot in summer, especially at low elevations, and is moderately cool in winter, especially on the mountains and high hills. Rainfall is fairly heavy and well distributed throughout the year. Snow falls nearly every winter but snow cover lasts only a few days.

Table 2 gives data on temperature and precipitation for the survey area as recorded at Harrison in the period 1961 to 1981. Table 3 shows probable dates of the first freeze in fall and the last freeze in spring. Table 4 provides data on length of the growing season.

In winter the average temperature is 37 degrees F, and the average daily minimum temperature is 27 degrees. The lowest temperature on record, which occurred at Harrison on January 8, 1970, is -6 degrees. In summer the average temperature is 76 degrees, and the average daily maximum temperature is 86 degrees. The highest recorded temperature, which occurred at Harrison on July 16, 1980, is 104 degrees.

Growing degree days are shown in table 2. 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 (50 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 46 inches. Of this, 26 inches, or 55 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 21 inches. The heaviest 1-day rainfall during the period of record was 5.57 inches at Harrison on November 24, 1973. Thunderstorms occur on about 56 days each year, and most occur in summer.

The average seasonal snowfall is 15 inches. The greatest snow depth at any one time during the period of record was 13 inches. On the average, 12 days have at least 1 inch of snow on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 55 percent. Humidity is higher at night, and the average at dawn is about 85 percent. The percentage of possible sunshine is 65 percent in summer and 50 percent in winter. The prevailing wind is from the northeast. Average windspeed is highest, 10 miles per hour, in spring.

How This Survey Was Made

This survey was made to provide information about the soils in the survey area. The information includes a description of the soils and their location and a discussion of the suitability, limitations, and management of the soils for specified uses. Soil scientists observed the steepness, length, and shape of slopes; the general pattern of drainage; the kinds of crops and native plants growing on the soils; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material 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

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.

The soils in the survey area vary widely in their potential for major land uses.

Each map unit is rated for *cultivated crops, pasture, woodland, and urban uses.* Cultivated crops are those grown extensively in the survey area. Pasture refers to areas of forage-type plants that are grown for livestock grazing. Woodland refers to areas of native or introduced trees. Urban uses include residential, commercial, and industrial developments.

1. Enders-Leesburg

Deep, gently sloping to steep, well drained, stony soils that formed in residuum or colluvium of acid sandstone or shale

Areas of these soils are in the northwest part of the county on upland crests, benches, foot slopes, and sides of the Boston Mountains.

This map unit makes up about 3 percent of the county. It consists of about 45 percent Enders soils, 40 percent Leesburg soils, and 15 percent soils of minor extent.

Enders soils are on gently sloping upland crests, foot slopes, and strongly sloping to steep mountainsides. These soils have a very dark grayish brown stony loam surface layer. The subsoil is strong brown loam, red silty clay loam, red silty clay, red mottled shaly clay, and mottled red and light brownish gray shaly clay. The underlying material is soft, weathered, dark gray shale and light brownish gray clay. Black fissile shale bedrock is below the weathered shale and clay.

Leesburg soils are on strongly sloping upper side slopes, benches, and steep mountainsides. These soils have a dark grayish brown stony loam surface layer and yellowish brown stony loam subsurface layer. The subsoil is strong brown gravelly sandy clay loam and strong brown gravelly and cobbly clay loam.

The soils of minor extent in this map unit are Ceda, Kenn, Linker, Mountainburg, Nella, and Spadra soils. Ceda soils are deep and cobbly. Kenn soils are fine sandy loam. Ceda and Kenn soils are along frequently flooded drainageways. Linker soils are moderately deep and gravelly. They are on gently sloping to moderately steep mountaintops. Mountainburg soils are shallow and stony. They are on gently sloping to moderately steep mountaintops and steep to very steep sides and rims of mountaintops. Nella soils are deep and gravelly or stony. They are on strongly sloping benches and steep and very steep mountainsides. Spadra soils are loamy. They are on terraces along drainageways. Also of minor extent are outcrops of sandstone, which, in places, form prominent bluffs.

Most of the soils in this map unit are used as woodland. These woodlands are made up mainly of mixed hardwoods and scattered pine plantations. Originally, Leesburg soils had a dense stand of hardwood trees, and Enders soils had an open stand of hardwood trees and prairie plants in open areas. Most of the desirable trees have been harvested, leaving a stand of undesirable trees and young trees. Surface stoniness and slope are the main limitations of the Enders and Leesburg soils for farming and for most other uses.

The soils in this map unit are not suited to cultivated crops. These soils are poorly suited to or not suited to pasture. They are moderately suited to woodland.

Leesburg soils are moderately suited to or poorly suited to most urban uses. Enders soils are poorly suited to most urban uses. Slope, surface stoniness, low strength, and high shrink-swell potential are the main limitations of the Enders soils for urban use, and slope and surface stoniness are the main limitations of the Leesburg soils. Special design and proper construction are needed to overcome the low strength and high shrink-swell potential limitations. The slope limitation is more difficult to overcome as slope gradient increases.

2. Linker-Steprock-Leadvale

Moderately deep and deep, gently sloping to strongly sloping, well drained and moderately well drained, loamy or gravelly soils that formed in residuum of acid sandstone or interbedded sandstone, siltstone, and shale

Areas of these soils are mainly in the west and southern part of the county. These soils are on the top of the Boston Mountains.

This map unit makes up about 3 percent of the county. It consists of about 55 percent Linker soils, 28 percent Steprock soils, 6 percent Leadvale soils, and 11 percent soils of minor extent.

Linker soils are moderately deep and are well drained. They are on gently sloping to strongly sloping mountaintops. These soils have a dark brown loam surface layer. The subsoil is dark brown loam, yellowish red clay loam, red clay loam, and mottled red, yellowish red, and brown clay loam. The underlying material is hard, level-bedded, red sandstone bedrock.

Steprock soils are moderately deep and are well drained. They are on gently sloping to strongly sloping mountaintops. These soils have a dark brown gravelly loam surface layer and yellowish brown gravelly fine sandy loam subsurface layer. The subsoil is strong brown very gravelly loam and yellowish red very gravelly sandy clay loam. The underlying material is platy, level-bedded sandstone that has yellowish red sandy clay loam between the plates.

Leadvale soils are deep and are moderately well drained. They are on gently sloping mountaintops. These soils have a dark brown silt loam surface layer. The subsoil is yellowish brown silt loam, strong brown silty clay loam, and mottled yellowish brown, gray, and red clay. The underlying material is interbedded shale, siltstone, and sandstone.

The soils of minor extent in this map unit are Enders, Mountainburg, and Nella soils. Enders soils are on upland crests. Mountainburg and Nella soils are in similar positions on moderately sloping mountaintops. Also of minor extent are outcrops of sandstone and some areas of soils that are very stony.

Most of the soils in this map unit have been cleared of trees and are used for pasture or hay. Most of the acreage was originally in mixed upland hardwoods and pine. Slopes, depth to bedrock, and the severe hazard of erosion are the main limitations of these soils for farming and most other uses.

The soils in this map unit are moderately suited to or poorly suited to cultivated crops because of slope. They are well suited to or moderately suited to pasture because of slope. They are moderately suited to woodland.

Steprock, Linker, and Leadvale soils are moderately suited to most urban uses. Depth to bedrock is the main limitation of Linker and Steprock soils for urban use, and low strength, wetness, and slow permeability are the main limitations of Leadvale soils. Special design and proper construction are needed to overcome the low strength, wetness, and permeability limitations. The depth to bedrock limitation is more difficult and often impractical to overcome.

3. Noark-Clarksville

Deep, gently sloping to very steep, well drained and somewhat excessively drained, very cherty soils that formed in residuum of cherty limestone

Areas of these soils are in the northeast part of the county. These soils are on ridges and hillsides of the Springfield Plateau.

This map unit makes up about 13 percent of the county. It consists of about 58 percent Noark soils, 27 percent Clarksville soils, and 15 percent soils of minor extent.

Noark soils are well drained. They are on gently sloping to steep ridges and hillsides. These soils have a dark grayish brown very cherty silt loam surface layer and a pale brown very cherty silt loam subsurface layer. The subsoil is yellowish red very cherty silty clay, yellowish red very cherty clay, and red mottled very cherty clay.

Clarksville soils are somewhat excessively drained. They are on steep to very steep hillsides. These soils have a brown very cherty silt loam surface layer and a pale brown extremely cherty silt loam subsurface layer. The subsoil is yellowish brown extremely cherty silt loam, strong brown extremely cherty silt loam, yellowish red extremely cherty silty clay loam, and red extremely cherty silty clay.

The soils of minor extent in this map unit are Arkana, Moko, and Nixa soils. The Arkana soils are very cherty, and Moko soils are very stony. These soils are on the lower hillsides that have outcrops of limestone. Nixa soils are very cherty. They are on ridgetops and uplands.

The soils in this map unit are used as woodland or for pasture or hay. Most of the acreage was originally in hardwoods or mixed hardwoods and pine. Slope, the hazard of erosion, and the high content of chert fragments are the main limitations for farming and most other uses.

Noark soils are moderately suited to or not suited to cultivated crops. Clarksville soils are not suited to cultivated crops. Slope, the hazard of erosion, and chert on the surface layer are the main limitations.

Noark soils are moderately suited to or poorly suited to improved pasture, depending upon slope. Clarksville soils are poorly suited to or not suited to improved pasture because of slope and droughtiness.

Noark and Clarksville soils are moderately suited to woodland.

Noark soils are moderately suited to or poorly suited to most urban uses. Slope and the moderate permeability of the subsoil are the main limitations. Special design

and proper construction generally can help to alleviate these limitations. The slope limitation becomes more difficult to overcome as the slope gradient increases. Clarksville soils are poorly suited to most urban uses. Slope is the main limitation.

4. Arkana-Moko-Lily

Moderately deep and shallow, strongly sloping to steep, well drained, cherty, stony, or loamy soils that formed in residuum of limestone or sandstone

Areas of these soils are in the northeast part of the county. These soils are on hilltops, foot slopes, and hillsides of the Salem Plateau and along the Buffalo National River.

This map unit makes up about 7 percent of the county. It consists of about 35 percent Arkana soils, 32 percent Moko soils, 12 percent Lily soils, and 21 percent soils of minor extent.

Arkana soils are moderately deep and very cherty, and Moko soils are shallow and very stony. These soils generally are intermingled on strongly sloping to steep hillsides near limestone outcrops. Arkana soils have a very dark grayish brown very cherty silt loam surface layer and a dark brown very cherty silt loam subsurface layer. The subsoil is reddish brown cherty clay, yellowish red clay, and yellowish brown mottled clay. The underlying material is hard, level-bedded limestone bedrock.

Moko soils have a very dark gray very stony silt loam surface layer and a very dark grayish brown very stony silty clay loam subsurface layer. The underlying material is hard, level-bedded limestone bedrock.

Lily soils are moderately deep and stony. They are on strongly sloping to steep hilltops and hillsides. These soils have a dark brown stony fine sandy loam surface layer. The subsoil is dark yellowish brown fine sandy loam, yellowish red sandy clay loam, and mottled light brownish gray, red, and strong brown loamy sand. The underlying material is stratified light brownish gray, strong brown, and yellowish brown loamy sand. Hard gray sandstone bedrock is below the stratified sand.

The soils of minor extent in this map unit are Clarksville, Noark, Razort, Portia, Estate, and Udorthents soils. Clarksville and Noark soils are very cherty. They are on steep hillsides at higher elevations. Razort soils are on flood plains. Portia, Estate, and Udorthents soils are in similar positions on the landscape as Arkana, Moko, and Lily soils. Also of minor extent are outcrops and escarpments of sandstone and limestone.

Most of the soils in this map unit are used as woodland. These woodlands are made up mainly of mixed low grade hardwoods, pine, and eastern redcedar trees. A few of the less sloping areas of these soils have been cleared of trees and stones and are used for pasture or hay, or they are left idle. Slope, stoniness, outcrops of bedrock, and the hazard of erosion are the main limitations for farming and other uses.

The soils in this map unit are not suited to cultivated crops. Slope, stoniness, and severe erosion hazard limit the use of these soils for crops.

These soils are poorly suited to or not suited to improved pasture because of slope.

Arkana and Moko soils are poorly suited to woodland, but this is a suitable use of the soils. Lily soils are moderately suited to woodland.

Arkana, Moko, and Lily soils are poorly suited to most urban uses. Depth to bedrock and slope are the main limitations. Shrink-swell potential, very slow permeability, and low strength are also limitations of Arkana soils for urban use, and large surface stones is also a limitation of Moko soils. Special design and proper construction are needed to overcome the slope, shrink-swell potential, permeability, and low strength limitations. The slope and depth to bedrock limitations become more difficult to overcome as slope gradient increases. It is often impractical to try to overcome the depth to bedrock limitation.

5. Spadra-Razort-Ceda

Deep, level to gently sloping, well drained, loamy and cobbly soils that formed in alluvium

Areas of these soils are scattered throughout the county. These soils are on terraces and flood plains along the Buffalo River, Little Buffalo River, Big Creek, Piney Creek, Cove Creek, and other small streams.

This map unit makes up about 3 percent of the county. It consists of about 34 percent Spadra soils, 28 percent Razort soils, 25 percent Ceda soils, and 13 percent soils of minor extent.

Some areas of Spadra soils do not flood, and some areas of these soils are occasionally flooded. Spadra soils are on level to gently sloping stream terraces. They have a dark brown loam surface layer. The subsoil is dark brown loam, dark brown sandy clay loam, strong brown sandy clay loam, and reddish brown mottled fine sandy loam. The substratum is reddish brown gravelly fine sandy loam.

Razort soils are occasionally flooded. They are on level to nearly level flood plains. These soils have a dark brown loam surface layer. The subsoil is dark brown loam and dark brown fine sandy loam. The substratum is dark yellowish brown gravelly sandy loam.

Ceda soils are frequently flooded. They are on level to nearly level flood plains. These soils have a dark brown cobbly loam surface layer. The underlying material is yellowish brown very gravelly loam and strong brown very gravelly loam.

The soils of minor extent in this map unit are Kenn, Wideman, Nella, Enders, and Steprock soils. Kenn and Wideman soils are on flood plains. Nella, Enders, and Steprock soils are stony and very stony. These soils are on adjacent steep and very steep side slopes. Also of

minor extent are some gravel bars, overflow channels, and riverwash.

The soils in this map unit are mainly used for pasture and hay (fig. 4). The hazards of flooding and of erosion are the main limitations for farming and most other uses.

Spadra soils that occasionally flood and those that do not flood are moderately suited to cultivated crops. Razort soils are moderately suited to cultivated crops because of occasional flooding. Ceda soils are not suited to cultivated crops because of frequent flooding.

Spadra and Razort soils are well suited to pasture and hay. Ceda soils are moderately suited to pasture and hay.

The soils in this map unit are well suited to woodland.

The Spadra soils that do not flood are well suited to most urban uses. Razort and Ceda soils are poorly suited to most urban uses because of flooding. Major flood control systems are needed to overcome the hazard of flooding.

6. Noark-Peridge-Nixa

Deep, gently sloping to strongly sloping, well drained and moderately well drained, very cherty or loamy soils that formed in residuum of cherty limestone, limestone, or old alluvium

Areas of these soils are in the extreme northeast corner of the county. These soils are on broad uplands of the Springfield Plateau and on stream terraces.

This map unit makes up about 1 percent of the county. It consists of about 52 percent Noark soils, 16 percent Peridge soils, 16 percent Nixa soils, and 16 percent soils of minor extent.

Noark soils are very cherty and are well drained. They are on gently sloping to strongly sloping ridges. These soils have a dark grayish brown very cherty silt loam surface layer and a pale brown very cherty silt loam subsurface layer. The subsoil is yellowish red very cherty silty clay, yellowish red very cherty clay, and red very cherty clay.

Peridge soils are loamy and are well drained. They are on gently sloping uplands and stream terraces. These

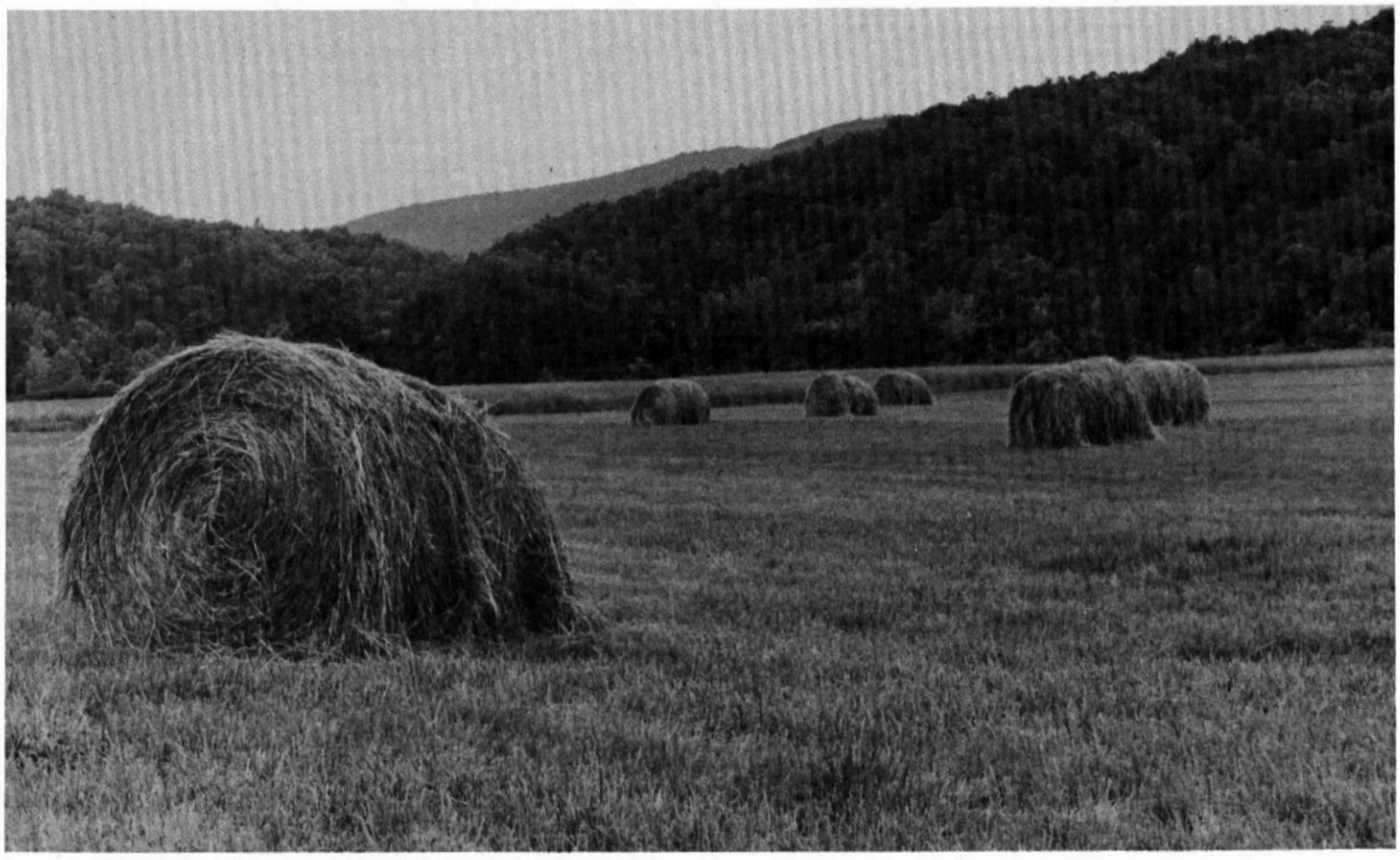


Figure 4.—This fescue hay crop is on Razort loam, occasionally flooded. This soil is used mainly for pasture and hay, and round bales are used to reduce labor costs.

soils have a dark brown silt loam surface layer. The subsoil is yellowish red silty clay loam, red silty clay loam, red gravelly silty clay loam, and red silty clay.

Nixa soils are very cherty and are moderately well drained. They are on gently sloping and strongly sloping ridges. These soils have a dark grayish brown very cherty silt loam surface layer and a brown very cherty silt loam subsurface layer. The subsoil is yellowish brown very cherty silt loam, strong brown mottled extremely cherty silt loam, mottled strong brown, yellowish brown, and light brownish gray extremely cherty silt loam, and mottled strong brown and light brownish gray extremely cherty silty clay.

The soils of minor extent in this map unit are Arkana and Moko soils. Arkana soils are very cherty. They are on the lower hillsides. Moko soils are very stony. They are on the lower hillsides and near outcrops of limestone. Also of minor extent are scattered, small areas of outcrops and escarpments of limestone.

Most of the soils in this map unit have been cleared and are used for pasture or hay. Most of the acreage was originally in mixed upland hardwoods. The slope and high content of chert fragments are the main limitations for farming and most other uses.

Noark and Nixa soils are moderately suited to or not suited to cultivated crops. Peridge soils are moderately suited to cultivated crops. Slope, the hazard of erosion, and chert on the surface are the main limitations.

Noark, Peridge and Nixa soils are well suited to woodland.

Noark, Peridge, and Nixa soils are moderately suited to most urban uses. Slope and the very slow permeability of Nixa soils and the moderate permeability of Noark and Peridge soils are the main limitations. These limitations generally can be overcome.

7. Nella-Enders-Steprock

Deep and moderately deep, strongly sloping to very steep, well drained, stony and very stony soils that formed in residuum or in colluvium of acid sandstone or shale

Areas of these soils are scattered throughout the county. These soils are on tops, benches, foot slopes and sides of the Boston Mountains (fig. 5).

This map unit makes up about 70 percent of the county. It consists of about 35 percent Nella soils, 23 percent Enders soils, 9 percent Steprock soils, and 33 percent soils of minor extent.

Nella soils are deep, stony, and very stony. They are on strongly sloping uplands and benches and on steep and very steep mountainsides. These soils typically have a dark grayish brown stony loam or very stony loam surface layer and a dark brown cobbly loam subsurface layer. The subsoil is reddish brown loam, yellowish red stony clay loam, and yellowish red mottled cobbly clay loam.

Enders soils are deep and stony. They are on strongly sloping and steep mountainsides and foot slopes. These soils have a very dark grayish brown stony loam surface layer. The subsoil is strong brown gravelly loam, red silty clay loam, red silty clay, and red mottled shaly clay. The underlying material is soft, weathered dark gray shale and light brownish gray clay. Black fissile shale bedrock is below the weathered shale and clay.

Steprock soils are moderately deep, gravelly, and very stony. They are on the strongly sloping upper side slopes and mountaintops and on the steep and very steep mountainsides. These soils typically have a dark brown very stony fine sandy loam surface layer and yellowish brown very stony fine sandy loam subsurface layer. The subsoil is strong brown very gravelly loam and yellowish red very gravelly sandy clay loam. The underlying material is soft, weathered, platy, level-bedded sandstone that has yellowish red sandy clay loam between the plates.

The soils of minor extent in this map unit are Ceda, Eden, Kenn, Leesburg, Linker, Mountainburg, Newnata, and Spadra soils. Ceda soils are deep and cobbly. Kenn soils are fine sandy loam. Ceda and Kenn soils are along frequently flooded drainageways. Eden soils are moderately deep and flaggy. They are on moderately sloping to steep foot slopes and steep and very steep mountainsides. Leesburg soils are deep and stony. They are on benches, foot slopes, and steep mountainsides. Linker soils are moderately deep loam and gravelly loam. They are on gently sloping and moderately sloping mountaintops. Mountainburg soils are shallow and gravelly and very stony. They are on gently sloping to moderately sloping mountaintops and steep to very steep sides and rims of mountaintops. Newnata soils are deep. They are on moderately sloping to steep foot slopes and steep and very steep mountainsides. Spadra soils are loamy. They are on terraces along drainageways. Also of minor extent are outcrops of sandstone, which, in places, form prominent bluffs.

Most of the soils in this map unit are used as woodland. These woodlands are made up mainly of mixed hardwoods and scattered pine plantations in the National forest. Originally, Nella soils had a dense stand of hardwood trees and Enders and Steprock soils had an open stand of hardwood trees, and prairie plants were in the open areas. Most of the desirable trees have been harvested, leaving a stand of undesirable trees and young trees. Surface stoniness, slope, and depth to bedrock are the main limitations of the Steprock soils for farming and for most other uses.

The soils in this map unit are not suited to cultivated crops. These soils are poorly suited to or not suited to pasture. They are moderately suited to woodland.

Nella and Steprock soils are moderately suited to or not suited to most urban uses. Enders soils are poorly suited to most urban uses. Slope and surface stoniness are the main limitations of the Nella soils for urban use;

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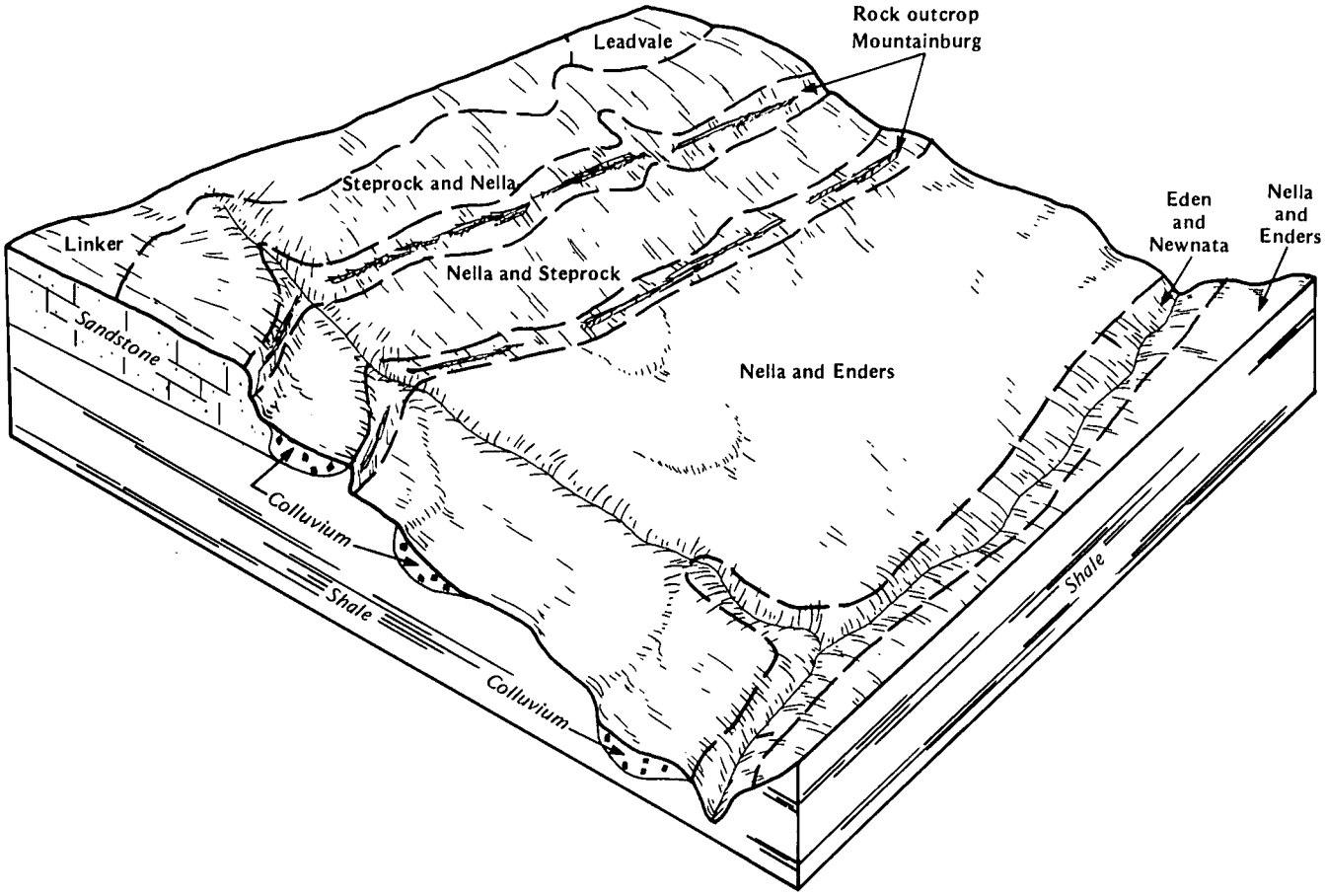

Figure 5.—Pattern of soils and parent material in Nella-Enders-Steprock general soil map unit.

slope, surface stoniness, low strength, and high shrink-swell potential are the main limitations of the Enders soils; and slope, depth to bedrock, and surface stoniness are the main limitations of the Steprock soils. Special design and proper construction are needed to overcome the low strength and high shrink-swell potential limitations. The slope and depth to bedrock limitations become more difficult to overcome as slope gradient increases.

Detailed Soil Map Units

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

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

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

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, Noark very cherty silt loam, 8 to 20 percent slopes, is one of several phases in the Noark 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. Arkana-Moko complex, 8 to 20 percent slopes, is an example.

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 5 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.

1—Arkana very cherty silt loam, 3 to 8 percent slopes. This soil is moderately deep, gently sloping, and well drained. It is on limestone ridges and on hillsides. The slopes are mostly convex and smooth. The mapped areas range from about 5 to 20 acres.

The typical sequence, depth, and composition of the layers of this Arkana soil are as follows:

Surface layer:
0 to 3 inches; very dark grayish brown very cherty silt loam

Subsurface layer:
3 to 7 inches; dark brown very cherty silt loam

Subsoil:
7 to 13 inches; reddish brown cherty clay
13 to 21 inches; yellowish red clay
21 to 33 inches; yellowish brown clay that has strong brown mottles

Bedrock:
33 to 35 inches; hard, level-bedded limestone

Important soil properties of Arkana soil:

Permeability: Moderate in the surface and subsurface layers, slow in the upper part of the subsoil and very slow in the lower part.

Available water capacity: Low

Organic matter content: Moderate

Natural fertility: Moderate

Soil reaction: Slightly acid or neutral in the surface layer and slightly acid to moderately alkaline in the subsoil

Surface runoff: Medium or rapid

Erosion hazard: Very severe if cultivated crops are grown

Tilth: Easily tilled; cherty surface layer limits use of some farm equipment

High water table: None within a depth of 6 feet

Root zone: Moderately deep; can be penetrated by plant roots to the clayey subsoil

Shrink-swell potential: High

Depth to bedrock: At a depth of 20 to 45 inches (hard)

Included with this soil in mapping are some areas of Moko soils and rock outcrop. Also included are some areas of soils that are similar to Arkana soil but have lighter colors and less chert in the surface layer. These similar soils also have bedrock at a depth of more than 45 inches.

Arkana soil is mainly used for pasture and hay.

It is moderately suited to this use. Adapted pasture plants include tall fescue, bermudagrass, lespedeza, and white clover.

This soil has the capability of producing about 78 cubic feet per acre, per year, of shortleaf pine commercial forest products. Adapted trees include eastern redcedar and shortleaf pine. Concerns in management are surface chert that increases seedling mortality and clay near the surface that restricts the use of equipment.

This soil is poorly suited to cultivated crops. The low available water capacity is a limitation and runoff is medium to rapid. Erosion is a very severe hazard. Contour farming, minimum tillage, terraces, and the use of cover crops reduce runoff and help control erosion.

This soil is poorly suited to most urban uses. High shrink-swell potential is a severe limitation for dwellings and small commercial buildings. Extra reinforcement in footings and backfilling with sandy material can help overcome this limitation. High shrink-swell potential and low strength are severe limitations for local roads and streets. A suitable subgrade or base material will prevent damage to roads and streets. Very slow permeability and depth to bedrock are severe limitations to use of this soil for septic tank absorption fields. A specially designed system or an alternate system can help overcome these limitations.

This Arkana soil is in capability subclass IVe and is in woodland suitability group 5C8.

2—Arkana-Moko complex, 8 to 20 percent slopes. This complex consists of soils that are moderately deep and shallow, strongly sloping to moderately steep, and well drained. These very cherty and very stony soils are on hillsides. The slopes are uneven and convex and include rock ledges. The soils in this map unit were mapped as a complex because the major components of the soils could not be consistently separated at the scale selected for mapping. The mapped areas range from about 20 to a few hundred acres. This complex is made up of about 50 percent Arkana soil, about 35 percent Moko soil, and 15 percent other soils and rock outcrop.

The typical sequence, depth, and composition of the layers of this Arkana soil are as follows:

Surface layer:
0 to 3 inches; very dark grayish brown very cherty silt loam

Subsurface layer:
3 to 7 inches; dark brown very cherty silt loam

Subsoil:
7 to 13 inches; reddish brown cherty clay
13 to 21 inches; yellowish red clay
21 to 33 inches; yellowish brown clay that has strong brown mottles

Bedrock:
33 to 35 inches; hard, level-bedded limestone.

Important soil properties of Arkana soil:

Permeability: Moderate in the surface and subsurface layers, slow in the upper part of the subsoil and very slow in the lower part

Available water capacity: Low

Organic matter content: Moderate

Natural fertility: Moderate

Soil reaction: Slightly acid or neutral in the surface layer and slightly acid to moderately alkaline in the subsoil

Surface runoff: Rapid

Erosion hazard: Severe

Depth to bedrock: At a depth of 20 to 45 inches (hard)

Root zone: Moderately deep; easily penetrated by plant roots to the restrictive clayey subsoil

Shrink-swell potential: High

The typical sequence, depth, and composition of the layers of this Moko soil are as follows:

Surface layer:
0 to 4 inches; very dark gray very stony silt loam

Subsurface layer:
4 to 13 inches; very dark grayish brown very stony silty clay loam

Bedrock:
13 to 15 inches; hard, level-bedded limestone

Important soil properties of Moko soil:

Permeability: Moderately permeable throughout

Available water capacity: Very low

Organic matter content: Moderate

Natural fertility: Moderate

Soil reaction: Neutral or mildly alkaline throughout

Surface runoff: Rapid

Erosion hazard: Severe

Depth to bedrock: At a depth of 10 to 20 inches (hard)

Root zone: Shallow

Shrink-swell potential: Low

Included with these soils in mapping are some areas of Clarksville and Noark soils. Clarksville soils are somewhat excessively drained, and Noark soils are well drained. Also included are some areas of rock outcrop.

In most areas, the soils in this complex are used as woodland, which consists of low-grade hardwoods and cedar. Some acreage is used as pasture.

Arkana soil has the capability of producing about 78 cubic feet per acre, per year, of shortleaf pine commercial forest products. Moko soil has the capability of producing about 32 cubic feet per acre, per year, of eastern redcedar commercial forest products. On Arkana soil, a concern in management is surface chert that increases seedling mortality. Also, clay near the surface restricts the use of equipment. Adapted trees include eastern redcedar and shortleaf pine. On Moko soil, concerns in management are surface stones that restrict the use of equipment and a very low available water capacity that increases seedling mortality. Eastern redcedar is the most suitable tree to plant.

Arkana soil is moderately suited to pasture. Adapted pasture plants include tall fescue, bermudagrass, lespedeza, and white clover. Low available water capacity, moderately steep slopes, and very cherty surface layer are moderate limitations to use as pasture. Moko soil is not suited to pasture. Depth to bedrock, surface stoniness, and very low available water capacity are severe limitations. This soil should not be cleared. The hazard of erosion is very severe if the native vegetation is disturbed.

The soils in this complex are not suited to cultivated crops. Moderately steep slope, chert and stone fragments on the surface layer, low to very low available water capacity, and moderate to shallow rooting depth are very severe limitations for cultivated crops. Erosion is a severe hazard.

Arkana soil is poorly suited to most urban uses. The shrink-swell potential is a severe limitation for dwellings and small commercial buildings. Extra reinforcement in footings and backfilling with sandy material can help overcome this limitation. Slope is also a severe limitation for small commercial buildings. Adapting the design to conform to the natural slope and shaping the site can help overcome the slope limitation. Low strength and high shrink-swell potential are severe limitations for local roads and streets. These limitations can be overcome by using a suitable subgrade or base material, or they can be avoided by selecting a soil that is better suited to this use. Depth to bedrock and very slow permeability are severe limitations to use of these soils for septic tank absorption fields. These limitations can be overcome by enlarging the absorption field, or they can be avoided by selecting a soil that is better suited to this use.

Moko soil is poorly suited to most urban uses. Shallow depth to bedrock and large stones severely limit the use of this soil for local roads and streets, dwellings, and septic tank absorption fields. These limitations are difficult and often impractical to overcome, but by selecting soils that are deep and sites that are better suited to these uses, these limitations can be avoided. Slope is a severe limitation for small commercial buildings. Adapting the design to conform to the natural slope can help overcome the slope limitation.

The soils in this complex are in capability subclass VIIs. Arkana soil is in woodland suitability group 5C8. Moko soil is in woodland suitability group 2X3.

3—Arkana-Moko complex, 20 to 40 percent slopes. This complex consists of soils that are moderately deep and shallow, very cherty and very stony, and well drained. These soils are on steep hillsides. The slopes are uneven and convex. They often have a stepped appearance because of outcrops of horizontally-bedded limestone bedrock. The soils in this map unit were mapped as a complex because the major components of the soils could not be consistently separated at the scale selected for mapping. The mapped areas range from about 20 to a few hundred acres. This complex is made up of about 45 percent Arkana soil, about 45 percent Moko soil, and 10 percent other soils and rock outcrop.

The typical sequence, depth, and composition of the layers of this Arkana soil are as follows:

Surface layer:

0 to 3 inches; very dark grayish brown very cherty silt loam

Subsurface layer:
3 to 7 inches; dark brown very cherty silt loam

Subsoil:
7 to 13 inches; reddish brown cherty clay
13 to 21 inches; yellowish red clay
21 to 33 inches; yellowish brown clay that has strong brown mottles

Bedrock:
33 to 35 inches; hard, level-bedded limestone

Important soil properties of Arkana soil:

Permeability: Moderate in the surface and subsurface layers, slow in the upper part of the subsoil and very slow in the lower part

Available water capacity: Low

Organic matter content: Moderate

Natural fertility: Moderate

Soil reaction: Slightly acid or neutral in the surface layer and slightly acid to moderately alkaline in the subsoil

Surface runoff: Rapid

Erosion hazard: Severe

Depth to bedrock: At a depth of 20 to 45 inches

Root zone: Moderately deep; easily penetrated by plant roots to the restrictive clayey subsoil

Shrink-swell potential: High

The typical sequence, depth, and composition of the layers of this Moko soil are as follows:

Surface layer:
0 to 4 inches; very dark gray very stony silt loam

Subsurface layer:
4 to 13 inches; very dark grayish brown very stony silty clay loam

Bedrock:
13 to 15 inches; hard, level-bedded limestone

Important soil properties of Moko soil:

Permeability: Moderately permeable throughout

Available water capacity: Very low

Organic matter content: Moderate

Natural fertility: Moderate

Soil reaction: Neutral or mildly alkaline throughout

Surface runoff: Rapid

Erosion hazard: Severe

Depth to bedrock: At a depth of 6 to 20 inches (hard)

Root zone: Shallow

Shrink-swell potential: Low

Included with these soils in mapping are areas of Clarksville and Noark soils. Clarksville soils are somewhat excessively drained, and Noark soils are well drained. Also included are some areas of rock outcrop.

In most areas, the soils in this complex are used as woodland, which consists of low-grade hardwood and cedar trees. Some acreages are used as habitat for wildlife.

Arkana soil has the capability of producing about 78 cubic feet per acre, per year, of shortleaf pine commercial forest products. Moko soil has the capability of producing about 32 cubic feet per acre, per year, of eastern redcedar commercial forest products. On Arkana soil, a concern in management is the steep slopes that restrict the use of equipment and increase seedling mortality and the hazard of erosion. Adapted trees include eastern redcedar and shortleaf pine. On Moko soil, concerns in management are slopes and surface stones that restrict the use of equipment and a very low available water capacity and the shallow depth to bedrock that increase seedling mortality. Slopes also increase the hazard of erosion. Eastern redcedar is the most suitable tree to plant.

The soils in this complex are not suited to pasture or cultivated crops because of steep slopes. In addition, Moko soil is not suited to pasture or cultivated crops because of the shallow depth to bedrock, surface stoniness, and very low available water capacity. Arkana and Moko soils are best suited to use as woodland, habitat for wildlife, or for recreation. These soils should not be cleared. The hazard of erosion is very severe if the native vegetation is disturbed.

Arkana soil is poorly suited to most urban uses. Slope, low strength, and high shrink-swell potential are severe limitations for local roads and streets. Slope and high shrink-swell potential are severe limitations for dwellings and small commercial buildings. Slow permeability, slope, and depth to bedrock are severe limitations to use of this soil for septic tank absorption fields. These limitations are difficult and often impractical to overcome. Moko soil is poorly suited to most urban uses. Depth to bedrock, large stones, and slope are severe limitations

for dwellings, small commercial buildings, local roads and streets, and septic tank absorption fields. These limitations are difficult or impractical to overcome.

The soils in this complex are in capability subclass VIIs. Arkana soil is in woodland suitability group 5R8. Moko soil is in woodland suitability group 2X3.

4—Britwater gravelly silt loam, 3 to 8 percent slopes. This soil is deep, gently sloping, and well drained. It is on stream terraces and uplands. The slopes are smooth and convex. The mapped areas are oval or irregularly shaped and range from about 5 to 25 acres.

The typical sequence, depth, and composition of the layers of this Britwater soil are as follows:

Surface layer:
0 to 7 inches; dark brown gravelly silt loam

Subsoil:
7 to 15 inches; yellowish red gravelly silty clay loam
15 to 29 inches; yellowish red very gravelly silty clay loam
29 to 72 inches; red very gravelly silty clay loam

Important soil properties of Britwater soil:

Permeability: Moderate throughout

Available water capacity: Moderate

Organic matter content: Low

Natural fertility: Moderate

Soil reaction: Medium acid or strongly acid throughout

Surface runoff: Medium

Erosion hazard: Severe

Tilth: Easily tilled throughout a wide range of moisture content; slight hindrance to tillage operations because of gravel

High water table: None within a depth of 6 feet

Root zone: Deep; easily penetrated by plant roots

Shrink-swell potential: Low

Included with this soil in mapping are small areas of Peridge and Razort soils. Also included are small areas of soils that are similar to Britwater soil but have a nongravelly surface layer and also some soils on narrow rock escarpments.

Britwater soil is mainly used as pasture or hayland.

This soil is well suited to these uses. Adapted pasture plants include bermudagrass, tall fescue, white clover, lespedeza, and alfalfa. Concerns in management are proper stocking, controlled grazing, maintaining the fertility level, and brush and weed control.

This soil has the capability of producing about 110 cubic feet per acre, per year, of shortleaf pine commercial forest products. Adapted trees include shortleaf pine, loblolly pine, southern red oak, and eastern redcedar. This soil has no significant limitations for woodland use and management.

This soil is moderately suited to cultivated crops. Runoff is medium. Erosion is a severe hazard. Contour farming, minimum tillage, terraces, and the use of cover crops reduce runoff and help control erosion. Gravel on the surface layer and a moderate available water capacity also are limitations for cultivated crops. Adapted crops include corn, soybeans, and small grains.

This soil is moderately suited to most urban uses. Britwater soil has no significant limitations for dwellings and for local roads and streets. Slope is a moderate limitation for small commercial buildings. This limitation can be overcome by land shaping and by special design and proper installation. Permeability is a moderate limitation for septic tank absorption fields. The permeability limitation can be overcome by expanding the size of the absorption field.

This Britwater soil is in capability subclass IIIe and is in woodland suitability group 8A7.

5—Ceda cobbly loam, frequently flooded. This soil is deep, level to nearly level, and well drained. It is on flood plains that generally parallel streams. The mapped areas are long and narrow and range from about 5 to 60 acres. The slopes are undulating and range from 0 to 3 percent.

The typical sequence, depth, and composition of the layers of this Ceda soil are as follows:

Surface layer:
0 to 10 inches; dark brown cobbly loam

Underlying material:
10 to 15 inches; yellowish brown very gravelly loam
15 to 72 inches; strong brown very gravelly loam

Important soil properties of Ceda soil:

Permeability: Rapid throughout

Available water capacity: Low

Organic matter content: Low

Natural fertility: Low

Soil reaction: Slightly acid or medium acid throughout

Surface runoff: Slow to medium

Erosion hazard: Slight

Tilth: Not easily tilled because of cobbles and gravel (fig. 6)

High water table: None within a depth of 6 feet

Root zone: Deep; easily penetrated by plant roots

Shrink-swell potential: Low

Included with this soil in mapping are small areas of Kenn and Spadra soils. The Kenn soils contain less coarse fragments in the surface layer than Ceda soil and are just slightly higher in elevation. The Spadra soils are on stream terraces adjacent to the flood plains. Also included are gravel bars and small areas of soils, adjacent to stream channels, that have a very cobbly or stony surface layer.

Ceda soil is used mainly as woodland or pasture. In most years, flooding occurs at least once in the winter or in the spring for very brief periods. If the soil does not have a vegetative cover, fast-moving floodwaters can cause severe damage by scouring.

This soil is not suited to cultivated crops because of frequent flooding.

This soil is moderately suited to pasture and hay. Suitable pasture plants include bermudagrass, bahiagrass, lespedeza, and tall fescue. Concerns in management are proper stocking, deferred grazing, and weed and brush control. Improved pasture grasses are difficult to establish on this soil because of the large content of coarse fragments on the surface. This soil is well adapted to warm-season grasses once they are established.

This soil has the capability of producing about 110 cubic feet per acre, per year, of shortleaf pine commercial forest products. Suitable trees include loblolly pine, shortleaf pine, American sycamore, and sweetgum. Seedling mortality is severe because of flooding.

This soil is not suited to most urban uses. Flooding is a severe hazard to use of this soil for dwellings, small commercial buildings, local roads and streets, and septic tank absorption fields. Poor filtering capacity is also a

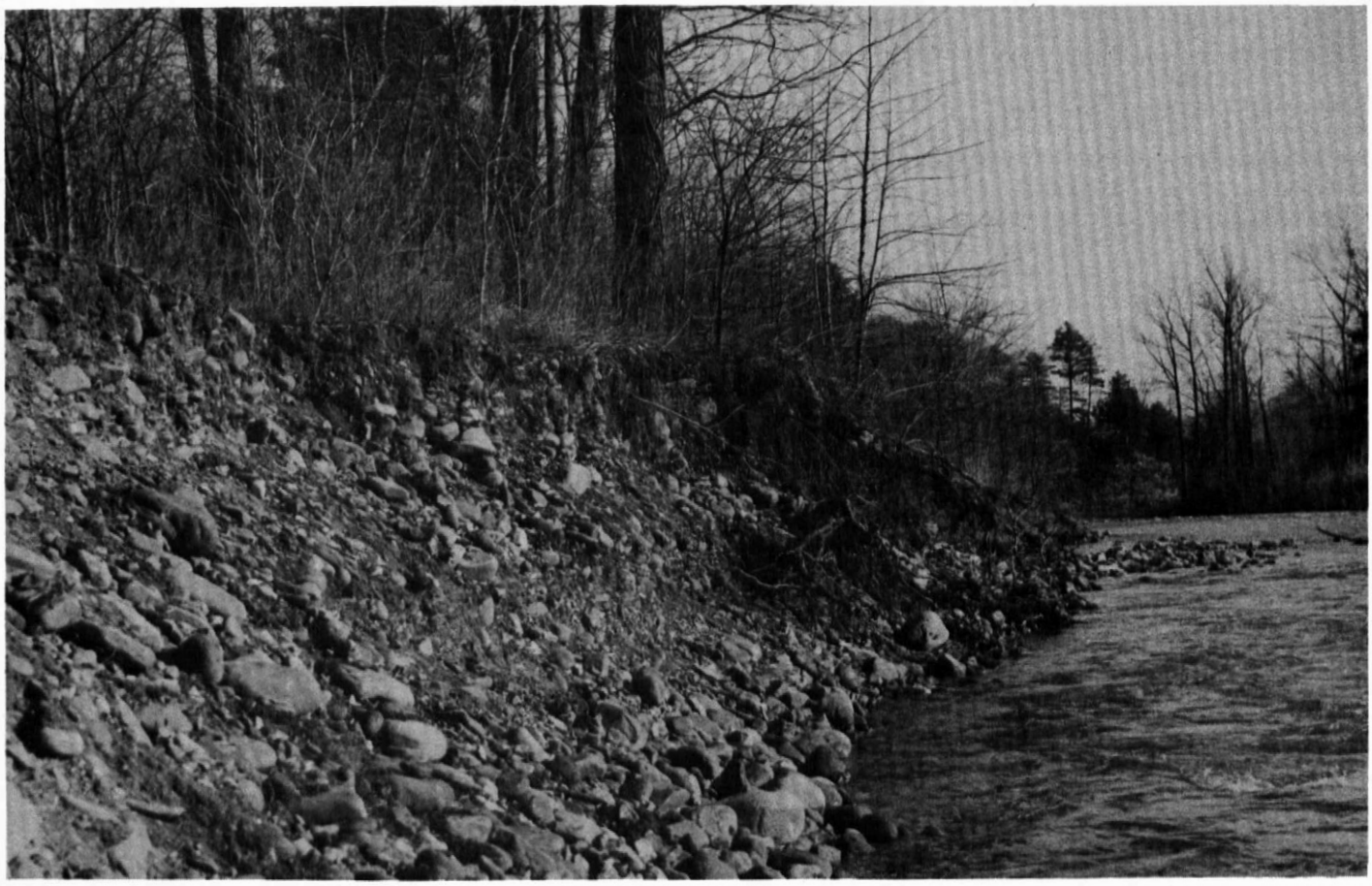

Figure 6.—Profile of Ceda cobbly loam, frequently flooded.

severe limitation to use of this soil for septic tank absorption fields. A major flood control system is needed to overcome this limitation.

This Ceda soil is in capability subclass VIIw and is in woodland suitability group 8W9.

6—Ceda-Kenn complex, frequently flooded. This complex consists of soils that are deep, level to nearly level, and well drained. These soils are on flood plains that generally parallel streams. The soils in this map unit were mapped as a complex because the major components of the soils could not be consistently separated at the scale selected for mapping. The mapped areas range from about 10 to 60 acres. The slopes range from 0 to 3 percent. This complex is made up of about 55 percent cobbly Ceda soils, about 30 percent loamy Kenn soils, and 15 percent other soils.

The typical sequence, depth, and composition of the layers of this Ceda soil are as follows:

Surface layer:
0 to 10 inches, dark brown cobbly loam

Underlying material:
10 to 15 inches; yellowish brown very gravelly loam
15 to 72 inches; strong brown very gravelly loam

Important soil properties of Ceda soil:

Permeability: Rapid throughout

Available water capacity: Low

Organic matter content: Low

Natural fertility: Low

Soil reaction: Slightly acid or medium acid throughout

Surface runoff: Slow or medium

Erosion hazard: Slight

Tilth: Not easily tilled because of cobbles and gravel

High water table: None within a depth of 6 feet

Root zone: Deep; easily penetrated by plant roots

Shrink-swell potential: Low

The typical sequence, depth, and composition of the layers of this Kenn soil are as follows:

Surface layer:
0 to 7 inches; dark brown fine sandy loam

Subsoil:
7 to 13 inches; brown fine sandy loam
13 to 25 inches; strong brown sandy clay loam
25 to 43 inches; dark brown extremely gravelly clay loam

Substratum:
43 to 60 inches; brown extremely gravelly loam

Important soil properties of Kenn soil:

Permeability: Moderate throughout

Available water capacity: Moderate

Organic matter content: Low

Natural fertility: Low

Soil reaction: Slightly acid to strongly acid in the surface layer and strongly acid or very strongly acid in the subsoil

Surface runoff: Slow or medium

Erosion hazard: Slight

Tilth: Good

High water table: None within a depth of 6 feet

Root zone: Deep; easily penetrated by plant roots

Shrink-swell potential: Moderate

Included with these soils in mapping are small areas of Spadra soils. Also included are gravel bars and small areas of soils, adjacent to stream channels, that have a very cobbly or stony surface layer.

The soils in this complex are used mainly as woodland or pasture. In most years, flooding occurs at least once in the winter or in the spring for very brief periods. If the soil does not have a vegetative cover, fast-moving floodwaters can cause severe damage by scouring.

Ceda and Kenn soils are not suited to cultivated crops because of frequent flooding.

The soils in this map unit are moderately suited to pasture and hay. Suitable pasture plants include bermudagrass, bahiagrass, lespedeza, and tall fescue. Concerns in management include proper stocking, deferred grazing, and weed and brush control. Improved pasture grasses are difficult to establish on Ceda soil because of the large content of coarse fragments on the surface layer. These soils are well adapted to warm-season grasses once they are established.

Ceda soil has the capability of producing about 110 cubic feet per acre, per year, of shortleaf pine commercial forest products, and Kenn soil has the capability of producing about 110 cubic feet per acre, per year. Suitable trees include loblolly pine, shortleaf pine, American sycamore, and sweetgum. Flooding increases

seedling mortality on Ceda soil. Kenn soil has no significant limitations for woodland use or management.

The soils in this map unit are not suited to most urban uses. Flooding is a severe hazard to use of these soils for dwellings, small commercial buildings, local roads and streets, and septic tank absorption fields. In addition, the poor filtering capacity is a severe limitation to use of Ceda soil for septic tank absorption fields. A major flood control system is needed to overcome this flooding hazard.

Ceda soil is in capability subclass VIIw, and Kenn soil is in capability subclass Vw. The soils in this complex are in woodland suitability group 8W9.

7—Clarksville very cherty silt loam, 20 to 50 percent slopes. This soil is deep, steep to very steep, and somewhat excessively drained. It is on hillsides. The slopes are complex. The mapped areas range from about 20 to a few thousand acres.

The typical sequence, depth, and composition of the layers of this Clarksville soil are as follows:

Surface layer:
0 to 4 inches; brown very cherty silt loam

Subsurface layer:
4 to 14 inches; pale brown extremely cherty silt loam

Subsoil:
14 to 23 inches; yellowish brown extremely cherty silt loam
23 to 59 inches; strong brown extremely cherty silt loam
59 to 69 inches; yellowish red extremely cherty silt loam
69 to 75 inches; red extremely cherty silty clay

Important soil properties of Clarksville soil:

Permeability: Moderately rapid

Available water capacity: Low

Organic matter content: Low

Natural fertility: Low

Soil reaction: Very strongly acid to medium acid in the surface layer and strongly acid or very strongly acid in the subsoil

Surface runoff: Rapid

Erosion hazard: Very severe if cleared

High water table: None within a depth of 6 feet

Shrink-swell potential: Low

Included with this soil in mapping are small areas of Noark, Arkana, and Moko soils. Also included are some very narrow areas of cobbly soils on flood plains; small areas of rock outcrop; small areas of soils that have cherty limestone bedrock at a depth of 3 feet; and areas of soils that have slopes of more than 50 percent.

In most areas, Clarksville soil is used as woodland. A few areas have been cleared and are used for pasture.

This soil is not suited to cultivated crops and pasture. Slope and rapid runoff are the main limitations. Erosion is a very severe hazard.

This soil has the capability of producing about 90 cubic feet per acre, per year, of shortleaf pine commercial forest products. Suitable trees include shortleaf pine and white oak. Erosion is a moderate hazard. Slopes are severe limitations for woodland use and management because use of equipment is restricted and seedling mortality is increased.

This soil is poorly suited to most urban uses. The steep slopes are a severe limitation to use of this soil for septic tank absorption fields, for dwellings and small commercial buildings, and for local roads and streets. This slope limitation is difficult or impractical to overcome.

This Clarksville soil is in capability subclass VIIs and is in woodland suitability group 6R9.

8—Eden-Newnata complex, 8 to 20 percent slopes. This complex consists of soils that are strongly sloping to moderately steep, flaggy and stony, and well drained. These soils are on foot slopes and mountainsides. The soils in this map unit were mapped as a complex because the major components of the soils could not be consistently separated at the scale selected for mapping. The mapped areas range from about 20 to 1,000 acres or more. This complex is made up of about 55 percent Eden soil that is moderately deep, 30 percent Newnata soil that is deep, and 15 percent other soils and rock outcrop.

Eden soil generally is covered by a thin layer of partly decomposed leaves, needles, and twigs. Under that layer, the typical sequence, depth, and composition of the layers of this Eden soil are as follows:

Surface layer:
0 to 5 inches; very dark grayish brown flaggy silty clay loam

Subsoil:
5 to 13 inches; dark yellowish brown flaggy silty clay
13 to 22 inches; dark yellowish brown flaggy silty clay that has light olive brown mottles

Substratum:
22 to 42 inches; dark grayish brown moderately weathered calcareous shale

42 to 60 inches; dark grayish brown interbedded calcareous shale and limestone

Important soil properties of Eden soil:

Permeability: Slow

Available water capacity: Low

Organic matter content: Moderate

Natural fertility: Moderate

Soil reaction: Medium acid to moderately alkaline in the surface layer and subsoil and mildly alkaline or moderately alkaline in the substratum

Surface runoff: Rapid

Erosion hazard: Severe

Landslide hazard: Severe

Shrink-swell potential: Moderate

Root zone: Moderately deep

Depth to bedrock: At a depth of 20 to 40 inches (soft)

Newnata soil generally is covered by a thin layer of partly decomposed leaves, needles, and twigs. Under that layer, the typical sequence, depth, and composition of the layers of this Newnata soil are as follows:

Surface layer:
0 to 3 inches; very dark grayish brown stony silt loam

Subsoil:
3 to 7 inches; yellowish brown silty clay loam
7 to 22 inches; yellowish brown clay
22 to 34 inches; yellowish brown clay that has pale brown mottles
34 to 44 inches; light olive brown clay

Bedrock:
44 to 46 inches; gray, hard limestone bedrock

Important soil properties of Newnata soil:

Permeability: Slow

Available water capacity: Moderate

Organic matter content: Moderate

Natural fertility: Moderate

Soil reaction: Strongly acid to slightly acid in the surface layer and strongly acid to mildly alkaline in the subsoil

Surface runoff: Rapid

Erosion hazard: Severe

Landslide hazard: Severe

Shrink-swell potential: High

Root zone: Deep; clayey subsoil not easily penetrated by plant roots

Depth to bedrock: At a depth of 40 to 60 inches (hard)

Included with these soils in mapping are small areas of Enders, Leesburg, and Nella soils. Also included are some small areas of soils that are eroded and have outcrops of limestone and shale.

In most areas, the soils in this complex are used as woodland. A few small areas have been cleared and are used for pasture. Shagbark hickory and eastern redcedar are prominent among the mixed hardwoods. The soils in this complex are subject to landslides under natural conditions. This hazard is greatly increased if the soil is disturbed.

Eden and Newnata soils are poorly suited to improved pasture. Suitable pasture plants include tall fescue and bermudagrass. Erosion is a severe hazard if the pasture is overgrazed. Surface stones restrict the use of farm equipment. Concerns in management include proper stocking, proper grazing, and weed and brush control.

The soils of this complex are not suited to cultivated crops. The stony and flaggy surface layer and strongly sloping to moderately steep slopes are the main limitations.

Eden soil has the capability of producing about 37 cubic feet per acre, per year, of eastern redcedar commercial forest products. Newnata soil has the capability of producing about 47 cubic feet per acre, per year, of northern red oak commercial forest products. A suitable tree to plant on Eden soil is eastern redcedar. Suitable trees to plant on Newnata soil are northern red oak, white oak, and eastern redcedar. The large content of clay near the surface is a moderate limitation to the use of equipment on Eden soil, and the clayey surface layer increases seedling mortality. Surface stoniness is a moderate limitation to use of equipment on Newnata soil. Logging roads on Eden and Newnata soils are subject to rutting during wet periods, but by scheduling logging operations during dry periods, this can be overcome.

The soils in this complex are poorly suited to most urban uses. Moderate shrink-swell potential, large stones, and slope are moderate limitations to use of Eden soil for dwellings. Slope is a severe limitation for small commercial buildings. Low strength is a severe

limitation for local roads and streets. The high shrink-swell potential is a severe limitation to use of Newnata soil for dwellings and small commercial buildings. Slope is also a severe limitation for small commercial buildings. Low strength and high shrink-swell potential are severe limitations for local roads and streets. These limitations are difficult to overcome. Extra reinforcement in footings and backfilling with sandy material will prevent damage caused by shrinking and swelling. Adapting the design to conform to the natural slope will help to overcome the slope limitation for commercial buildings. Building roads and streets on the contour and using suitable subgrade or base material will help to overcome the slope and low strength limitations.

Slow permeability is a severe limitation to use of the soils in this map unit for septic tank absorption fields. This limitation is difficult to overcome and may require a specially designed system or an alternate system. In addition, depth to bedrock is also a severe limitation to use of Eden soil for septic tank absorption fields. This limitation is difficult to overcome. It can be avoided by selecting areas or inclusions in the map unit that have soils that are deep.

The soils in this complex are in capability subclass VIs. Eden soil is in woodland suitability group 2C8. Newnata soil is in woodland suitability group 3X8.

9—Eden-Newnata complex, 20 to 40 percent slopes. This complex consists of soils that are steep, flaggy and stony, and well drained. These soils are on mountainsides. The soils in this map unit were mapped as a complex because the major components of the soils could not be consistently separated at the scale selected for mapping. The mapped areas range from about 100 to 1,000 acres or more. This complex consists of about 50 percent Eden soil that is moderately deep, 40 percent Newnata soil that is deep, and 10 percent other soils and rock outcrop.

Eden soil generally is covered by a thin layer of partly decomposed leaves, needles, and twigs. Under that layer, the typical sequence, depth, and composition of the layers of this Eden soil are as follows:

Surface layer:
0 to 5 inches; very dark grayish brown flaggy silty clay loam

Subsoil:
5 to 13 inches; dark yellowish brown flaggy silty clay
13 to 22 inches; dark yellowish brown flaggy silty clay that has light olive brown mottles

Substratum:
22 to 42 inches; dark grayish brown moderately weathered calcareous shale
42 to 60 inches; dark grayish brown interbedded calcareous shale and limestone

Important soil properties of Eden soil:

Permeability: Slow

Available water capacity: Low

Organic matter content: Moderate

Natural fertility: Moderate

Soil reaction: Medium acid to moderately alkaline in the surface layer and subsoil and mildly alkaline or moderately alkaline in the substratum

Surface runoff: Rapid

Erosion hazard: Severe

Landslide hazard: Severe

Shrink-swell potential: Moderate

Root zone: Moderately deep

Depth to bedrock: At a depth of 20 to 40 inches (soft)

Newnata soil generally is covered by a thin layer of partly decomposed leaves, needles, and twigs. Under that layer, the typical sequence, depth, and composition of the layers of this Newnata soil are as follows:

Surface layer:
0 to 3 inches; very dark grayish brown stony silt loam

Subsoil:
3 to 7 inches; yellowish brown silty clay loam
7 to 22 inches; yellowish brown clay
22 to 34 inches; yellowish brown clay that has pale brown mottles
34 to 44 inches; light olive brown clay

Bedrock:
44 to 46 inches; gray, hard limestone bedrock

Important soil properties of Newnata soil:

Permeability: Slow

Available water capacity: Moderate

Organic matter content: Moderate

Natural fertility: Moderate

Soil reaction: Strongly acid to slightly acid in the surface layer and strongly acid to mildly alkaline in the subsoil

Surface runoff: Rapid

Erosion hazard: Very severe

Landslide hazard: Severe

Shrink-swell potential: High

Root zone: Deep; clayey subsoil not easily penetrated

Depth to bedrock: At a depth of 40 to 60 inches (hard)

Included with these soils in mapping are small areas of Enders and Nella soils. Also included are some small areas of soils that are eroded and have outcrops of limestone and shale.

In most areas, the soils in this complex are used as woodland. Shagbark hickory and eastern redcedar are prominent among the mixed hardwoods. The soils in this complex are subject to landslides under natural conditions. This hazard is greatly increased if the soil is disturbed.

Eden and Newnata soils are not suited to cultivated crops or to improved pasture. Steep slopes and the flaggy and stony surface layer severely restrict the use of farm equipment.

Eden soil has the capability of producing about 37 cubic feet per acre, per year, of eastern redcedar commercial forest products. Newnata soil has the capability of producing about 47 cubic feet per acre, per year, of northern red oak commercial forest products. A suitable tree to plant on Eden soil is eastern redcedar. Suitable trees to plant on Newnata soil are northern red oak, white oak, and eastern redcedar. Slope restricts the use of equipment on Eden soil, and the clayey surface layer increases seedling mortality. Slopes and the stony surface layer restrict the use of equipment on Newnata soil. Erosion is a moderate hazard on this soil. Logging roads on Eden and Newnata soils are subject to rutting during wet periods, but by scheduling logging operations during dry periods, this can be overcome.

The soils in this complex are poorly suited to most urban uses. Steep slopes are severe limitations to use of Eden soil for dwellings and small commercial buildings. Steep slopes and low strength are severe limitations for local roads and streets. These limitations are difficult and often impractical to overcome. Slope and a high shrink-swell potential are severe limitations to use of Newnata soil for dwellings and small commercial buildings and for local streets and roads. In addition, low strength is a severe limitation for local roads and streets. These limitations are difficult and often impractical to overcome.

Slow permeability and slope are severe limitations to use of the soils in this map unit for septic tank absorption fields. In addition, depth to bedrock is a severe limitation to use of Eden soil for septic tank absorption fields. This limitation is difficult to overcome, and a specially designed system or an alternate system may be needed if the depth to bedrock limitation is to be overcome.

Eden soil is in capability subclass VIIe and is in woodland suitability group 2R8. Newnata soil is in capability subclass VIIs and is in woodland suitability group 3R8.

10—Eden-Newnata-Rock outcrop complex, 40 to 60 percent slopes. This complex consists of soils that are very steep, flaggy and stony, and well drained. These soils are on mountainsides. The soils in this map unit were mapped as a complex because the major components of the soils could not be consistently separated at the scale selected for mapping. The mapped areas range from about 20 to 1,000 acres or more. This complex is made up of about 40 percent Eden soil that is moderately deep, 35 percent Newnata soil that is deep, 15 percent Rock outcrop, and 10 percent other soils.

Eden soil generally is covered by a thin layer of partly decomposed leaves, needles, and twigs. Under that layer, the typical sequence, depth, and composition of the layers of this Eden soil are as follows:

Surface layer:
0 to 5 inches; very dark grayish brown flaggy silty clay loam

Subsoil:
5 to 13 inches; dark yellowish brown flaggy silty clay
13 to 22 inches; dark yellowish brown flaggy silty clay that has light olive brown mottles

Substratum:
22 to 42 inches; dark grayish brown moderately weathered calcareous shale
42 to 60 inches; dark grayish brown interbedded calcareous shale and limestone

Important soil properties of Eden soil:

Permeability: Slow

Available water capacity: Low

Organic matter content: Moderate

Natural fertility: Moderate

Soil reaction: Medium acid to moderately alkaline in the surface layer and subsoil and mildly alkaline or moderately alkaline in the substratum

Surface runoff: Rapid

Erosion hazard: Severe

Landslide hazard: Severe

Shrink-swell potential: Moderate

Root zone: Moderately deep

Depth to bedrock: At a depth of 20 to 40 inches (soft)

Newnata soil generally is covered by a thin layer of partly decomposed leaves, needles, and twigs. Under that layer, the typical sequence, depth, and composition of the layers of this Newnata soil are as follows:

Surface layer:
0 to 3 inches; very dark grayish brown stony silt loam

Subsoil:
3 to 7 inches; yellowish brown silty clay loam
7 to 22 inches; yellowish brown clay
22 to 34 inches; yellowish brown clay that has pale brown mottles
34 to 44 inches; light olive brown clay

Bedrock:
44 to 46 inches; gray, hard limestone bedrock

Important soil properties of Newnata soil:

Permeability: Slow

Available water capacity: Moderate

Organic matter content: Moderate

Natural fertility: Moderate

Soil reaction: Strongly acid to slightly acid in the surface layer and strongly acid to mildly alkaline in the subsoil

Surface runoff: Rapid

Erosion hazard: Very severe

Landslide hazard: Severe

Shrink-swell potential: High

Root zone: Deep; clayey subsoil not easily penetrated

Depth to bedrock: At a depth of 40 to 60 inches (hard)

Included with these soils in mapping are areas of Mountainburg and Steprock soils. Mountainburg soils are shallow and Steprock soils are moderately deep. These soils are in the upper part of the mapped area near sandstone rock outcrops and escarpments.

In most areas, the soils in this complex are used as woodland. Shagbark hickory and eastern redcedar are prominent among the mixed hardwoods. The soils in this complex are subject to landslides under natural conditions. This hazard is greatly increased if the soil is disturbed.

Eden and Newnata soils are not suited to pasture or cultivated crops. Very steep slopes and surface stones severely limit the use of farm equipment.

Eden soil has the capability of producing about 37 cubic feet per acre, per year, of shortleaf pine commercial forest products. Newnata soil has the capability of producing about 47 cubic feet per acre, per year, of northern red oak commercial forest products. A suitable tree to plant on Eden soil is eastern redcedar. Suitable trees to plant on Newnata soil are northern red oak, white oak, and eastern redcedar. Slopes severely restrict the use of equipment on the soils in this complex. Erosion is a moderate hazard on Eden soil because of slopes, and it is a severe hazard on Newnata soil. The clayey surface layer on Eden soil increases seedling mortality.

The soils in this complex are poorly suited to most urban uses. Steep slopes are severe limitations to use of Eden soil for dwellings and small commercial buildings. Steep slopes and low strength are severe limitations for local roads and streets. These limitations are difficult and often impractical to overcome. Slope and the high shrink-swell potential are severe limitations to use of Newnata soil for dwellings and small commercial buildings and for local streets and roads. Low strength also is a severe limitation of Newnata soil for local roads and streets. These limitations are difficult and often impractical to overcome.

Slow permeability and slope are severe limitations to use of the soils in this map unit for septic tank absorption fields. In addition, depth to bedrock is also a severe limitation to use of Eden soil for septic tank absorption fields. This limitation is difficult to overcome, and a specially designed system or an alternate system may be needed to overcome the depth to bedrock limitation.

Eden soil is in capability subclass VIIe and is in woodland suitability group 2R9. Newnata soil is in capability subclass VIIs and is in woodland suitability group 3R9. Rock outcrop is in capability subclass VIIIs and has not been assigned to a woodland suitability group.

11—Enders gravelly loam, 3 to 8 percent slopes. This soil is deep, gently sloping, and well drained. It is on mountaintops, benches, and foot slopes. The slopes typically are smooth and convex. The mapped areas range from 10 to 200 acres.

Enders soil generally is covered by a thin layer of partly decomposed leaves and twigs. Under that layer, the typical sequence, depth, and composition of the layers of this Enders soil are as follows:

Surface layer:
0 to 5 inches; very dark grayish brown gravelly loam

Subsoil:

5 to 9 inches; strong brown gravelly loam
9 to 27 inches; red silty clay
27 to 46 inches; red shaly clay that has strong brown and yellowish red mottles
46 to 49 inches; mottled red and light brownish gray shaly clay

Substratum:
49 to 55 inches; dark gray weathered shale and light brownish gray clay

Bedrock:
55 to 57 inches; black fissile shale, hardness increases with depth

Important soil properties of Enders soil:

Permeability: Moderate in the surface layer and very slow in the subsoil and in the substratum

Available water capacity: Moderate

Organic matter content: Low

Natural fertility: Low

Soil reaction: Strongly acid to extremely acid throughout

Surface runoff: Medium or rapid

Erosion hazard: Very severe

Shrink-swell potential: High

Root zone: At a depth of 10 to 20 inches

Depth to bedrock: At a depth of 40 to 60 inches (soft)

Included with this soil in mapping are small areas of Linker, Mountainburg, Nella, and Steprock soils. Also included are a few areas that have cobbles and stones on the surface layer; some areas of soils that have eroded spots and shale outcrops; and some areas of soils that are similar to Enders soil except that the combined thickness of the A and B horizons is more than 60 inches.

In most areas, Enders soil is used as woodland, which consists of low-grade hardwoods or is planted to pines. A few areas are used for pasture.

This soil is moderately suited to improved pasture. Suitable pasture plants include bermudagrass, bahiagrass, tall fescue, lespedeza, and white clover. Erosion is a severe hazard if the pasture is overgrazed. Concerns in management include proper stocking, proper grazing, and weed and brush control.

This soil is poorly suited to cultivated crops. Runoff is medium to rapid. Erosion is a very severe hazard if cultivated crops are grown. With good management that includes minimum tillage, contour farming, and terracing, crops that leave a large amount of residue can be grown occasionally. A close-growing cover crop should be left on the surface most of the time.

This soil has the capability of producing about 99 cubic feet per acre, per year, of shortleaf pine commercial forest products. Adapted trees include loblolly pine, shortleaf pine, northern red oak, and white oak. This soil has no significant limitations for woodland use and management. Logging roads are subject to rutting during wet periods, but by scheduling logging operations during dry periods, this can be overcome.

This soil is poorly suited to most urban uses. High shrink-swell potential is a severe limitation for dwellings and small commercial buildings. Extra reinforcement in footings and backfilling with sandy material can help overcome this limitation. High shrink-swell potential and low strength are severe limitations for local roads and streets, but if a suitable subgrade or base material is used, damage to roads and streets can be prevented. Very slow permeability is a severe limitation to use of this soil for septic tank absorption fields. A specially designed system or an alternate system may be needed to overcome the permeability limitation.

This Enders soil is in capability subclass IVe and is in woodland suitability group 7A7.

12—Enders gravelly loam, 8 to 20 percent slopes. This soil is deep, strongly sloping to moderately steep, and well drained. It is on upland crests, benches, and foot slopes. The slopes are convex on crests and concave on foot slopes and mountainsides. The mapped areas range from 10 to 150 acres.

Enders soil generally is covered by a thin layer of partly decomposed leaves and twigs. Under that layer, the typical sequence, depth, and composition of this Enders soil are as follows:

Surface layer:
0 to 5 inches; very dark grayish brown gravelly loam

Subsoil:
5 to 9 inches; strong brown gravelly loam
9 to 27 inches; red silty clay
27 to 46 inches; red shaly clay that has strong brown and yellowish red mottles
46 to 49 inches; mottled red and light brownish gray shaly clay

Substratum:
49 to 55 inches; dark gray weathered shale and light brownish gray clay

Bedrock:
55 to 57 inches; black fissile shale, hardness increases with depth

Important soil properties of Enders soil:

Permeability: Moderate in the surface layer and very slow in the subsoil and in the substratum

Available water capacity: Moderate

Organic matter content: Low

Natural fertility: Low

Soil reaction: Strongly acid to extremely acid throughout

Surface runoff: Rapid

Erosion hazard: Very severe

Shrink-swell potential: High

Root zone: At a depth of 10 to 20 inches

Depth to bedrock: At a depth of 40 to 60 inches (soft)

Included with this soil in mapping are some small areas of Linker, Mountainburg, Nella, and Steprock soils. Also included are a few areas of soils that have cobbles and stones on the surface layer; some areas of soils that have eroded spots and shale outcrops; and some areas of soils that are similar to Enders soil except that the combined thickness of the A and B horizons is more than 60 inches.

In most areas, Enders soil is used as woodland, which consists of low- grade hardwoods; or it is planted to pines. A few areas have been cleared and are used for pasture.

This soil is poorly suited to improved pasture. Suitable pasture plants for areas that have been cleared are bermudagrass, bahiagrass, tall fescue, lespedeza, and white clover. The hazard of erosion is severe. Concerns in management are proper stocking, proper grazing, and weed and brush control.

This Enders soil is not suited to cultivated crops. Runoff is rapid. Erosion is a very severe hazard. The slope restricts the use of some farm equipment.

This soil has the capability of producing about 99 cubic feet per acre, per year, of shortleaf pine commercial forest products. Adapted trees include loblolly pine, shortleaf pine, northern red oak, and white oak. This soil has no significant limitations for woodland use or management. Logging roads are subject to rutting during wet periods, but by scheduling logging operations during dry periods, this can be overcome.

This soil is poorly suited to most urban uses. High shrink-swell potential is a severe limitation for dwellings and small commercial buildings. Slope is also a severe limitation for small commercial buildings. Extra reinforcement in footings and backfilling with sandy material can help overcome the high shrink-swell potential limitation. Land shaping and adapting the design to conform to the natural slope will help overcome the slope limitation. Low strength and a high shrink-swell potential are severe limitations for local roads and streets. Using suitable subgrade or base material will prevent damage to roads and streets. Very slow permeability is a severe limitation to use of this soil for septic tank absorption fields. A specially designed system or an alternate system may be needed to overcome the permeability limitation.

This Enders soil is in capability subclass VIe and is in woodland suitability group 7A7.

13—Enders stony loam, 3 to 20 percent slopes. This soil is deep, gently sloping to moderately steep, and well drained. It is on mountaintops, benches, and foot slopes. The slopes typically are smooth and convex. The mapped areas range from 20 to 200 acres.

Enders soil generally is covered by a thin layer of partly decomposed leaves and twigs. Under that layer, the typical sequence, depth, and composition of the layers of this Enders soil are as follows:

Surface layer:
0 to 5 inches; very dark grayish brown stony loam

Subsoil:
5 to 9 inches; strong brown gravelly loam
9 to 27 inches; red silty clay
27 to 46 inches; red shaly clay that has strong brown and yellowish red mottles
46 to 49 inches; mottled red and light brownish gray shaly clay

Substratum:
49 to 55 inches; dark gray weathered shale and light brownish gray clay

Bedrock:
55 to 57 inches; black fissile shale, hardness increases with depth

Important soil properties of the Enders soil:

Permeability: Moderate in the surface layer and very slow in the subsoil and in the substratum

Available water capacity: Moderate

Organic matter content: Low

Natural fertility: Low

Soil reaction: Strongly acid to extremely acid throughout

Surface runoff: Medium to rapid

Erosion hazard: Very severe

Shrink-swell potential: High

Root zone: Typically 10 to 20 inches

Depth to bedrock: At a depth of 40 to 60 inches (soft)

Included with this soil in mapping are small areas of Leesburg, Mountainburg, Nella, and Steprock soils. Also included are a few areas of soils that have a gravelly or cobbly surface layer; some areas of soils that have eroded spots and shale outcrops; and some areas of soils that are similar to Enders soil except that the combined thickness of the A and B horizons is more than 60 inches.

In most areas, Enders soil is used as woodland, which consists mainly of low-grade hardwoods. A few areas are used for pasture.

This soil is poorly suited to improved pasture. Rapid runoff, moderately steep slopes, and stones are severe limitations. Erosion is a very severe hazard. Suitable plants for established pastures include bermudagrass, bahiagrass, tall fescue, lespedeza, and white clover. Concerns in management include proper stocking, proper grazing, and weed and brush control.

This Enders soil is not suited to cultivated crops. Slope and surface stones are the main limitations. Erosion is a very severe hazard.

This soil has the capability of producing about 88 cubic feet per acre, per year, of shortleaf pine commercial forest products. Adapted trees include loblolly pine, shortleaf pine, northern red oak, and white oak. Surface stoniness restricts the use of equipment.

This soil is poorly suited to most urban uses. High shrink-swell potential is a severe limitation for dwellings and small commercial buildings. Slope is also a severe limitation for small commercial buildings. Extra reinforcement in footings and backfilling with sandy material can help overcome the high shrink-swell potential limitation. Land shaping and adapting the design to conform to the natural slope will help to overcome the slope limitation. Low strength and a high shrink-swell potential are severe limitations for local roads and streets. Using suitable subgrade or base material will prevent damage to roads and streets. Very slow permeability is a severe limitation to use of this soil for septic tank absorption fields. A specially designed system or an alternate system may be needed to overcome the permeability limitation.

This Enders soil is in capability subclass VIs and is in woodland suitability group 6X8.

14—Enders stony loam, 20 to 40 percent slopes. This soil is deep, steep, and well drained. It is on mountainsides. The slopes typically are smooth and concave. The mapped areas range from 40 to 200 acres.

Enders soil generally is covered by a thin layer of partly decomposed leaves and twigs. Under that layer, the typical sequence, depth, and composition of the layers of this Enders soil are as follows:

Surface layer:
0 to 5 inches; very dark grayish brown stony loam

Subsoil:
5 to 9 inches; strong brown gravelly loam
9 to 27 inches; red silty clay
27 to 46 inches; red shaly clay that has strong brown and yellowish red mottles
46 to 49 inches; mottled red and light brownish gray shaly clay

Substratum:
49 to 55 inches; dark gray weathered shale and light brownish gray clay

Bedrock:
55 to 57 inches; black fissile shale, hardness increases with depth

Important soil properties of Enders soil:

Permeability: Moderate in the surface layer and very slow in the subsoil and in the substratum

Available water capacity: Moderate

Organic matter content: Low

Natural fertility: Low

Soil reaction: Strongly acid to extremely acid throughout

Surface runoff: Rapid

Erosion hazard: Very severe

Shrink-swell potential: High

Root zone: At a depth of 10 to 20 inches

Depth to bedrock: At a depth of 40 to 60 inches (soft)

Included with this soil in mapping are small areas of Leesburg, Mountainburg, Nella, and Steprock soils. Also included are a few areas of soils that have a gravelly or cobbly surface layer; some areas of soils that have eroded spots and shale outcrops; and some areas of soils that are similar to Enders soil except that the combined thickness of the A and B horizons is more than 60 inches.

In most areas, Enders soil is used as woodland, which consists of low-grade hardwoods. A few areas have been cleared and are used for pasture.

This soil is not suited to cultivated crops or improved pasture. Surface stoniness and slope are severe limitations.

When this Enders soil slopes south and west, it has the capability of producing about 68 cubic feet per acre, per year, of shortleaf pine commercial forest products;

and when it slopes north and east, it has the capability of producing about 88 cubic feet per acre, per year. Adapted trees include loblolly pine, shortleaf pine, northern red oak, and white oak. Slope is a moderate limitation to woodland use and management. It restricts the use of equipment. Erosion is a moderate hazard. Seedling mortality is severe when the soil slopes south and west and is only slight when it slopes north and east. Logging roads are subject to rutting during the wet periods, but by scheduling logging operations during the dry periods, this can be overcome.

This soil is poorly suited to most urban uses. Slope and high shrink-swell potential are severe limitations for dwellings and small commercial buildings and for local streets and roads. Low strength also is a severe limitation for local roads and streets. These limitations are difficult and often impractical to overcome. The very slow permeability of the subsoil and slope are severe limitations to use of this soil for septic tank absorption fields. These limitations are difficult and often impractical to overcome.

This Enders soil is in capability subclass VIIs and is in woodland suitability group 5R9 when it slopes south and west and in group 6R8 when it slopes north and east.

15—Enders-Leesburg stony loams, 8 to 20 percent slopes. This complex consists of soils that are deep, strongly sloping to moderately steep, and well drained. These soils are on benches, side slopes, and foot slopes. The soils in this map unit were mapped as a complex because the major components of the soils could not be consistently separated at the scale selected for mapping. The mapped areas range from about 20 to 1,000 acres or more. This complex is made up of about 60 percent Enders soil, 30 percent Leesburg soil, and 10 percent other soils.

Enders soil generally is covered by a thin layer of partly decomposed leaves and twigs. Under that layer, the typical sequence, depth, and composition of the layers of this Enders soil are as follows:

Surface layer:
0 to 5 inches; very dark grayish brown stony loam

Subsoil:
5 to 9 inches; strong brown gravelly loam
9 to 27 inches; red silty clay
27 to 46 inches; red shaly clay that has strong brown and yellowish red mottles
46 to 49 inches; mottled red and light brownish gray shaly clay

Substratum:
49 to 55 inches; dark gray weathered shale and light brownish gray clay

Bedrock:
55 to 57 inches; black fissile shale, hardness increases with depth

Important soil properties of Enders soil:

Permeability: Moderate in the surface layer and very slow in the subsoil and in the substratum

Available water capacity: Moderate

Organic matter content: Low

Natural fertility: Low

Soil reaction: Strongly acid to extremely acid throughout

Surface runoff: Rapid

Erosion hazard: Very severe

Landslide hazard: Moderate

Shrink-swell potential: High

Root zone: At a depth of 10 to 20 inches

Depth to bedrock: At a depth of 40 to more than 60 inches

Leesburg soil generally is covered by a thin layer of partly decomposed leaves and twigs. Under that layer, the typical sequence, depth, and composition of the layers of this Leesburg soil are as follows:

Surface layer:
0 to 5 inches; dark grayish brown stony loam

Subsurface layer:
5 to 10 inches; yellowish brown stony loam

Subsoil:
10 to 19 inches; strong brown gravelly sandy clay loam
19 to 33 inches; strong brown gravelly clay loam
33 to 72 inches; strong brown cobbly clay loam that has yellowish brown mottles

Important soil properties of Leesburg soil:

Permeability: Moderately rapid in the surface layer and moderate in the subsoil

Available water capacity: Moderate

Organic matter content: Low

Natural fertility: Low

Soil reaction: Strongly acid or very strongly acid throughout

Surface runoff: Rapid

Erosion hazard: Very severe

Landslide hazard: Moderate

Shrink-swell potential: Low to a depth of 40 inches and moderate below 40 inches

Root zone: At a depth of more than 40 inches

Depth to bedrock: None within a depth of 5 feet

Included with these soils in mapping are small areas of Mountainburg, Nella, and Steprock soils. Nella and Steprock soils are in similar positions on the landscape as Leesburg soil. Nella soils are deep, and Steprock soils are moderately deep. Mountainburg soils are shallow and are near rock outcrops and escarpments. Also included are some small areas of bluffs and rock outcrops and some areas of soils that have large boulders on the surface layer.

In most areas, the soils in this complex are used as woodland, mainly low-grade hardwoods. A few areas are used for pasture. The soils in steeper areas are subject to landslides if the soil is disturbed.

Leesburg and Enders soils are poorly suited to pasture. Suitable pasture plants include tall fescue, bermudagrass, lespedeza, bahiagrass, and white clover. The hazard of erosion is severe if the pasture is overgrazed. Surface stones limit the use of farm equipment. Concerns in management are proper stocking, proper grazing, and weed and brush control.

The soils of this map unit are not suited to cultivated crops. Moderately steep slope and large surface stones are the main limitations.

Enders soil has the capability of producing about 86 cubic feet per acre, per year, of shortleaf pine commercial forest products, and Leesburg soil has the capability of producing about 110 cubic feet per acre, per year. Suitable trees to plant include shortleaf pine, loblolly pine, northern red oak, and white oak. Surface stones are a moderate limitation for woodland use and management. They restrict the use of equipment. Logging roads on the Enders soil are subject to rutting during wet periods.

Enders soil is poorly suited to most urban uses. Slope and shrink-swell potential are severe limitations for small commercial buildings. Shrink-swell potential is a severe limitation for dwellings. Adapting the design to conform to the natural slope and shaping the site can help to overcome the slope limitation. Extra reinforcement in footings and backfilling with sandy material can overcome the shrink-swell potential limitation. Low strength and shrink-swell potential are severe limitations for local roads and streets. A suitable subgrade or base material can prevent damage to local roads and streets. Very slow permeability is a severe limitation to use of this soil for septic tank absorption fields. This limitation is difficult to overcome. A specially designed system or an alternate system may be needed, or the limitation can be avoided by selecting a site, if possible, on the moderately permeable Leesburg soil.

Leesburg soil is moderately suited to most urban uses. Slope is a moderate limitation for dwellings and local roads and streets. It is a severe limitation for small commercial buildings. Adapting the design to conform to the natural slope and shaping the site can overcome the slope limitation. Constructing roads and streets on the contour can help to overcome the slope limitation. Moderate permeability and slope are moderate limitations to use of this soil for septic tank absorption fields. The slope and permeability limitations can be overcome by increasing the size of the septic tank absorption field or by modifying the absorption field.

The soils in this map unit are in capability subclass VIs. Enders soil is in woodland suitability group 6X8. Leesburg soil is in woodland suitability group 8X8.

16—Enders-Leesburg stony loams, 20 to 40 percent slopes. This complex consists of soils that are deep, steep, and well drained. These soils are on mountainsides. The soils in this map unit were mapped as a complex because the major components of the soil could not be consistently separated at the scale selected for mapping. The mapped areas range from about 40 to 500 acres or more. This complex is made up of about 50 percent Enders soil, about 40 percent Leesburg soil, and 10 percent other soils.

Enders soil generally is covered by a thin layer of partly decomposed leaves and twigs. Under that layer, the typical sequence, depth, and composition of this Enders soil are as follows:

Surface layer:
0 to 5 inches; very dark grayish brown stony loam

Subsoil:
5 to 9 inches; strong brown gravelly loam
9 to 27 inches; red silty clay
27 to 46 inches; red shaly clay that has strong brown and yellowish red mottles
46 to 49 inches; mottled red and light brownish gray shaly clay

Substratum:
49 to 55 inches; dark gray weathered shale and light brownish gray clay

Bedrock:
55 to 57 inches; black fissile shale, hardness increases with depth

Important soil properties of Enders soil:

Permeability: Moderate in the surface layer and very slow in the subsoil and in the substratum

Available water capacity: Moderate

Organic matter content: Low

Natural fertility: Low

Soil reaction: Strongly acid to extremely acid throughout

Surface runoff: Rapid

Erosion hazard: Very severe

Landslide hazard: Severe

Shrink-swell potential: High

Root zone: At a depth of 10 to 20 inches

Depth to bedrock: At a depth of 40 to more than 60 inches

Leesburg soil generally is covered by a thin layer of partly decomposed leaves and twigs. Under that layer, the typical sequence, depth, and composition of the layers of this Leesburg soil are as follows:

Surface layer:
0 to 5 inches; dark grayish brown stony loam

Subsurface layer:
5 to 10 inches; yellowish brown stony loam

Subsoil:
10 to 19 inches; strong brown gravelly sandy clay loam
19 to 33 inches; strong brown gravelly clay loam
33 to 72 inches; strong brown cobbly clay loam that has yellowish brown mottles

Important soil properties of Leesburg soil:

Permeability: Moderately rapid in the surface layer and moderate in the subsoil

Available water capacity: Moderate

Organic matter content: Low

Natural fertility: Low

Soil reaction: Strongly acid or very strongly acid throughout

Surface runoff: Rapid

Erosion hazard: Very severe

Landslide hazard: Severe

Shrink-swell potential: Low to a depth of 40 inches and moderate below 40 inches

Root zone: At a depth of more than 40 inches

Depth to bedrock: None within a depth of 5 feet

Included with these soils in mapping are some areas of Nella, Mountainburg, and Steprock soils. Nella soils are deep and are in similar positions as Leesburg soil on benches and side slopes. Mountainburg soils are shallow, and Steprock soils are moderately deep. These soils are near rock outcrops and escarpments. Also included are small areas of bluffs and rock outcrops and some areas of soils that have large boulders on the surface layer.

In most areas, the soils in this complex are used as woodland, which consists mainly of low-grade hardwoods. A few areas are used for pasture. The soils in this map unit are subject to landslides under natural conditions. This hazard is greatly increased if the soils are disturbed.

The soils of this map unit are not suited to cultivated crops or improved pasture. Steep slopes and surface stoniness are the main limitations.

When Enders soil slopes south and west, it has the capability of producing about 68 cubic feet per acre, per year, of shortleaf pine commercial forest products and has the capability of producing about 88 cubic feet per acre, per year, when it slopes north and east. Suitable trees to plant are shortleaf pine, loblolly pine, northern red oak, and white oak. Slopes restrict the use of equipment. Erosion is a moderate hazard. Seedling mortality is severe when Enders soil slopes south and west and is slight when the soil slopes north and east.

When Leesburg soil slopes south and west, it has the capability of producing about 88 cubic feet per acre, per year, of shortleaf pine commercial forest products and has the capability of producing about 110 cubic feet per acre, per year, when it slopes north and east. Suitable trees to plant are loblolly pine, shortleaf pine, northern red oak, and white oak. Slopes restrict the use of equipment. Seedling mortality is severe when Leesburg soil slopes south and west and is slight when the soil slopes north and east.

The soils in this map unit are poorly suited to most urban uses. Slope is a severe limitation to use of Leesburg soil for dwellings, local roads and streets, small commercial buildings, and septic tank absorption fields. Slope and the high shrink-swell potential are severe limitations to use of Enders soil for dwellings, small commercial buildings, and local roads and streets. Low strength is also a severe limitation for local roads and streets. The very slow permeability and slope are severe limitations to use of Enders soil for septic tank absorption fields. These limitations are difficult and often impractical to overcome.

The soils in this map unit are in capability subclass VIIs. Enders soil is in woodland suitability group 5R9 when it slopes south and west and in group 6R8 when it slopes north and east. Leesburg soil is in woodland suitability group 6R9 when it slopes south and west and in group 8R8 when it slopes north and east.

17—Estate-Lily-Portia complex, 8 to 20 percent slopes. This complex consists of soils that are strongly sloping to moderately steep, loamy and stony, and well drained. These soils are on hilltops and hillsides. The soils in this map unit were mapped as a complex because the major components of the soils could not be consistently separated at the scale selected for mapping. The mapped areas range from about 10 to 400 acres. This complex is made up of about 35 percent Estate soil that is deep, 30 percent Lily soil that is moderately deep, 25 percent Portia soil that is deep, and 10 percent other soils and rock outcrop.

Estate soil generally is covered by a thin layer of partly decomposed leaves and twigs. Under that layer, the typical sequence, depth, and composition of the layer of this Estate soil are as follows:

Surface layer:
0 to 4 inches; dark yellowish brown stony fine sandy loam

Subsurface layer:
4 to 11 inches; yellowish brown gravelly sandy loam

Subsoil:
11 to 16 inches; strong brown sandy loam
16 to 25 inches; yellowish red sandy clay
25 to 58 inches; red clay

Bedrock:
58 to 62 inches; hard limestone

Important soil properties of Estate soil:

Permeability: Slow

Available water capacity: Moderate

Organic matter content: Low

Natural fertility: Low

Soil reaction: Strongly acid to neutral in the surface and subsurface layers and upper part of the subsoil and medium acid to neutral in the lower part of the subsoil

Surface runoff: Rapid

Root zone: Deep; easily penetrated by plant roots

Depth to bedrock: At a depth of 40 to 60 inches

Lily soil generally is covered by a thin layer of partly decomposed leaves, needles, and twigs. Under that layer, the typical sequence, depth, and composition of the layers of this Lily soil are as follows:

Surface layer:
0 to 4 inches; dark brown stony fine sandy loam

Subsoil:
4 to 9 inches; dark yellowish brown fine sandy loam
9 to 21 inches; yellowish red sandy clay loam
21 to 29 inches; mottled light brownish gray, red, and strong brown loamy sand

Substratum:
29 to 36 inches; light brownish gray, strong brown, and yellowish brown weakly cemented sandstone that crushes to loamy sand

Bedrock:
36 to 38 inches; hard sandstone

Important soil properties of Lily soil:

Permeability: Moderately rapid

Available water capacity: Low

Organic matter content: Low

Natural fertility: Low

Soil reaction: Strongly acid to extremely acid throughout

Surface runoff: Rapid

Root zone: Moderately deep; easily penetrated by plant roots

Depth to bedrock: At a depth of 20 to 40 inches

The typical sequence, depth, and composition of the layers of this Portia soil are as follows:

Surface layer:
0 to 4 inches; dark brown sandy loam

Subsoil:
4 to 15 inches; dark brown loam
15 to 28 inches; yellowish red loam
28 to 41 inches; yellowish red sandy clay loam
41 to 58 inches; red sandy clay loam
458 to 72 inches; red sandy clay

Important soil properties of Portia soil:

Permeability: Moderately slow

Available water capacity: Moderate

Organic matter content: Low

Natural fertility: Low

Soil reaction: Strongly acid to slightly acid in the surface layer, very strongly acid to medium acid in the upper part of the subsoil, and strongly acid or medium acid in the lower part of the subsoil

Surface runoff: Rapid

Root zone: Deep; easily penetrated by plant roots

Depth to bedrock: None within a depth of 5 feet

Included with these soils in mapping are some small areas of escarpments and rock outcrops of sandstone or limestone. Also included are some areas of soils that have slopes of less than 8 percent and some small areas of Udorthents soils.

In most areas, the soils in this complex are used as woodland. A few areas are used for pasture.

Portia soil is moderately suited to pasture, Estate soil is poorly suited to pasture, and Lily soil is not suited to pasture. Suitable plants for established pastures include tall fescue and native grasses. The hazard of erosion is severe if the pasture is overgrazed. Other concerns in management include brush and weed control. Surface stones restrict the use of farm equipment.

The soils in this map unit are not suited to cultivated crops. The stony surface layer and slope are the main limitations.

Estate soil has the capability of producing about 88 cubic feet per acre, per year, of shortleaf pine commercial forest products; Lily soil has the capability of producing about 88 cubic feet per acre, per year; and Portia soil has the capability of producing about 110 cubic feet per acre, per year. Adapted trees are shortleaf pine and northern red oak. Surface stones are a moderate limitation to use of equipment on Estate and Lily soils. Portia soil has a slight limitation for woodland use and management. Seedling mortality is moderate on Lily soil because of the rooting depth.

The soils in this map unit are moderately suited to or poorly suited to most urban uses. Slope and shrink-swell potential are moderate limitations to use of Estate soil for dwellings; slope also is a severe limitation for small commercial buildings; and low strength is a limitation for local roads and streets. These limitations are generally difficult to overcome and will require special design and proper construction or installation. This will increase the cost but will help to overcome the slope, shrink-swell potential, and low strength limitations.

Depth to bedrock and slope are moderate limitations to use of Lily soil for dwellings and for local roads and streets. Slope also is a severe limitation for small commercial buildings. Adapting the design to conform to the natural slope, using fill material for landscaping above the bedrock, and shaping the site can help overcome the slope and depth to bedrock limitations.

Slope is a moderate limitation to use of Portia soil for dwellings and for local roads and streets and is a severe limitation for small commercial buildings. Adapting the design to conform to the natural slope and shaping the site can help to overcome this limitation.

Slow and moderately slow permeability is a severe limitation to use of Estate and Portia soils for septic tank absorption fields. Depth to bedrock is a severe limitation to use of Lily soil for septic tank absorption fields. The permeability and depth to bedrock limitation can be overcome by enlarging the septic tank absorption field or by modifying the absorption field.

The soils in this complex are in capability subclass VIIs. Estate and Lily soils are in woodland suitability group 6X8. Portia soil is in woodland suitability group 8A7.

18—Estate-Lily-Portia complex, 20 to 40 percent slopes. This complex consists of soils that are steep, loamy and stony, and well drained. These soils are on hillsides. The soils in this map unit were mapped as a complex because the major components of the soils could not be consistently separated at the scale selected for mapping. The mapped areas range from about 10 to 500 acres. This complex is made up of about 40 percent Estate soil that is deep, 30 percent Lily soil that is moderately deep, 15 percent Portia soil that is deep, and 15 percent other soils and rock outcrop.

Estate soil generally is covered by a thin layer of partly decomposed leaves and twigs. Under that layer, the typical sequence, depth, and composition of the layers of this Estate soil are as follows:

Surface layer:
0 to 4 inches; dark yellowish brown stony fine sandy loam

Subsurface layer:
4 to 11 inches; yellowish brown gravelly sandy loam

Subsoil:
11 to 16 inches; strong brown sandy loam
16 to 25 inches; yellowish red sandy clay
25 to 58 inches; red clay

Bedrock:
58 to 62 inches; hard limestone

Important soil properties of Estate soil:

Permeability: Slow

Available water capacity: Moderate

Organic matter content: Low

Natural fertility: Low

Soil reaction: Strongly acid to neutral in the surface and subsurface layers and in the upper part of the subsoil, medium acid to neutral in the lower part of the subsoil

Surface runoff: Rapid

Root zone: Deep; easily penetrated by plant roots

Depth to bedrock: At a depth of 40 to 60 inches

Lily soil generally is covered by a thin layer of partly decomposed leaves, needles, and twigs. Under that layer, the typical sequence, depth, and composition of the layers of this Lily soil are as follows:

Surface layer:
0 to 4 inches; dark brown stony fine sandy loam

Subsoil:
4 to 9 inches; dark yellowish brown fine sandy loam
9 to 21 inches; yellowish red sandy clay loam
21 to 29 inches; mottled light brownish gray, red, and strong brown loamy sand

Substratum layer:
29 to 36 inches; light brownish gray, strong brown, and yellowish brown weakly cemented sandstone that crushes to loamy sand

Bedrock:
36 to 38 inches; sandstone

Important soil properties of Lily soil:

Permeability: Moderately rapid

Available water capacity: Low

Organic matter content: Low

Natural fertility: Low

Soil reaction: Strongly acid to extremely acid throughout

Surface runoff: Rapid

Root zone: Moderately deep; easily penetrated by plant roots

Depth to bedrock: At a depth of 20 to 40 inches

Portia soil generally is on lower hillsides that have slopes of less than 30 percent. The typical sequence, depth, and composition of the layers of this Portia soil are as follows:

Surface layer:
0 to 4 inches; dark brown sandy loam

Subsurface layer:
4 to 15 inches; dark brown loam
15 to 28 inches; yellowish red loam
28 to 41 inches; yellowish red sandy clay loam
41 to 58 inches; red sandy clay loam
58 to 72 inches; red sandy clay

Important soil properties of Portia soil:

Permeability: Moderately slow

Available water capacity: Moderate

Organic matter content: Low

Natural fertility: Low

Soil reaction: Strongly acid to slightly acid in the surface layer, very strongly acid to medium acid in the upper part of the subsoil, and strongly acid or medium acid in the lower part

Surface runoff: Rapid

Root zone: Deep; easily penetrated by plant roots

Depth to bedrock: None within a depth of 5 feet

Included with these soils in mapping are small areas of Clarksville and Udorthents soils. Also included are massive, vertical escarpments of interbedded sandstone and limestone; small areas of outcrops of sandstone or limestone; and some areas of soils that have slopes of more than 40 percent.

In most areas, the soils in this map unit are used as woodland.

These soils are not suited to improved pasture or cultivated crops. Steep slopes, surface stoniness, rock outcrops, and escarpments are the main limitations.

Estate soil has the capability of producing about 88 cubic feet per acre, per year, of shortleaf pine commercial forest products; Lily soil has the capability of producing about 88 cubic feet per acre, per year; and Portia soil has the capability of producing about 110 cubic feet per acre, per year. Adapted trees include shortleaf pine and northern red oak. Slopes and rooting depth are moderate limitations for woodland use and management. Slopes restrict the use of equipment on these soils. Erosion is a moderate hazard on Lily and Portia soils because of slopes. Seedling mortality is moderate on Lily soil because of the rooting depth.

The soils in this map unit are poorly suited to most urban uses. Slope is a severe limitation for dwellings, small commercial buildings, and local roads and streets. In addition, low strength is a severe limitation to use of Estate soil for local roads and streets, and depth to

bedrock is a severe limitation to Lily soil for dwellings, small commercial buildings, and local roads and streets.

Slope is a severe limitation to use of the soils in this map unit for septic tank absorption fields. In addition, slow permeability is a severe limitation to use of Estate soil for septic tank absorption fields; depth to bedrock is a severe limitation to use of Lily soil; and moderately slow permeability is a severe limitation to use of Portia soil. These limitations are difficult to overcome and will require special design and proper construction or installation. This will increase the cost but will help to overcome the slope, depth to bedrock, and permeability limitations.

The soils in the complex are in capability subclass VIIs. Estate and Lily soils are in woodland suitability group 6R8. Portia soil is in woodland suitability group 8R8.

19—Leadvale silt loam, 3 to 8 percent slopes. This soil is deep, gently sloping, and moderately well drained. It is on plateaus and mountaintops. The mapped areas range from 5 to 20 acres.

The typical sequence, depth, and composition of the layers of this Leadvale soil are as follows:

Surface layer:
0 to 5 inches; dark brown silt loam

Subsoil:
5 to 10 inches; yellowish brown silt loam
10 to 25 inches; strong brown silty clay loam
25 to 34 inches; strong brown silty clay loam that has red mottles
34 to 47 inches; strong brown silty clay loam that has red and gray mottles
47 to 52 inches; mottled yellowish brown, gray, and red clay

Bedrock:
52 to 54 inches; interbedded shale, siltstone, and sandstone

Important soil properties of Leadvale soil:

Permeability: Moderate in the surface layer and upper part of the subsoil, slow in the firm part of the subsoil and in the substratum

Available water capacity: Moderate

Organic matter content: Low

Natural fertility: Low

Soil reaction: Strongly acid or very strongly acid throughout

Surface runoff: Moderate

Erosion hazard: Severe

Tilth: Easily tilled throughout a wide range of moisture content

High water table: Perched above the very firm part of the subsoil in winter and early in the spring

Root zone: At a depth of about 25 inches. Below that depth, a fragipan restricts root penetration

Shrink-swell potential: Low

Included with this soil in mapping are small areas of Linker, Mountainburg, and Steprock soils. Also included are some small areas of soils that are poorly drained.

In most areas, this Leadvale soil has been cleared and is mainly used for pasture.

Leadvale soil is well suited to pasture. Adapted pasture plants include bermudagrass, bahiagrass, tall fescue, and white clover. This soil has no significant limitations for pasture. Deferred grazing, rotation grazing, brush and weed control, and proper stocking help control erosion.

This soil is moderately suited to cultivated crops. Suitable crops include small grains and truck crops that are adapted to the local climate. Erosion is a severe hazard. With good management and adequate erosion control, clean-tilled crops can be grown in rotation with grasses. Terraces, contour farming, minimum tillage, proper management of crop residue, and the use of cover crops reduce runoff and help to control erosion. Conservation practices need to be intensified as slope length and gradient increase.

This soil has the capability of producing about 110 cubic feet per acre, per year, of shortleaf pine commercial forest products. Adapted trees include shortleaf pine, loblolly pine, northern red oak, and white oak. This soil has no significant limitations for woodland use and management.

This soil is moderately suited to most urban uses. Wetness is a moderate limitation for dwellings and small commercial buildings. This limitation can be partly overcome by shaping the site so that water moves away from the buildings and by installing tile drains by the footings. Slope is also a moderate limitation for small commercial buildings. Land shaping and adapting the design to conform to the natural slope can help to overcome the slope limitation.

Low strength and wetness are moderate limitations for local roads and streets. The low strength limitation can be overcome by proper construction and using a suitable subgrade or base material to adequately support heavy traffic. Wetness can be overcome by constructing on raised fill material and installing a drainage system.

The slow permeability and wetness are severe limitations to use of this soil for septic tank absorption

fields. The permeability limitation can be partly overcome by enlarging the absorption field and digging a wide, deep trench below the distribution lines. Installing a drainage system around the septic tank absorption field, diverting water from higher areas, or using a specially designed system or an alternate system can help to overcome the wetness limitation. Wetness and permeability limitations are difficult to overcome; and if a septic tank system is to be used, a soil that is more suited to this use should be selected.

This Leadvale soil is in capability subclass IIIe and is in woodland suitability group 8A7.

20—Lily-Udorthents-Rock outcrop complex, 8 to 20 percent slopes. This complex consists of soils that are strongly sloping to moderately steep and well drained to excessively drained. These soils are on hillsides and mountainsides. The soils in this map unit were mapped as a complex because the major components of the soils could not be consistently separated at the scale selected for mapping. The mapped areas range from about 10 to 250 acres. This complex is made up of about 45 percent Lily soil that is moderately deep, about 30 percent Udorthents soil that is shallow, about 15 percent Rock outcrop, and 10 percent other soils.

Lily soil generally is covered by a thin layer of partly decomposed leaves and twigs. Under that layer, the typical sequence, depth, and composition of the layers of this Lily soil are as follows:

Surface layer:
0 to 4 inches; dark brown stony fine sandy loam

Subsoil:
4 to 9 inches; dark yellowish brown fine sandy loam
9 to 21 inches; yellowish red sandy clay loam
21 to 29 inches; mottled light brownish gray, red, and strong brown loamy sand

Substratum:
29 to 36 inches; stratified, light brownish gray, strong brown, and yellowish brown weakly cemented sandstone that crushes to loamy sand

Bedrock:
36 to 38 inches; hard, gray sandstone

Important soil properties of Lily soil:

Permeability: Moderately rapid

Available water capacity: Low

Organic matter content: Low

Natural fertility: Low

Soil reaction: Strongly acid to extremely acid throughout

Surface runoff: Rapid

Root zone: Moderately deep

Depth to bedrock: At a depth of 20 to 40 inches

The Udorthents soil is 6 to 20 inches deep and is underlain by level-bedded, coarse grained, acid sandstone that has limestone on the higher elevations. Texture is mainly sandy loam, fine sandy loam, loamy sand, or loamy fine sand.

Important soil properties of Udorthents soil:

Permeability: Rapid

Available water capacity: Very low

Organic matter content: Low

Natural fertility: Low

Soil reaction: Medium acid to neutral throughout

Surface runoff: Rapid

Root zone: Shallow

Depth to bedrock: At a depth of 6 to 20 inches

Included with these soils in mapping are small areas of Portia soils. Also included are some small areas of soils that have large boulders on the surface layer and small areas of soils that have very few stones on the surface layer.

In most areas, the soils in this complex are used as woodland, which consists of low-grade hardwoods, shortleaf pine, and eastern redcedar. A few small areas have been cleared and are used for native pasture.

The soils in this map unit are not suited to pasture. Suitable plants for established pastures include tall fescue and native grasses. The hazard of erosion is very severe in these areas if the pasture is overgrazed. Other concerns in management include brush and weed control.

The soils in this map unit are not suited to cultivated crops. Surface stones and Rock outcrops limit the use of farm equipment.

Lily soil has the capability of producing about 88 cubic feet per acre, per year, of shortleaf pine commercial forest products. Adapted trees include shortleaf pine, loblolly pine, and eastern redcedar. Seedling mortality is moderate. Surface stones restrict the use of equipment. Udorthents soil in this map unit is not suited to woodland use and should not be cleared of native vegetation (fig. 7).

The soils in this map unit are poorly suited to most urban uses. Depth to bedrock and slope are moderate limitations to use of Lily soil for dwellings and for roads

Figure 7.—Udorthents soil in an area of Lily-Udorthents-Rock outcrop complex, 8 to 20 percent slopes, is not suited to woodland use and should not be cleared of such native vegetation as these eastern redcedars and grasses.

and streets. Slope is a severe limitation for small commercial buildings. Building above the bedrock, adapting the design to conform to the natural slope, and shaping the site can help overcome the slope and depth to bedrock limitations. The slope and depth to bedrock limitations can be avoided by selecting areas or inclusions that have deep soils. Placing the roads and streets on the contour, ripping the bedrock if soft enough, and blasting the bedrock if necessary can help to overcome the limitations for roads and streets. Depth to bedrock is a severe limitation to use of Lily soil for septic tank absorption fields. This limitation can be avoided by selecting areas or inclusions in the map unit that have soils that are deep and are better suited to use as septic tank absorption fields.

Depth to bedrock is a severe limitation to use of Udorthents soil for dwellings, small commercial buildings, local roads and streets, and septic tank absorption fields. Slope is also a severe limitation for small commercial buildings. Poor filtering capacity is also a severe limitation for septic tank absorption fields. These limitations are difficult to overcome. Adapting the design to conform to the natural slope will help to overcome the depth to bedrock, slope, and poor filtering capacity limitations. These limitations can be avoided by selecting areas or inclusions in the map unit that have soils that are deep and more suited to use as septic tank absorption fields or by selecting soils that will not require blasting to remove bedrock.

The Lily and Udorthents soils are in capability subclass VIs. Rock outcrop in this complex is in capability subclass VIIIs. Lily soil is in woodland suitability group 6X8. Udorthents and Rock outcrop have not been assigned to a woodland suitability group.

21—Lily-Udorthents-Rock outcrop complex, 20 to 40 percent slopes. This complex consists of soils that are steep and well drained to excessively drained. These

soils are on hillsides and mountainsides. The soils in this map unit were mapped as a complex because the major components of the soils could not be consistently separated at the scale selected for mapping. The mapped areas range from about 10 to 475 acres. This complex is made up of about 35 percent Lily soil that is moderately deep, about 30 percent Udorthents soil that is shallow, about 25 percent Rock outcrop, and 10 percent other soils.

Lily soil generally is covered by a thin layer of partly decomposed leaves and twigs. Under that layer, the typical sequence, depth, and composition of the layers of this Lily soil are as follows:

Surface layer:
0 to 4 inches; dark brown stony fine sandy loam

Subsoil:
4 to 9 inches; dark yellowish brown fine sandy loam
9 to 21 inches; yellowish red sandy clay loam
21 to 29 inches; mottled light brownish gray, red, and strong brown loamy sand

Substratum:
29 to 36 inches; stratified light brownish gray, strong brown, and yellowish brown weakly cemented sandstone that crushes to loamy sand

Bedrock:
36 to 38 inches; hard, gray sandstone bedrock

Important soil properties of Lily soil:

Permeability: Moderately rapid

Available water capacity: Low

Organic matter content: Low

Natural fertility: Low

Soil reaction: Strongly acid to extremely acid throughout

Surface runoff: Rapid

Root zone: Moderately deep

Depth to bedrock: At a depth of 20 to 40 inches

Udorthents soil is 6 to 20 inches deep and is underlain by level-bedded, coarse grained, acid sandstone that has limestone on the higher elevations. Texture is mainly sandy loam, fine sandy loam, loamy sand, or loamy fine sand.

Important soil properties of Udorthents soil:

Permeability: Rapid

Available water capacity: Very low

Organic matter content: Low

Natural fertility: Low

Soil reaction: Medium acid to neutral throughout

Surface runoff: Rapid

Root zone: Shallow

Depth to bedrock: At a depth of 5 to 20 inches

Included with these soils in mapping are small areas of Portia soils. Also included are some small areas of soils that have large boulders on the surface layer and areas of soils that have slopes of more than 40 percent.

In most areas, the soils in this complex are used as woodland, which consists of low-grade hardwoods, shortleaf pine, and eastern redcedar.

The soils in this map unit are not suited to pasture or cultivated crops. Slope and surface stones are severe limitations for these uses. Runoff is rapid. Erosion is a very severe hazard.

Lily soil has the capability of producing about 88 cubic feet per acre, per year, of shortleaf pine commercial forest products. Adapted trees include shortleaf pine, loblolly pine, and eastern redcedar. Concerns in management are slopes and surface stones that restrict the use of equipment on Lily soil and depth to bedrock that increases seedling mortality. Erosion is a moderate hazard. Udorthents soil is not suited to woodland use and should not be cleared of native vegetation.

The soils in this map unit are poorly suited to most urban uses. Depth to bedrock and slopes are severe limitations for dwellings, small commercial buildings, and local roads and streets. These limitations are difficult and often impractical to overcome. Depth to bedrock, poor filtering capacity, and slopes are severe limitations to use of these soils for septic tank absorption fields. These limitations are difficult and often impractical to overcome.

Lily and Udorthents soils in this complex are in capability subclass VIs, and Rock outcrop is in capability subclass VIIIs. Lily soil is in woodland suitability group 6R8. Udorthents and Rock outcrop have not been assigned to a woodland suitability group.

22—Linker loam, 3 to 8 percent slopes. This soil is moderately deep, gently sloping, and well drained. It is on mountaintops and benches. The slopes are smooth and convex. The mapped areas range from about 10 to 100 acres.

The typical sequence, depth, and composition of the layers of this Linker soil are as follows:

Surface layer:
0 to 5 inches; dark brown loam

Subsoil:
5 to 10 inches; dark brown loam
10 to 18 inches; yellowish red clay loam
18 to 28 inches; red clay loam
28 to 37 inches; mottled red, yellowish red, and brown gravelly clay loam

Bedrock:
37 to 39 inches; hard, level-bedded, acid, red sandstone

Important soil properties of Linker soil:

Permeability: Moderate

Available water capacity: Low

Organic matter content: Low

Natural fertility: Low

Soil reaction: Strongly acid to extremely acid throughout except in areas where the surface layer has been limed

Surface runoff: Medium

Erosion hazard: Severe

Tilth: Easily tilled throughout a wide range of moisture content

Root zone: Moderately deep; easily penetrated by plant roots

Bedrock: At a depth of 20 to 40 inches

Included with this soil in mapping are small areas of Leadvale, Steprock, and Mountainburg soils. Leadvale soils are moderately well drained and are in small concave areas on mountaintops. Steprock and Mountainburg soils are well drained and are on mountaintops and benches. Also included are small areas of soils that have a stony or gravelly surface layer and some small areas of soils that are similar to Linker soil but have bedrock at a depth of more than 40 inches.

Linker soil is well suited to improved pasture. Adapted pasture plants include bermudagrass, lovegrass, lespedeza, tall fescue, and white clover. Good management includes proper stocking, rotation grazing, and brush and weed control.

This soil is moderately suited to cultivated crops. Suitable crops include corn, small grains, and truck crops that are adapted to the local climate. If cultivated crops are grown, runoff is medium. Erosion is a severe hazard. Contour farming, terraces, and minimum tillage should be used if crops that leave a large amount of residue are to be safely grown year after year on the less sloping areas. Conservation practices need to be intensified as slope length and gradient increase.

This soil has the capability of producing about 88 cubic feet per acre, per year, of shortleaf pine commercial forest products. Adapted trees include shortleaf pine, loblolly pine, and eastern redcedar. This soil has no significant limitations for woodland use and management.

This soil is moderately suited to most urban uses. Depth to bedrock is a moderate limitation for dwellings and small commercial buildings. Building above bedrock or using additional fill material for landscaping can help to overcome the depth to bedrock. This limitation can be avoided by selecting areas or inclusions in the map unit that have soils that are deep or by selecting another soil that is better suited to these uses. Slope is also a moderate limitation for small commercial buildings. Adapting the design to conform to the natural slope and shaping the site will help to overcome the slope limitation. Depth to bedrock is a moderate limitation for local roads and streets. The depth to bedrock limitation can be overcome by planning grades, removing bedrock, ripping the bedrock if soft enough, and blasting the bedrock when necessary. Depth to bedrock is a severe limitation to use of this soil for septic tank absorption fields. This limitation can be avoided by selecting areas or inclusions in the map unit that have soils that are deep.

This Linker soil is in capability subclass IIIe and is in woodland suitability group 6A7.

23—Linker gravelly loam, 3 to 8 percent slopes. This soil is moderately deep, gently sloping and well drained. It is on mountaintops and benches. The slopes are smooth and convex. The mapped areas range from about 10 to 100 acres.

The typical sequence, depth, and composition of the layers of this Linker soil are as follows:

Surface layer:
0 to 5 inches; dark brown gravelly loam

Subsoil:
5 to 10 inches; yellowish brown gravelly loam
10 to 18 inches; yellowish red clay loam
18 to 28 inches; red clay loam
28 to 37 inches; mottled red, yellowish red, and brown gravelly clay loam

Bedrock:
37 to 39 inches; hard, level-bedded, acid, red sandstone

Important soil properties of Linker soil:

Permeability: Moderate

Available water capacity: Low

Organic matter content: Low

Natural fertility: Low

Soil reaction: Strongly acid to extremely acid throughout except in areas where the surface layer has been limed

Surface runoff: Medium

Erosion hazard: Severe

Tilth: Easily tilled throughout a wide range of moisture content; surface gravel hinders some tillage operations

Root zone: Moderately deep; easily penetrated by plant roots

Bedrock: At a depth of 20 to 40 inches

Included with this soil in mapping are small areas of Leadvale, Steprock, and Mountainburg soils. Leadvale soils are moderately well drained and are in small concave areas on mountaintops. Steprock and Mountainburg soils are well drained and are on mountaintops and benches. Also included are small areas of soils that have a stony surface layer and some small areas of soils that are similar to Linker soil but have bedrock at a depth of more than 40 inches.

Linker soil is well suited to improved pasture. Adapted pasture plants include bermudagrass, lovegrass, lespedeza, tall fescue, and white clover. Good management includes proper stocking, rotation grazing, and brush and weed control.

This soil is moderately suited to cultivated crops. Suitable crops include corn, small grains, and truck crops that are adapted to the local climate. If cultivated crops are grown, runoff is medium. Erosion is a severe hazard. Contour farming, terraces, and minimum tillage should be used if crops that leave a large amount of residue on the surface are to be safely grown year after year on the less sloping areas. Conservation practices need to be intensified as slope length and gradient increase.

This soil has the capability of producing about 88 cubic feet per acre, per year, of shortleaf pine commercial forest products. Adapted trees include shortleaf pine, loblolly pine, and eastern redcedar. This soil has no significant limitations for woodland use and management.

This soil is moderately suited to most urban uses. Depth to bedrock is a moderate limitation for dwellings and small commercial buildings. The depth to bedrock limitation can be overcome by building above bedrock or using additional fill material for landscaping. The limitation can be avoided by selecting areas or inclusions in the map unit that have soils that are deep or by selecting a soil that is better suited to these uses. Slope is also a moderate limitation for small commercial buildings. Adapting the design to conform to the natural slope and shaping the site can help to overcome the slope limitation. Depth to bedrock is a moderate limitation for local roads and streets. This limitation can be overcome by planning grades, removing bedrock, ripping the bedrock if soft enough, and blasting the bedrock when necessary. Depth to bedrock is a severe limitation to use of this soil for septic tank absorption fields. This limitation can be avoided by selecting areas or inclusions in the map unit that have soils that are deep or by selecting more suitable sites.

This Linker soil is in capability subclass IIIe and is in woodland suitability group 6A7.

24—Linker-Mountainburg complex, 3 to 8 percent slopes. This complex consists of soils that are gently sloping, gravelly and stony, and well drained. These soils are on broad mountaintops and plateaus. The soils in this map unit were mapped as a complex because the major components of the soils could not be consistently separated at the scale selected for mapping. The mapped areas range from about 10 to 100 acres. This complex is made up of about 50 percent Linker soil that is moderately deep, about 45 percent Mountainburg soil that is shallow, and 5 percent other soils.

The typical sequence, depth, and composition of the layers in this Linker soil are as follows:

Surface layer:
0 to 5 inches; dark brown gravelly loam

Subsoil:
5 to 10 inches; dark brown loam
10 to 18 inches; yellowish red clay loam
18 to 28 inches; red clay loam
28 to 37 inches; mottled red, yellowish red, and brown gravelly clay loam

Bedrock:
37 to 39 inches; hard, level-bedded, acid, red sandstone

Important soil properties of Linker soil:

Permeability: Moderate

Available water capacity: Low

Organic matter content: Low

Natural fertility: Low

Soil reaction: Strongly acid to extremely acid throughout except in areas where the surface layer has been limed

Surface runoff: Medium

Erosion hazard: Severe

Depth to bedrock: At a depth of 20 to 40 inches

The typical sequence, depth, and composition of the layers in this Mountainburg soil are as follows:

Surface layer:
0 to 4 inches; dark brown stony fine sandy loam

Subsurface layer:
4 to 9 inches; yellowish brown stony fine sandy loam

Subsoil:
9 to 19 inches; strong brown very stony sandy clay loam

Bedrock:
19 to 21 inches; hard, level-bedded, acid sandstone

Important soil properties of Mountainburg soil:

Permeability: Moderately rapid

Available water capacity: Very low

Organic matter content: Low

Natural fertility: Low

Soil reaction: Strongly acid or medium acid in the surface layer and strongly acid or very strongly acid in the subsoil

Surface runoff: Medium

Erosion hazard: Severe

Depth to bedrock: At a depth of 12 to 20 inches

Included with these soils in mapping are small areas of Enders, Leadvale, and Steprock soils. Also included are small areas of soils that do not have a gravelly or stony surface layer.

In most areas, the soils in this complex are used as parture or woodland. A few areas are used for urban development.

Linker soil is well suited to pasture, and Mountainburg soil is poorly suited. Suitable plants for established pasture include tall fescue, bermudagrass, lovegrass, and native grasses. Good management includes proper stocking, rotation grazing, and brush and weed control.

Linker soil is poorly suited to cultivated crops, and Mountainburg soil is not suited to cultivated crops. If cultivated crops are grown on Linker soil, runoff is medium. Erosion is a severe hazard. Contour farming, terraces, and minimum tillage should be used if crops that leave a large amount of residue on the surface are to be safely grown year after year on the less sloping areas. Conservation practices need to be intensified as slope length and gradient increase. Mountainburg soil has large stones that restrict the use of farm equipment. This soil is droughty.

Linker soil has the capability of producing about 88 cubic feet per acre, per year, of shortleaf pine commercial forest products, and Mountainburg soil has the capability of producing about 68 cubic feet per acre, per year. Adapted trees include shortleaf pine, loblolly pine, and eastern redcedar. Linker soil has no significant limitations for woodland use and management. On Mountainburg soil, the very low available water capacity increases seedling mortality, and large stones restrict the use of equipment.

Linker soil is moderately suited to most urban uses. Depth to bedrock is a moderate limitation of Linker soil for dewllings and small commercial buildings. Building above the bedrock or using additional fill material for landscaping can help overcome this depth to bedrock limitation. This limitation can be avoided by selecting areas or inclusions in the map unit that have soils that are deep or selecting a soil that is better suited to urban use. Slope is also a moderate limitation for small commercial buildings. Adapting the design to conform to the natural slope and shaping the site can help overcome the slope limitation. Depth to bedrock is a moderate limitation for local roads and streets. Planning grades and blasting the bedrock where necessary can help to overcome this depth to bedrock limitation. Depth to bedrock is a severe limitation to use of Linker soil for septic tank absorption fields. This limitation can be avoided by selecting areas or inclusions in the map unit that have soils that are deep.

Mountainburg soil is poorly suited to most urban uses. Depth to bedrock is a severe limitation to use of Mountainburg soil for dwellings, small commercial buildings, local roads and streets, and septic tank absorption fields. This limitation is difficult to overcome, but it can be avoided by selecting areas or inclusions in the map unit that have soils that are deep and by selecting areas where the removal of bedrock is not necessary.

The Linker soil in this complex is in capability subclass IIIe and is in woodland suitability group 6A7. Mountainburg soil is in capability subclass VIs and is in woodland suitability group 5X8.

25—Linker-Mountainburg complex, 8 to 20 percent slopes. This complex consists of soils that are strongly sloping to moderately steep, gravelly and stony, and well drained. These soils are on broad mountaintops and ridgetops. The soils in this map unit were mapped as a complex because the major components of the soils could not be consistently separated at the scale selected for mapping. The mapped areas range from about 10 to 600 acres. This complex is made up of about 50 percent Linker soil that is moderately deep, about 45 percent

Mountainburg soil that is shallow, and 5 percent other soils.

Linker soil generally is covered by a thin layer of partly decomposed leaves, needles, and twigs. Under that layer, the typical sequence, depth, and composition of the layers of this Linker soil are as follows:

Surface layer:
0 to 5 inches; dark brown gravelly loam

Subsoil:
5 to 10 inches; dark brown loam
10 to 18 inches; yellowish red clay loam
18 to 28 inches; red clay loam
28 to 37 inches; mottled red, yellowish red, and brown gravelly clay loam

Bedrock:
37 to 39 inches; hard, level-bedded, acid, red sandstone

Important soil properties of Linker soil:

Permeability: Moderate

Available water capacity: Low

Organic matter content: Low

Natural fertility: Low

Soil reaction: Strongly acid to extremely acid throughout except in areas where the surface layer has been limed

Surface runoff: Rapid

Erosion hazard: Severe

Depth to bedrock: At a depth of 20 to 40 inches

Mountainburg soil generally is covered by a thin layer of partly decomposed leaves, needles, and twigs. Under that layer, the typical sequence, depth, and composition of the layers of this Mountainburg soil are as follows:

Surface layer:
0 to 4 inches; dark brown stony fine sandy loam

Subsurface layer:
4 to 9 inches; yellowish brown stony fine sandy loam

Subsoil:
9 to 19 inches; strong brown very stony sandy clay loam

Bedrock:
19 to 21 inches; hard, level-bedded, acid sandstone

Important soil properties of Mountainburg soil:

Permeability: Moderately rapid

Available water capacity: Very low

Organic matter content: Low

Natural fertility: Low

Soil reaction: Strongly acid or medium acid in the surface layer and strongly acid or very strongly acid in the subsoil

Surface runoff: Rapid

Erosion hazard: Severe

Depth to bedrock: At a depth of 12 to 20 inches

Included with these soils in mapping are small areas of Enders, Leadvale, Nella, and Steprock soils. Also included are small areas of soils that do not have a gravelly or stony surface layer.

In most areas, the soils in this complex are used as woodland. A few areas have been cleared and are used for pasture.

Linker soil is moderately suited to pasture. Mountainburg soil is poorly suited to pasture. Suitable plants for established pastures include tall fescue, bermudagrass, lovegrass, and native grasses. Good management includes proper stocking, rotation grazing, and brush and weed control.

The soils in this map unit are not suited to cultivated crops.

Linker soil has the capability of producing about 88 cubic feet per acre, per year, of shortleaf pine commercial forest products, and Mountainburg soil has the capability of producing about 68 cubic feet per acre, per year. Adapted trees include shortleaf pine, loblolly pine, and eastern redcedar. Linker soil has no significant limitations for woodland use and management. The very low available water capacity that increases seedling mortality and large stones that restrict the use of equipment are moderate limitations to use of Mountainburg soil for woodland use and management.

Linker soil is moderately suited to or poorly suited to most urban uses. Depth to bedrock and slope are moderate limitations for dwellings and roads and streets. Building above the bedrock or using additional fill material above the bedrock for landscaping can help to overcome these limitations. These limitations can be avoided by selecting areas or inclusions in the map unit that have soils that are deep or by selecting another soil that is more suited to these uses. Slope is a severe limitation for small commercial buildings. Adapting the design to conform to the natural slope and land shaping can help to overcome the slope limitation. Depth to bedrock is a severe limitation to use of this soil for septic tank absorption fields. This limitation can be avoided by

selecting areas or inclusions in the map unit that have soils that are deep.

Depth to bedrock is a severe limitation to use of Mountainburg soil for dwellings, small commercial buildings, local roads and streets, and septic tank absorption fields. Slope is also a severe limitation for small commercial buildings. These limitations are difficult to overcome, but adapting the design to conform to the natural slope is helpful. The depth to bedrock and slope limitations for septic tank absorption fields can be avoided by selecting areas or inclusions in the map unit that have soils that are deep or by selecting sites where the removal of bedrock is not necessary.

Linker soil in this complex is in capability subclass IVe and is in woodland suitability group 6A7. Mountainburg soil is in capability subclass VIs and is in woodland suitability group 5X8.

26—Moko-Rock outcrop complex, 15 to 50 percent slopes. This complex consists of Moko soil and limestone Rock outcrop. Moko soil is shallow, moderately steep to very steep, and well drained. Typically, Moko soil is in concave areas above and below rock ledges and outcrops on hilltops and hillsides. This map unit was mapped as a complex because the major components of the soils could not be consistently separated at the scale selected for mapping. The mapped areas range from 5 to 100 acres. This complex is made up of about 50 percent Moko soil, about 40 percent Rock outcrop, and 10 percent other soils.

The typical sequence, depth, and composition of the layers of this Moko soil are as follows:

Surface layer:
0 to 4 inches; very dark gray very stony silt loam
4 to 13 inches; very dark grayish brown very stony silty clay loam

Bedrock:
13 to 15 inches; hard, level-bedded limestone

Important soil properties of Moko soil:

Permeability: Moderate

Available water capacity: Very low

Organic matter content: Moderate

Natural fertility: Moderate

Soil reaction: Neutral or mildly alkaline throughout

Surface runoff: Very rapid

Root zone: Ranges from very shallow to shallow

Depth to bedrock: At a depth of 10 to 20 inches (hard)

Included with these soils in mapping are small areas of Arkana, Clarksville, and Noark soils. Also included are some areas of soils that have slopes of more than 50 percent and have vertical bluffs and some small areas of soils that have interbedded limestone and sandstone.

The soils in this complex are not suited to cultivated crops or pasture because of depth to bedrock, surface stoniness, steep slopes, and the very low available water capacity. These soils are best suited to use as woodland, habitat for wildlife, or for recreation. These soils should not be cleared. The hazard of erosion is very severe if the native vegetation is disturbed.

Moko soil has the capability of producing about 32 cubic feet per acre, per year, of eastern redcedar commercial forest products. The main adapted tree is eastern redcedar. The hazard of erosion is moderate because of slopes. Slopes, surface stones, and shallow rooting depth are the main limitations to woodland use. Surface stones restrict the use of equipment, and the shallow rooting depth increases seedling mortality.

The soils in this map unit are poorly suited to most urban uses. Depth to bedrock, slope, and large stones are severe limitations for dwellings, small commercial buildings, local roads and streets, and septic tank absorption fields. These limitations are difficult or impractical to overcome.

Moko soil in this complex is in capability subclass VIIs and is in woodland suitability group 2X3. Rock outcrop is in capability subclass VIIIs but has not been assigned to a woodland suitability group.

27—Mountainburg gravelly fine sandy loam, 3 to 8 percent slopes. This soil is shallow, gently sloping, and well drained. It is on hilltops, mountaintops, and ridges. The mapped areas range from about 5 to 50 acres.

The typical sequence, depth, and composition of the layers of this Mountainburg soil are as follows:

Surface layer:
0 to 4 inches; dark brown gravelly fine sandy loam

Subsurface layer:
4 to 9 inches; yellowish brown very gravelly fine sandy loam

Subsoil:
9 to 19 inches; strong brown very gravelly sandy clay loam

Bedrock:
19 to 21 inches; hard, level-bedded, acid sandstone

Important soil properties of Mountainburg soil:

Permeability: Moderately rapid

Available water capacity: Very low

Organic matter content: Low

Natural fertility: Low

Soil reaction: Medium acid or strongly acid in the surface layer and strongly acid or very strongly acid in the subsoil

Surface runoff: Medium to rapid

Root zone: Extends to a depth of less than 20 inches; easily penetrated

Depth to bedrock: At a depth of 12 to 20 inches

Included with this soil in mapping are small areas of Enders, Leadvale, Linker, and Steprock soils. Also included are a few small areas of soils that have some rock outcrop and some areas of soils that have a stony surface layer.

In most areas, this Mountainburg soil is used as woodland, which consists mainly of shortleaf pine. Some acreage is used for pasture.

This soil is poorly suited to use as pasture. If used for pasture, some suitable pasture plants include little bluestem, big bluestem, native grasses, bermudagrass, and tall fescue.

This soil is poorly suited to cultivated crops. It is droughty. Erosion is very severe hazard. Seedbed preparation is difficult because of the gravelly surface layer.

This soil has the capability of producing about 68 cubic feet per acre, per year, of shortleaf pine commercial forest products. Adapted trees include shortleaf pine, loblolly pine, and eastern redcedar. A very low available water capacity that increases seedling mortality is the main limitation for woodland use.

This soil is poorly suited to most urban uses. Depth to bedrock is a severe limitation for dwellings, small commercial buildings, local streets and roads, and septic tank absorption fields. Building above the bedrock or using additional fill material above the bedrock for landscaping can help to overcome the depth to bedrock limitation for dwellings and small commercial buildings. This limitation can be avoided by selecting areas or inclusions in the map unit that have soils that are deep or by selecting a soil that is better suited to urban use. Planning grades, ripping the bedrock if soft enough, and blasting the bedrock when necessary can overcome the depth to bedrock limitation for local roads and streets, or the limitation can be avoided by selecting areas where the removal of bedrock is not necessary. The depth to bedrock limitation to use of this soil for septic tank absorption fields can be avoided by selecting areas or inclusions in the map unit that have soils that are deep or by selecting a soil that is better suited to use as septic tank absorption fields.

This Mountainburg soil is in capability subclass IVe and is in woodland suitability group 5D8.

28—Mountainburg very stony fine sandy loam, 3 to 8 percent slopes. This soil is shallow, gently sloping, and well drained. It is on hilltops, mountaintops, and ridges. The mapped areas range from about 5 to 50 acres.

The typical sequence, depth, and composition of the layers of this Mountainburg soil are as follows:

Surface layer:
0 to 4 inches; dark brown very stony fine sandy loam

Subsurface layer:
4 to 9 inches; yellowish brown very stony fine sandy loam

Subsoil:
9 to 19 inches; strong brown very stony sandy clay loam

Bedrock:
9 to 21 inches; hard, level-bedded, acid sandstone

Important soil properties of Mountainburg soil:

Permeability: Moderately rapid

Available water capacity: Very low

Organic matter content: Low

Natural fertility: Low

Soil reaction: Medium acid or strongly acid in the surface layer and strongly acid or very strongly acid in the subsoil

Surface runoff: Medium to rapid

Root zone: Extends to a depth of less than 20 inches; easily penetrated

Depth to bedrock: At a depth of 12 to 20 inches

Included with this soil in mapping are small areas of Enders, Leadvale, Linker, and Steprock soils. Also included are a few small areas of soils that have a sandy loam or gravelly surface layer and occasional rock outcrop.

In most areas, this Mountainburg soil is used as woodland, which consists mainly of low-grade hardwood trees.

This soil is poorly suited to improved pasture and is not suited to cultivated crops. Large stones restrict the use of farm equipment. This soil is droughty. It is best

suited to native pasture, habitat for wildlife, or recreational use.

This soil has the capability of producing about 68 cubic feet per acre, per year, of shortleaf pine commercial forest products. Adapted trees include shortleaf pine, loblolly pine, and eastern redcedar. Concerns in management are the low available water capacity that increases seedling mortality and large stones that restrict the use of equipment.

This soil is poorly suited to most urban uses. Depth to bedrock is a severe limitation for dwellings, small commercial buildings, local roads and streets, and septic tank absorption fields. The depth to bedrock limitation can be avoided by selecting areas or inclusions in the map unit that have soils that are deep or by selecting sites where the removal of bedrock is not necessary.

This Mountainburg soil is in capability subclass VIs and is in woodland suitability group 5X8.

29—Mountainburg very stony fine sandy loam, 8 to 20 percent slopes. This soil is shallow, strongly sloping to moderately steep, and well drained. It is on mountains, ridges, and benches. The mapped areas range from about 5 to 150 acres.

The typical sequence, depth, and composition of the layers of this Mountainburg soil are as follows:

Surface layer:
0 to 4 inches; dark brown very stony fine sandy loam

Subsurface layer:
4 to 9 inches; yellowish brown very stony fine sandy loam

Subsoil:
9 to 19 inches; strong brown very stony sandy clay loam

Bedrock:
19 to 21 inches; hard, level-bedded, acid sandstone

Important soil properties of Mountainburg soil:

Permeability: Moderately rapid

Available water capacity: Very low

Organic matter content: Low

Natural fertility: Low

Soil reaction: Medium acid or strongly acid in the surface layer and strongly acid or very strongly acid in the subsoil

Surface runoff: Medium to rapid

Erosion hazard: Very severe

Root zone: Extends to a depth of less than 20 inches; easily penetrated

Depth to bedrock: At a depth of 12 to 20 inches

Included with this soil in mapping are small areas of Enders, Linker, and Steprock soils. Also included are a few small areas of soils that have a sandy loam or gravelly surface layer and occasional rock outcrop.

In most areas, this Mountainburg soil is used as woodland. The woodland consists mainly of low-grade hardwood trees and eastern redcedar.

This soil is not suited to improved pasture or to cultivated crops. Large stones, shallow depth to bedrock, and very low available water capacity are the main limitations. It is best suited to native pasture, habitat for wildlife, or recreational use.

This soil has the capability of producing about 68 cubic feet per acre, per year, of shortleaf pine commercial forest products. Suitable trees include shortleaf pine, loblolly pine, and eastern redcedar. Concerns in management are the low available water capacity that increases seedling mortality and large stones and slopes that restrict the use of equipment.

This soil is poorly suited to most urban uses. Depth to bedrock is a severe limitation for dwellings, small commercial buildings, local roads and streets, and septic tank absorption fields. Slope is also a severe limitation for small commercial buildings. These limitations are difficult and often impractical to overcome. Selecting areas or inclusions in the map unit that have soils that are deep or selecting sites where the removal of bedrock is not necessary avoids these limitations.

This Mountainburg soil is in capability subclass VIIs and is in woodland suitability group 5X8.

30—Mountainburg very stony fine sandy loam, 20 to 40 percent slopes. This soil is shallow, steep, and well drained. It is on hillsides and mountainsides. The mapped areas range from about 20 to 200 acres.

The typical sequence, depth, and composition of the layers of this Mountainburg soil are as follows:

Surface layer:
0 to 4 inches; dark brown very stony fine sandy loam

Subsurface layer:
4 to 9 inches; yellowish brown very stony fine sandy loam

Subsoil:
9 to 19 inches; strong brown very stony sandy clay loam

Bedrock:
19 to 21 inches; hard, level-bedded, acid sandstone

Important soil properties of Mountainburg soil:

Permeability: Moderately rapid

Available water capacity: Very low

Organic matter content: Low

Natural fertility: Low

Soil reaction: Medium acid or strongly acid in the surface layer and strongly acid or very strongly acid in the subsoil

Surface runoff: Rapid

Erosion hazard: Very severe

Root zone: To a depth of less than 20 inches; easily penetrated

Depth to bedrock: At a depth of 12 to 20 inches

Included with this soil in mapping are small areas of Enders, Nella, and Steprock soils. Also included are small areas of soils that have slopes of more than 40 percent, rock outcrops, and escarpments of sandstone.

In most areas, this Mountainburg soil is used as woodland, which consists mainly of low-grade hardwoods and eastern redcedar.

This soil is not suited to improved pasture or to cultivated crops. Large stones, shallow depth to bedrock, steep slopes, and very low available water capacity are the main limitations. This soil is best suited to native pasture, habitat for wildlife, or recreational use.

This soil has the capability of producing about 68 cubic feet per acre, per year, of shortleaf pine commercial forest products. Suitable trees include shortleaf pine, loblolly pine, and eastern redcedar. Concerns in management are slopes, large stones, the very low available water capacity, and surface stoniness. Erosion is a moderate hazard. Large stones and slopes restrict the use of equipment. The very low available water capacity and surface stoniness increase seedling mortality.

This soil is poorly suited to urban uses. Depth to bedrock and steep slopes are severe limitations for dwellings, small commercial buildings, local roads and streets, and septic tank absorption fields. These limitations are difficult or impractical to overcome. Selecting areas or inclusions in the map unit that have soils that are deep or selecting a soil that is better suited to urban use avoids the depth to bedrock and slope limitations.

This Mountainburg soil is in capability subclass VIIs and is in woodland suitability group 5R8.

31—Nella gravelly loam, 3 to 12 percent slopes. This soil is deep, gently sloping to strongly sloping, and well drained. It is in colluvial positions on benches, mountainsides, and foot slopes. The mapped areas range from 10 to 200 acres.

Nella soil generally is covered by a thin layer of partly decomposed leaves and twigs. Under that layer, the typical sequence, depth, and composition of the layers of this Nella soil are as follows:

Surface layer:
0 to 3 inches; dark grayish brown gravelly loam

Subsurface layer:
3 to 7 inches; dark brown gravelly loam

Subsoil:
7 to 16 inches; reddish brown loam
16 to 52 inches; yellowish red cobbly clay loam
52 to 72 inches; yellowish red cobbly clay loam that has yellowish brown mottles

Important soil properties of Nella soil:

Permeability: Moderate

Available water capacity: Moderate

Organic matter content: Low

Natural fertility: Low

Soil reaction: Strongly acid or very strongly acid except in areas where the surface layer has been limed

Surface runoff: Medium to rapid

Erosion hazard: Very severe

Root zone: Deep and easily penetrated by roots

Included with this soil in mapping are areas of Enders, Leesburg, Linker, Mopuntainburg, and Steprock soils. Leesburg and Enders soils are deep and in similar positions on benches, mountainsides, and foot slopes as Nella soil. Linker soils are moderately deep and are on ridgetops and benches. Mountainburg soils are shallow, and Steprock soils are moderately deep. In most mapped areas, these soils are near rock outcrops and ledges. Also included are some small areas of soils that have stones on the surface layer and some soils that have rock outcrops.

This Nella soil is moderately suited to pasture, and this is the main use. Adapted pasture plants include bermudagrass, bahiagrass, tall fescue, and white clover. Concerns in management include proper stocking, controlled grazing, maintaining fertility level, and brush and weed control.

This soil is poorly suited to cultivated crops. Runoff is medium to rapid. Erosion is a very severe hazard.

Contour farming, minimum tillage, terraces, and the use of cover crops reduce runoff and help control erosion.

This soil has the capability of producing about 110 cubic feet per acre, per year, of shortleaf pine commercial forest products. Adapted trees include loblolly pine, shortleaf pine, northern red oak, and white oak. This soil has no significant limitations for woodland use and management.

This soil is moderately suited to most urban uses. Slope is a moderate limitation for dwellings and small commercial buildings and for local streets and roads. Adapting the design to conform to the natural slope and shaping and grading the site can help to overcome the slope limitation. Permeability and slope are moderate limitations to use of this soil for septic tank absorption fields. The slope limitation can be partly overcome by land shaping and installing lines across the slope. This limitation can be avoided by selecting less sloping areas as sites for septic tank absorption fields. Expanding the size of the septic tank absorption field will help to overcome the permeability limitation.

This Nella soil is in capability subclass IVe and is in woodland suitability group 8A7.

32—Nella gravelly loam, 12 to 20 percent slopes. This soil is deep, moderately steep, and well drained. It is in colluvial positions on benches, mountainsides, and foot slopes. The mapped areas range from 5 to 150 acres.

Nella soil generally is covered by a thin layer of partly decomposed leaves and twigs. Under that layer, the typical sequence, depth, and composition of the layers of this Nella soil are as follows:

Surface layer:
0 to 3 inches; dark grayish brown gravelly loam

Subsurface layer:
3 to 7 inches; dark brown gravelly loam

Subsoil:
7 to 16 inches; reddish brown loam
16 to 52 inches; yellowish red cobbly clay loam
52 to 72 inches; yellowish red cobbly clay loam that has yellowish brown mottles

Important soil properties of Nella soil:

Permeability: Moderate

Available water capacity: Moderate

Organic matter content: Low

Natural fertility: Low

Soil reaction: Strongly acid or very strongly acid except in areas where the surface layer has been limed

Surface runoff: Rapid

Erosion hazard: Very severe

Root zone: Deep; easily penetrated by roots

Included with this soil in mapping are areas of Enders, Leesburg, Mountainburg, and Steprock soils. Leesburg and Enders soils are deep and are in similar positions as Nella soil on benches, mountainsides, and foot slopes. Mountainburg soils are shallow, and Steprock soils are moderately deep. In most mapped areas, these soils are near rock outcrops and ledges. Also included are some small areas of soils that have stones on the surface layer and some soils that have rock outcrops.

This soil is mainly used as pasture.

This Nella soil is moderately suited to pasture. Adapted pasture plants include bermudagrass, bahiagrass, tall fescue, and white clover. Concerns in management include proper stocking, controlled grazing, maintaining fertility level, and brush and weed control.

This soil is not suited to cultivated crops. Runoff is rapid. Erosion is a very severe hazard.

This soil has the capability of producing about 110 cubic feet per acre, per year, of shortleaf pine commercial forest products. Adapted trees include loblolly pine, shortleaf pine, northern red oak, and white oak. Slopes restrict the use of equipment.

This soil is poorly suited to most urban uses. Slope is a severe limitation for dwellings and small commercial buildings and for local streets and roads. Adapting the design to conform to the natural slope and shaping and grading the site can help to overcome the slope limitation. Slope is a severe limitation to use of this soil for septic tank absorption fields. The slope limitation can be partly overcome by shaping the site or installing field lines on the contour. This limitation can be avoided by selecting less sloping areas as sites for septic tank absorption fields.

This Nella soil is in capability subclass VIe and is in woodland suitability group 8R8.

33—Nella stony loam, 8 to 20 percent slopes. This soil is deep, strongly sloping to moderately steep, and well drained. It is in colluvial positions on benches, mountainsides, and foot slopes. The mapped areas range from 5 to 300 acres.

Nella soil generally is covered by a thin layer of partly decomposed leaves and twigs. Under that layer, the typical sequence, depth, and composition of the layers of this Nella soil are as follows:

Surface layer:
0 to 3 inches; dark grayish brown stony loam

Subsurface layer:
3 to 7 inches; dark brown cobbly loam

Subsoil:
7 to 16 inches; reddish brown loam
16 to 52 inches; yellowish red cobbly clay loam
52 to 72 inches; yellowish red cobbly clay loam that has yellowish brown mottles

Important soil properties of Nella soil:

Permeability: Moderate

Available water capacity: Moderate

Organic matter content: Low

Natural fertility: Low

Soil reaction: Strongly acid or very strongly acid except in areas where the surface layer has been limed

Surface runoff: Rapid

Erosion hazard: Very severe

Root zone: Deep; easily penetrated by roots

Included with this soil in mapping are some areas of Enders, Leesburg, Mountainburg, and Steprock soils. Leesburg and Enders soils are deep and are in similar positions on benches, mountainsides, and foot slopes as Nella soil. Mountainburg soils are shallow, and Steprock soils are moderately deep. These soils are in most mapped areas near rock outcrops and ledges. Also included are some small areas of soils that have a gravelly surface layer and rock outcrops.

This Nella soil is moderately suited to improved pasture, and this is the main use. Surface stones are the main limitation. Where surface stones are removed to facilitate the use of farm equipment, moderate amounts of forage are produced from native grasses and improved pasture. Adapted plants include bermudagrass, bahiagrass, tall fescue, white clover, and native grasses. The hazard of erosion is very severe if the pasture is overgrazed. Concerns in management include proper stocking, controlled grazing, maintaining fertility level, fire protection, and brush and weed control.

This soil is not suited to cultivated crops. Runoff is rapid. Erosion is a very severe hazard. The stony surface layer severely restricts the use of farm equipment.

This soil has the capability of producing about 99 cubic feet per acre, per year, of shortleaf pine commercial forest products. Adapted trees are loblolly pine, shortleaf pine, northern red oak, and white oak. Stony surface layers restrict the use of equipment.

This soil is moderately suited to most urban uses. Slope is a moderate limitation for dwellings and for local streets and roads. It is a severe limitation for small commercial buildings. Adapting the design to conform to the natural slope or shaping and grading the site can help to overcome the slope limitation. Large stones moderately limit the use of the soil for dwellings, small commercial buildings, and local roads and streets. If it is necessary to remove the stones during construction, excavation and disposition of the stones may be difficult and add to the cost of construction. Slope, moderate permeability, and large stones are moderate limitations to use of this soil as septic tank absorption fields. The slope limitation can be partly overcome by shaping the site or installing the field lines on the contour. This limitation can be avoided by selecting less sloping areas as sites for septic tank absorption fields. The permeability limitation can be partly overcome by enlarging the septic tank absorption field or by digging a wide, deep trench below the distribution lines and backfilling with material that contains fewer stones.

This Nella soil is in capability subclass VIs and is in woodland suitability group 7X8.

34—Nella stony loam, 20 to 40 percent slopes. This soil is deep, steep, and well drained. It is in colluvial positions on benches, mountainsides, and foot slopes. The mapped areas range from 20 to 175 acres.

Nella soil generally is covered by a thin layer of partly decomposed leaves and twigs. Under that layer, the typical sequence, depth, and composition of the layers of this Nella soil are as follows:

Surface layer:
0 to 3 inches; dark grayish brown stony loam

Subsurface layer:
3 to 7 inches; dark brown cobbly loam

Subsoil:
7 to 16 inches; reddish brown loam
16 to 52 inches; yellowish red cobbly clay loam
52 to 72 inches; yellowish red cobbly clay loam that has yellowish brown mottles

Important soil properties of Nella soil:

Permeability: Moderate

Available water capacity: Moderate

Organic matter content: Low

Natural fertility: Low

Soil reaction: Strongly acid or very strongly acid except in areas where the surface layer has been limed

Surface runoff: Rapid

Erosion hazard: Very severe

Root zone: Deep; easily penetrated by roots

Included with this soil in mapping are some areas of Enders, Leesburg, Mountainburg, and Steprock soils. Leesburg and Enders soils are deep and are in similar positions on benches, mountainsides, and foot slopes as Nella soil. Mountainburg soils are shallow, and Steprock soils are moderately deep. These soils are in most mapped areas near rock outcrops and ledges. Also included are some small areas of soils that have no stones on the surface layer and some areas of soils that have rock outcrops.

In most areas, this Nella soil is used as woodland. The woodland consists mainly of low-grade hardwoods.

This soil is not suited to pasture or to cultivated crops. Surface stones and steep slopes are severe limitations. They restrict the use of equipment. Erosion is a very severe hazard.

Nella soil that slopes south and west has the capability of producing about 88 cubic feet per acre, per year, of shortleaf pine commercial forest products; and when it slopes north and east, it has the capability of producing about 99 cubic feet per acre, per year. Adapted trees include loblolly pine, shortleaf pine, northern red oak, and white oak. Slope and the stony surface layer of this soil restrict the use of equipment. Seedling mortality is severe when the soil slopes south and west and slight when it slopes north and east.

This soil is poorly suited to most urban uses. Slope is a severe limitation for dwellings, small commercial buildings, local roads and streets, and septic tank absorption fields. These limitations are difficult and often impractical to overcome.

This Nella soil is in capability subclass VIIs and is in woodland suitability group 6R9 when it slopes south and west and in group 7R8 when it slopes north and east.

35—Nella-Enders stony loams, 8 to 20 percent slopes. This complex consists of soils that are deep, strongly sloping to moderately steep, and well drained. These soils are on benches and foot slopes. The soils in this map unit were mapped as a complex because the major components of the soils could not be consistently separated at the scale selected for mapping. The mapped areas range from about 20 to 1,000 acres or more. This complex is made up of about 45 percent Nella soil, 40 percent Enders soil, and 15 percent other soils.

Nella soil generally is covered by a thin layer of partly decomposed leaves and twigs. Under that layer, the typical sequence, depth, and composition of the layers of this Nella soil are as follows:

Surface layer:
0 to 3 inches; dark grayish brown stony loam

Subsurface layer:
3 to 7 inches; dark brown cobbly loam

Subsoil:
7 to 16 inches; reddish brown loam
16 to 52 inches; yellowish red cobbly clay loam
52 to 72 inches; yellowish red cobbly clay loam that has yellowish brown mottles

Important soil properties of Nella soil:

Permeability: Moderate

Available water capacity: Moderate

Soil reaction: Strongly acid or very strongly acid except in areas where the surface layer has been limed

Depth to bedrock: None within a depth of 5 feet

Root zone: At a depth of more than 40 inches

Shrink-swell potential: Low

Enders soil generally is covered by a thin layer of partly decomposed leaves and twigs. Under that layer, the typical sequence, depth, and composition of the layers of this Enders soil are as follows:

Surface layer:
0 to 5 inches; very dark grayish brown stony loam

Subsoil:
5 to 9 inches; strong brown gravelly loam
9 to 27 inches; red silty clay
27 to 46 inches; red shaly clay that has strong brown and yellowish red mottles
46 to 49 inches; mottled red and light brownish gray shaly clay

Substratum:
49 to 55 inches; dark gray weathered shale and light brownish gray clay

Bedrock:
55 to 57 inches; black fissile shale, hardness increases with depth

Important soil properties of Enders soil:

Permeability: Moderate in the surface layer and very slow in the subsoil and substratum

Available water capacity: Moderate

Soil reaction: Strongly acid to extremely acid throughout

Depth to bedrock: At a depth of 40 to 60 inches (soft)

Root zone: Generally at a depth of 10 to 20 inches

Shrink-swell potential: High

Included with these soils in mapping are small areas of Leesburg, Mountainburg, and Steprock soils. Leesburg soils are in similar positions on benches and side slopes as Nella soil. Mountainburg soils are shallow, and Steprock soils are moderately deep. These soils are in most mapped areas near rock outcrops and escarpments. Also included are areas of soils that have large boulders on the surface layer and some small areas of bluffs and rock outcrop.

In most areas, the soils in this map unit are used as woodland, which consists mainly of low-grade hardwoods. A few areas are used for pasture.

Nella soil is moderately suited to pasture. Enders soil is poorly suited to pasture. Suitable pasture plants include tall fescue, bermudagrass, lovegrass, lespedeza, bahiagrass, and white clover. Erosion is a very severe hazard on the soils in this map unit if the pasture is overgrazed. Surface stones restrict the use of farm equipment. Concerns in management include proper stocking, proper grazing, and weed and brush control.

The soils in this map unit are not suited to cultivated crops. Slope and surface stones are the main limitations.

Nella soil has the capability of producing about 99 cubic feet per acre, per year, of shortleaf pine (fig. 8) commercial forest products, and Enders soil has the capability of producing about 88 cubic feet per acre, per year. Suitable trees to plant include shortleaf pine and loblolly pine. Surface stones restrict the use of equipment.

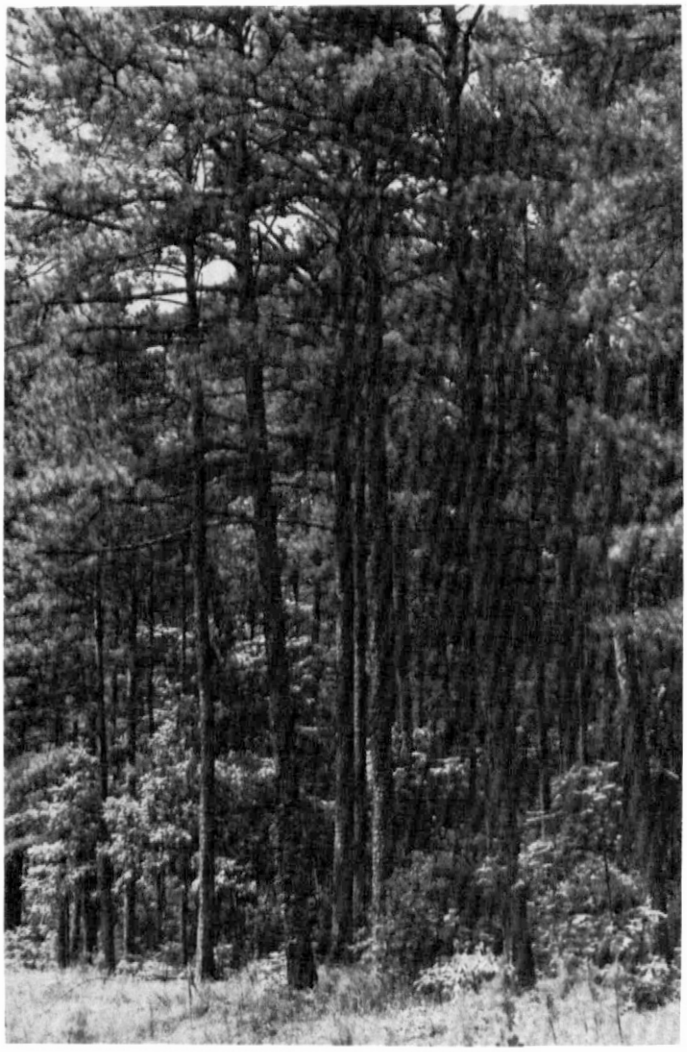

Figure 8.—Shortleaf pine on Nella-Enders stony loams, 8 to 20 percent slopes. These soils produce about 88 cubic feet, per acre, of shortleaf pine for commercial use each year.

Nella soil is moderately suited to most urban uses. Slope and surface stones are moderate limitations for dwellings and local roads and streets and are severe limitations for small commercial buildings. These limitations can be overcome by adapting the design to conform to the natural slope, shaping the site, and selecting a soil that is better suited to these uses. Slope, moderate permeability, and large stones are moderate limitations to use of Nella soil for septic tank absorption fields. The slope limitation can be partly overcome by shaping the site or installing the field lines on the contour. This limitation can be avoided by selecting less sloping areas as sites for septic tank absorption fields. Surface stones and permeability can be partly overcome by enlarging the septic tank absorption field or by digging a wide, deep trench below the distribution lines and backfilling with material that contains fewer stones.

Enders soil is poorly suited to most urban uses. The high shrink-swell potential is a severe limitation for dwellings and small commercial buildings. This limitation can be overcome by extra reinforcement in the footings and backfilling with coarse material. Slope is also a severe limitation for small commercial buildings. This slope limitation can be overcome by adapting the design to conform to the natural slope or shaping the site. This limitation can be avoided by selecting a less sloping area as a site for small commercial buildings or selecting a soil that is better suited to this use. Low strength and high shrink-swell potential are severe limitations for local roads and streets. Damage caused by shrink-swell potential and low strength can be prevented by using suitable subgrade or base material. Permeability is a severe limitation to use of Enders soil for septic tank absorption fields. The permeability limitation can be overcome by placing the septic tank absorption field on the contour, increasing the size of the absorption field, or using an alternate system or a specially designed system. This limitation can be avoided by selecting a soil that is better suited to septic tank absorption fields, such as the moderately permeable Nella soil.

The soils in this map unit are in capability subclass VIs. Nella soil is in woodland suitability group 7X8. Enders soil is in woodland suitability group 6X8.

36—Nella-Enders stony loams, 20 to 40 percent slopes. This complex consists of soils that are deep, steep, and well drained. These soils are on mountainsides. The soils in this map unit were mapped as a complex because the major components of the soils could not be consistently separated at the scale selected for mapping. The mapped areas range from about 20 to 200 acres or more. The complex is made up of about 50 percent Nella soil, 35 percent Enders soil, and 15 percent other soils.

Nella soil generally is covered by a thin layer of partly decomposed leaves and twigs. Under that layer, the typical sequence, depth, and composition of the layers of this Nella soil are as follows:

Surface layer:
0 to 3 inches; dark grayish brown stony fine sandy loam

Subsurface layer:
3 to 7 inches; dark brown cobbly loam

Subsoil:
7 to 16 inches; reddish brown loam
16 to 52 inches; yellowish red cobbly clay loam
52 to 72 inches; yellowish red cobbly clay loam that has yellowish brown mottles

Important soil properties of Nella soil:

Permeability: Moderate

Available water capacity: Moderate

Soil reaction: Strongly acid or very strongly acid except in areas where the surface layer has been limed

Depth to bedrock: None within a depth of 5 feet

Root zone: At a depth of more than 40 inches

Shrink-swell potential: Low

Enders soil generally is covered by a thin layer of partly decomposed leaves and twigs. Under that layer, the typical sequence, depth, and composition of the layers of this Enders soil are as follows:

Surface layer:
0 to 5 inches; very dark grayish brown stony loam

Subsoil:
5 to 9 inches; strong brown gravelly loam
9 to 27 inches; red silty clay
27 to 46 inches; red shaly clay that has strong brown and yellowish red mottles
46 to 49 inches; mottled red and light brownish gray shaly clay

Substratum:
49 to 55 inches; dark gray weathered shale and light brownish gray clay

Bedrock:
55 to 57 inches; black fissile shale, hardness increases with depth

Important soil properties of Enders soil:

Permeability: Moderate in the surface layer and very slow in the subsoil and substratum

Available water capacity: Moderate

Soil reaction: Strongly acid to extremely acid throughout

Depth to bedrock: At a depth of 40 to 60 inches (soft)

Root zone: Generally at a depth of 10 to 20 inches

Shrink-swell potential: High

Included with these soils in mapping are small areas of Leesburg, Mountainburg, and Steprock soils. Leesburg soils are in similar positions on benches and side slopes as Nella soil. Mountainburg soils are shallow, and Steprock soils are moderately deep. These soils are in most mapped areas near rock outcrops and escarpments. Also included are areas of soils that have large boulders on the surface layer and some small areas of bluffs and rock outcrop.

In most areas, the soils in this map unit are used as woodland, which consists mainly of low-grade hardwoods. A few areas are used for native pasture.

The soils in this complex are not suited to cultivated crops or improved pasture. Steep slopes and surface stoniness are the main limitations.

Nella soil that slopes south and west has the capability of producing about 88 cubic feet per acre, per year, of shortleaf pine commercial forest products, and it has the capability of producing about 99 cubic feet per acre, per year, when it slopes north and east. Enders soil that slopes south and west has the capability of producing about 68 cubic feet per acre, per year, of shortleaf pine commercial forest products, and it has the capability of producing about 88 cubic feet per acre, per year, when it slopes north and east. Suitable trees to plant include shortleaf pine and loblolly pine. The slope and stony surface layer restrict the use of equipment on Nella and Enders soils and are moderate limitations for woodland use and management. Erosion is a moderate hazard on Enders soil because of slope and is a slight hazard on Nella soil. Seedling mortality is severe on Nella and Enders soils that slope south and west and is slight when they slope north and east.

These soils are poorly suited to most urban uses. Slope is a severe limitation to use of Nella soil for dwellings, small commercial buildings, local roads and streets, and septic tank absorption fields. Slope and high shrink-swell potential are severe limitations to use of Enders soil for dwellings, small commercial buildings, and local roads and streets. In addition, low strength is a severe limitation of Enders soil for local roads and streets, and very slow permeability is a severe limitation for septic tank absorption fields. These limitations are difficult to overcome and may require special design and proper construction or installation. The limitations can be avoided by selecting a soil or site that is more suited to urban use.

The soils in this map unit are in capability subclass VIIs. Nella soil is in woodland suitability group 6R9 when it slopes south and west and in group 7R8 when it slopes north and east. Enders soil is in woodland suitability group 5R9 when it slopes south and west and in group 6R8 when it slopes north and east.

37—Nella-Steprock complex, 8 to 20 percent slopes. This complex consists of soils that are strongly sloping to moderately steep, stony and very stony, and well drained. Nella soil generally is in colluvial positions on moderately steep hillsides and on less sloping, concave parts of benches. Steprock soil generally is on upper side slopes and mountainsides and on convex parts of benches. The soils in this map unit were mapped as a complex because the major components of the soils could not be consistently separated at the scale selected for mapping. The mapped areas range from about 40 to 500 acres. The complex is made up of about 50 percent Nella soil that is deep, 35 percent Steprock soil that is moderately deep, and 15 percent other soils.

Nella soil generally is covered by a thin layer of partly decomposed leaves and twigs. Under this layer, the typical sequence, depth, and composition of the layers of this Nella soil are as follows:

Surface layer:
0 to 3 inches; dark grayish brown stony loam

Subsurface:
3 to 7 inches; dark brown cobbly loam

Subsoil:
7 to 16 inches; reddish brown loam
16 to 52 inches; yellowish red cobbly clay loam
52 to 72 inches; yellowish red cobbly clay loam that has yellowish brown mottles

Important soil properties of Nella soil:

*Permeability:*Moderate

Available water capacity: Moderate

Soil reaction: Strongly acid or very strongly acid except in areas where the surface layer has been limed

Depth to bedrock: None within a depth of 5 feet

Root zone: At a depth of more than 40 inches

Shrink-swell potential: Low

Steprock soil generally is covered by a thin layer of partly decomposed leaves and twigs. Under that layer, the typical sequence, depth, and composition of the layers of this Steprock soil are as follows:

Surface layer:
0 to 3 inches; dark brown very stony loam

Subsurface:
3 to 10 inches; yellowish brown very gravelly loam

Subsoil:
10 to 15 inches; strong brown very gravelly loam
15 to 32 inches; yellowish red very gravelly sandy clay loam

Substratum:
32 to 38 inches; weathered, platy, level-bedded sandstone that has yellowish red sandy clay loam between the plates (soft)

Important soil properties of Steprock soil:

Permeability: Moderate

Available water capacity: Very low

Soil reaction: Strongly acid or very strongly acid throughout

Depth to bedrock: At a depth of 20 to 40 inches (soft)

Root zone: At a depth of 20 to 40 inches; in places, somewhat restricted by fractured sandstone

Shrink-swell potential: Low

Included with these soils in mapping are small areas of Enders, Leesburg, and Mountainburg soils. Enders and Leesburg soils are deep and well drained. These soils are in similar positions on benches, mountainsides, and foot slopes as Nella soil. Mountainburg soils are shallow and are near sandstone outcrops and escarpments. Also included are areas of soils that have large boulders on the surface layer and some small areas of bluffs and rock outcrop.

In most areas, the soils in this map unit are used as woodland, which consists mainly of low-grade hardwoods. A few areas are used for pasture.

Nella soil is moderately suited to pasture. Steprock soil is poorly suited to pasture. Suitable plants for established pastures include tall fescue and native grasses. The hazard of erosion is severe if the pasture is overgrazed. Surface stones restrict the use of farm equipment. Concerns in management are proper stocking, proper grazing, and weed and brush control.

The soils of this map unit are not suited to cultivated crops. Surface stones and slope are the main limitations.

Nella soil has the capability of producing about 99 cubic feet per acre, per year, of shortleaf pine commercial forest products. Steprock soil has the capability of producing about 84 cubic feet per acre, per year. Suitable trees to plant include shortleaf pine, loblolly pine, white oak, and northern red oak. Surface stones restrict the use of equipment on Nella and Steprock soils and are a moderate limitation to woodland use and management.

The soils in this map unit are moderately suited to or poorly suited to most urban uses. Slope and large stones are moderate limitations for dwellings and local roads and streets. Slope is a severe limitation for small commercial buildings. The slope limitation can be overcome by adapting the design to conform to the natural slope. Large stones should be removed during construction. l01Slope, large stones, and moderate permeability are moderate limitations to use of Nella soil as septic tank absorption fields. These limitations can be minimized by using a specially designed system or an alternate system or by increasing the size of the septic tank absorption field. The limitations can be avoided by selecting a soil that is better suited to this use. Depth to bedrock is a severe limitation to use of Steprock soil as septic tank absorption fields. This limitation is difficult and often impractical to overcome. This depth to bedrock limitation can be avoided by selecting areas or inclusions in the map unit that have soils that are deep.

The soils in this complex are in capability subclass VIs. Nella soil is in woodland suitability group 7X8. Steprock soil is in woodland suitability group 6X8.

38—Nella-Steprock-Mountainburg very stony loams, 20 to 40 percent slopes. This complex consists of soils that are steep, very stony, and well drained. Nella soil is deep and is generally in colluvial positions on steep hillsides and on less sloping, concave parts of benches. Steprock soil is moderately deep and is generally on upper side slopes, hillsides, and mountainsides and on convex parts of benches. Mountainburg soil is shallow and is near sandstone outcrops and in convex positions above sandstone bluffs (fig. 9). The soils in this map unit were mapped as a complex because the major components of the soils could not be consistently separated at the scale selected for mapping. The mapped areas are from 30 to more than 500 acres. This complex is made up of about 45 percent Nella soil, 25 percent Steprock soil, 15 percent Mountainburg soil, and 15 percent other soils.

Nella soil generally is covered by a thin layer of partly decomposed leaves and twigs. Under that layer, the typical sequence, depth, and composition of the layers of this Nella soil are as follows:

Surface layer:
0 to 3 inches; dark grayish brown very stony loam

Subsurface layer:
3 to 7 inches; dark brown cobbly loam

Subsoil:
7 to 16 inches; reddish brown loam
16 to 52 inches; yellowish red cobbly clay loam

Figure 9.—Typically, these Nella-Steprock-Mountainburg very stony loams, 20 to 40 percent slopes, are on "bench-bluff" type landscapes.

52 to 72 inches; yellowish red cobbly clay loam that has yellowish brown mottles

Important soil properties of Nella soil:

Permeability: Moderate

Available water capacity: Moderate

Soil reaction: Strongly acid or very strongly acid except in areas where the surface layer has been limed

Depth to bedrock: None within a depth of 5 feet

Root zone: At a depth of more than 40 inches

Shrink-swell potential: Low

Steprock soil generally is covered by a thin layer of partly decomposed leaves and twigs. Under that layer, the typical sequence, depth, and composition of the layers of Steprock soil are as follows:

Surface layer:
0 to 3 inches; dark brown very stony loam

Subsurface layer:
3 to 10 inches; yellowish brown very gravelly loam

Subsoil:
10 to 15 inches; strong brown very gravelly loam
15 to 32 inches; yellowish red very gravelly sandy clay loam

Substratum:
32 to 38 inches; weathered, platy, level-bedded sandstone that has yellowish red sandy clay loam between plates (soft)

Important soil properties of Steprock soil:

Permeability: Moderate

Available water capacity: Very low

Soil reaction: Strongly acid or very strongly acid throughout

Depth to bedrock: At a depth of 20 to 40 inches (soft)

Root zone: At a depth of 20 to 40 inches, but somewhat restricted by fractured sandstone in places

Shrink-swell potential: Low

Mountainburg soil generally is covered by a thin layer of partly decomposed leaves and twigs. Under that layer, the typical sequence, depth, and composition of the layers of Mountainburg soil are as follows:

Surface layer:
0 to 4 inches; dark brown very stony loam

Subsurface layer:
4 to 9 inches; yellowish brown very stony fine sandy loam

Subsoil:
9 to 19 inches; strong brown very stony sandy clay loam

Bedrock:
19 to 21 inches; hard, level-bedded, acid sandstone

Important soil properties of Mountainburg soil:

Permeability: Moderately rapid

Available water capacity: Very low

Soil reaction: Medium acid or strongly acid in the surface layer and strongly acid or very strongly acid in the subsoil

Depth to bedrock: At a depth of 12 to 20 inches (hard)

Root zone: At a depth of less than 20 inches, easily penetrated

Shrink-swell potential: Low

Included with these soils in mapping are some small areas of Enders and Leesburg soils. These soils are deep and well drained. They are in similar positions on benches, mountainsides, and foot slopes as Nella soil. Also included are prominent sandstone bluffs and rock outcrops and small areas of soils that have large boulders on the surface layer.

The soils in most areas of this complex are used as woodland, which consists mainly of low-grade hardwoods.

These soils are not suited to cultivated crops or pasture. Slope and surface stones severely restrict the use of farm equipment. Runoff is rapid. Erosion is a very severe hazard.

When Nella, Steprock, and Mountainburg soils slope south and west, production capability for shortleaf pine commercial forest products is about 88 cubic feet per acre, per year, for Nella soil; 68 cubic feet per acre, per year, for Steprock soil; and 57 cubic feet per acre, per year, for Mountainburg soil. When these soils slope north and east, production capability is about 99 cubic feet per acre, per year, for Nella soil; 88 cubic feet per acre, per year, for Steprock soil; and 72 cubic feet per acre, per year, for Mountainburg soil. Suitable trees to plant include shortleaf pine, loblolly pine, and eastern redcedar. Slopes and surface stones are moderate limitations to use of equipment on Nella, Steprock, and Mountainburg soils. Seedling mortality is severe on Nella, Steprock, and Mountainburg soils when these soils slope south and west and is moderate when they slope north and east.

The soils in this complex are poorly suited to most urban uses including dwellings, small commercial buildings, local roads and streets, and septic tank absorption fields because of steep slopes and depth to bedrock. These limitations are difficult to overcome; however, on the deep Nella soils, slope and depth to bedrock limitations can be avoided by selecting a site where this soil is on less sloping concave parts of benches.

The soils in this complex are in capability subclass VIIs. Nella soil is in woodland suitability group 6R9 when it slopes south and west and in group 7R8 when it slopes north and east. Steprock soil is in woodland suitability group 5R9 when it slopes south and west and in group 6R8 when it slopes north and east. Mountainburg soil is in woodland suitability group 4R9 when it slopes south and west and in group 5R8 when it slopes north and east.

39—Nella-Steprock-Mountainburg very stony loams, 40 to 60 percent slopes. This complex consists of soils that are very steep, very stony, and well drained. Nella soil is deep and is generally in colluvial positions on very steep hillsides and on less sloping, concave parts of benches. Steprock soil is moderately deep and is generally on upper side slopes and tops of hillsides and mountainsides and on convex parts of benches. Mountainburg soil is shallow and is near sandstone outcrops and in convex positions above sandstone bluffs. The soils in this map unit were mapped as a complex because the major components of the soils could not be consistently separated at the scale selected for mapping. The mapped areas range from 40 to several thousand acres. The complex is made up of about 45 percent Nella soil, 20 percent Steprock soil, 10 percent Mountainburg soil, and 25 percent other soils.

Nella soil generally is covered by a thin layer of partly decomposed leaves and twigs. Under that layer, the

typical sequence, depth, and composition of the layers of this Nella soil are as follows:

Surface layer:
0 to 3 inches; dark grayish brown very stony loam

Subsurface layer:
3 to 7 inches; dark brown cobbly loam

Subsoil:
7 to 16 inches; reddish brown loam
16 to 52 inches; yellowish red cobbly clay loam
52 to 72 inches; yellowish red cobbly clay loam that has yellowish brown mottles

Important soil properties of Nella soil:

Permeability: Moderate

Available water capacity: Moderate

Soil reaction: Strongly acid or very strongly acid throughout

Depth to bedrock: None within a depth of 5 feet

Root zone: At a depth of more than 40 inches

Shrink-swell potential: Low

Steprock soil generally is covered by a thin layer of partly decomposed leaves and twigs. Under that layer, the typical sequence, depth, and composition of the layers of this Steprock soil are as follows:

Surface layer:
0 to 3 inches; dark brown very stony loam

Subsurface layer:
3 to 10 inches; yellowish brown very gravelly loam

Subsoil:
10 to 15 inches; strong brown very gravelly loam
15 to 32 inches; yellowish red very gravelly sandy clay loam

Substratum:
32 to 38 inches; weathered, platy, level-bedded sandstone that has yellowish red sandy clay loam between sandstone plates (soft)

Important soil properties of Steprock soil:

Permeability: Moderate

Available water capacity: Very low

Soil reaction: Strongly acid or very strongly acid throughout

Depth to bedrock: At a depth of 20 to 40 inches (soft)

Root zone: At a depth of 20 to 40 inches; in places, somewhat restricted by fractured sandstone

Shrink-swell potential: Low

Mountainburg soil generally is covered by a thin layer of partly decomposed leaves and twigs. Under that layer, the typical sequence, depth, and composition of the layers of this Mountainburg soil are as follows:

Surface layer:
0 to 4 inches; dark brown very stony loam

Subsurface layer:
4 to 9 inches; yellowish brown very stony fine sandy loam

Subsoil:
9 to 19 inches; strong brown very stony sandy clay loam

Bedrock:
19 to 21 inches; hard, level-bedded sandstone

Important soil properties of Mountainburg soil:

Permeability: Moderately rapid

Available water capacity: Very low

Soil reaction: Medium acid or strongly acid in the surface layer and strongly acid or very strongly acid in the subsoil

Depth to bedrock: At a depth of 12 to 20 inches (hard)

Root zone: At a depth of less than 20 inches; easily penetrated

Shrink-swell potential: Low

Included with these soils in mapping are some small areas of Enders and Leesburg soils. Enders and Leesburg soils are deep and well drained. These soils are in similar positions on benches, mountainsides, and foot slopes as Nella soil. Also included are some areas of soils that have large boulders on the surface layer and some areas of prominent sandstone bluffs and rock outcrops.

In most areas, the soils in this map unit are used as woodland, which consists mainly of low-grade hardwoods.

These soils are not suited to pasture or cultivated crops. Runoff is very rapid. Erosion is a very severe hazard. Very steep slopes and surface stones restrict the use of farm equipment.

Nella soil that slopes south and west has the capability of producing about 86 cubic feet per acre, per year, of shortleaf pine commercial forest products and about 100 cubic feet per acre, per year, when it slopes north and east. Steprock soil that slopes south and west has the capability of producing about 57 cubic feet per acre, per year, of shortleaf pine commercial forest products and about 72 cubic feet per acre, per year, when it slopes north and east. Mountainburg soil has the capability of producing about 57 cubic feet per acre, per year, of shortleaf pine commercial forest products. Suitable trees to plant include shortleaf pine, loblolly pine, northern red oak, and white oak. The very steep slopes restrict the use of equipment on the soils in this map unit. Erosion is a moderate hazard. Seedling mortality is severe on Nella, Steprock, and Mountainburg soils that slope south and west and is moderate when they slope north and east.

The soils in this map unit are poorly suited to most urban uses. Steep slopes are severe limitations for dwellings, small commercial buildings, local roads and streets, and septic tank absorption fields. Depth to bedrock also is a severe limitation to use of Steprock and Mountainburg soils for septic tank absorption fields. Depth to bedrock is a severe limitation to use of Mountainburg soil for dwellings, small commercial buildings, and local roads and streets. This limitation is difficult to overcome. In many places, the use of the soils in this map unit for urban use may be impractical; however, by selecting a site where the deep Nella soil occurs on less sloping, concave parts of benches, the slope and depth to bedrock limitations can be partly overcome.

The soils in this map unit are in capability subclass VIIs. Nella soil is in woodland suitability group 6R9 when it slopes south and west and in group 7R9 when it slopes north and east. Steprock soil is in woodland suitability group 4R9 when it slopes south and west and in group 5R9 when it slopes north and east. Mountainburg soil is in woodland suitability group 4R9.

40—Nixa very cherty silt loam, 3 to 8 percent slopes. This soil is deep, gently sloping, and moderately well drained. It is on narrow ridgetops. The mapped areas range from about 10 to 200 acres.

Nixa soil generally is covered by a thin layer of partly decomposed leaves, needles, and twigs. Under that layer, the typical sequence, depth, and composition of the layers of this Nixa soil are as follows:

Surface layer:
0 to 4 inches; dark grayish brown very cherty silt loam

Subsurface layer:
4 to 11 inches; brown very cherty silt loam

Subsoil:
11 to 19 inches; yellowish brown very cherty silt loam
19 to 26 inches; strong brown extremely cherty silt loam, firm and brittle fragipan
26 to 41 inches; mottled strong brown, yellowish brown, and light brownish gray extremely cherty silt loam, firm and brittle fragipan
41 to 72 inches; mottled red, strong brown, and light brownish gray extremely cherty silty clay

Important soil properties of Nixa soil:

Permeability: Very slow

Available water capacity: Low

Organic matter content: Low

Natural fertility: Low

Soil reaction: Strongly acid or very strongly acid except in areas where the surface layer has been limed

Surface runoff: Rapid

Erosion hazard: Severe

Tilth: Difficult to maintain; high content of chert fragments causes droughtiness; tillage operations difficult

Root zone: Ranges from shallow to moderately deep; fragipan restricts root penetration and slows movement of water

Depth to bedrock: None within a depth of 5 feet

Included with this soil in mapping are small areas of Noark soils. Also included are some areas of soils that have less than 35 percent chert on the surface layer; some small areas of soils that have slopes of less than 3 percent or slopes of more than 8 percent; and some small areas of soils that are similar to Nixa soil but have chert or limestone bedrock at a depth of less than 60 inches.

This soil is mainly used for pasture and hay.

This Nixa soil is moderately suited to pasture and hay. Adapted pasture plants include bermudagrass, bahiagrass, tall fescue, and white clover. The surface chert is a hindrance in pasture management and haying operations. Deferred grazing, rotation grazing, brush and weed control, and proper stocking help to control erosion.

This soil is moderately suited to cultivated crops. Suitable crops include grain sorghum, winter small grains, and truck crops that are adapted to the local climate. Erosion is a severe hazard. Rapid runoff, slope, low available water capacity, and surface chert are

limitations for cultivated crops. With good management and adequate erosion control, clean-tilled crops can be grown in rotation with grasses. Terraces, contour farming, minimum tillage, proper management of crop residue, and the use of cover crops reduce runoff and help control erosion. Conservation practices need to be intensified as slope length and gradient increase.

This soil has the capability of producing about 86 cubic feet per acre, per year, of shortleaf pine commercial forest products. Suitable trees include shortleaf pine, loblolly pine, eastern redcedar, northern red oak, and white oak. The low available water capacity increases seedling mortality and is a moderate limitation to woodland use and management. Surface chert restricts the use of equipment.

Nixa soil is moderately suited to most urban uses. This soil has no significant limitations for dwellings or for local roads and streets. Slope is a moderate limitation for small commercial buildings. Adapting the design to conform to the natural slope and shaping the site help to overcome the slope limitation. The very slow permeability is a severe limitation to use of this soil as septic tank absorption fields. The permeability limitation can be overcome by enlarging or modifying the septic tank absorption field.

This Nixa soil is in capability subclass IIIs and is in woodland suitability group 6F8.

41—Nixa very cherty silt loam, 8 to 12 percent slopes. This soil is deep, strongly sloping, and moderately well drained. It is on narrow ridgetops. The mapped areas range from about 10 to 300 acres.

Nixa soil generally is covered by a thin layer of partly decomposed leaves, needles, and twigs. Under that layer, the typical sequence, depth, and composition of the layers of this Nixa soil are as follows:

Surface layer:
0 to 4 inches; dark grayish brown very cherty silt loam

Subsurface layer:
4 to 11 inches; brown very cherty silt loam

Subsoil:
11 to 19 inches; yellowish brown very cherty silt loam
19 to 26 inches; strong brown extremely cherty silt loam, firm and brittle fragipan
26 to 41 inches; mottled strong brown, yellowish brown, and light brownish gray extremely cherty silt loam, firm and brittle fragipan
41 to 72 inches; mottled red, strong brown, and light brownish gray extremely cherty silty clay

Important soil properties of Nixa soil:

Permeability: Very slow

Available water capacity: Low

Organic matter content: Low

Natural fertility: Low

Soil reaction: Strongly acid or very strongly acid except in areas where the surface layer has been limed

Surface runoff: Rapid

Erosion hazard: Severe

Tilth: Difficult to maintain; high content of chert fragments causes droughtiness; tillage operations difficult

Root zone: Ranges from shallow to moderately deep; fragipan restricts root penetration and slows the movement of water

Depth to bedrock: None within a depth of 5 feet

Included with this soil in mapping are small areas of Noark soils. Also included are some areas of soils that have less than 35 percent chert on the surface layer; some small areas of soils that have slopes of less than 8 percent or slopes of more than 12 percent; and some small areas of soils that are similar to Nixa soil but have chert or limestone bedrock at a depth of less than 60 inches.

This soil is mainly used for pasture and hay.

This Nixa soil is moderately suited to pasture and hay. Adapted pasture plants include bermudagrass, bahiagrass, tall fescue, and white clover. The slope and surface chert are the main limitations for pasture management and haying operations. Deferred grazing, rotation grazing, brush and weed control, and proper stocking help control erosion.

This soil is poorly suited to cultivated crops. Adapted crops include grain sorghum, winter small grains, and truck crops that are adapted to the local climate. Erosion is a severe hazard. Rapid runoff, slope, low available water capacity, and surface chert are limitations for cultivated crops. With good management and adequate erosion control, minimum-tilled crops can be grown. Terraces, contour farming, minimum tillage, proper management of crop residue, and the use of cover crops reduce runoff and control erosion. Conservation practices need to be intensified as slope length and gradient increase.

This soil has the capability of producing about 86 cubic feet per acre, per year, of shortleaf pine commercial forest products. Suitable trees include shortleaf pine, loblolly pine, eastern redcedar, northern red oak, and white oak. The low available water capacity increases seedling mortality and is a moderate limitation

to woodland use and management. Surface chert restricts the use of equipment.

Nixa soil is moderately suited to or poorly suited to most urban uses. Slope is a moderate limitation for dwellings and for local roads and streets. It is a severe limitation for small commercial buildings. The slope limitation can be overcome by adapting the design to conform to the natural slope and shaping the site. The very slow permeability is a severe limitation to use of this soil as septic tank absorption fields. The permeability limitation can be overcome by enlarging or modifying the septic tank absorption field.

This Nixa soil is in capability subclass IVs and is in woodland suitability group 6F8.

42—Noark very cherty silt loam, 3 to 8 percent slopes. This soil is deep, gently sloping, and well drained. It is on ridges. The slopes are smooth and convex. The mapped areas range from 5 to 450 acres.

Noark soil generally is covered by a thin layer of partly decomposed pine needles, leaves, and twigs. Under that layer, the typical sequence, depth, and composition of the layers of this Noark soil are as follows:

Surface layer:
0 to 4 inches; dark grayish brown very cherty silt loam

Subsurface layer:
4 to 14 inches; pale brown very cherty silt loam

Subsoil:
14 to 30 inches; yellowish red very cherty silty clay
30 to 43 inches; yellowish red very cherty clay
43 to 72 inches; red very cherty clay

Important soil properties of Noark soil:

Permeability: Moderate

Available water capacity: Moderate

Organic matter content: Low

Natural fertility: Low

Soil reaction: Slightly acid to strongly acid in the surface layer and strongly acid or very strongly acid in the subsoil

Surface runoff: Rapid

Erosion hazard: Severe

Tilth: Difficult to till

Root zone: Deep

Included with this soil in mapping are small areas of Nixa and Clarksville soils. Also included are small areas of soils that are similar to Noark soil but have chert or limestone bedrock at a depth of less than 60 inches.

This Noark soil is used mainly for woodland or pasture.

This soil is moderately suited to pasture. Suitable pasture plants include tall fescue, white clover, and bermudagrass. The surface chert is a hindrance in pasture management and haying operations. Concerns in management include proper stocking and weed control.

This soil is moderately suited to cultivated crops. Adapted crops include corn and small grains (fig. 10). Erosion is a severe hazard. With good management and adequate erosion control, clean-tilled crops can be grown in rotation with grasses. Terraces, contour farming, minimum tillage, proper management of crop residue, and the use of cover crops reduce runoff and help control erosion. Conservation practices need to be intensified as slope length and gradient increase.

This soil has the capability of producing about 86 cubic feet per acre, per year, of shortleaf pine commercial forest products. Suitable trees include northern red oak, shortleaf pine, and white oak. Chert is a moderate limitation for woodland use and management because it restricts the use of equipment and increases seedling mortality.

This soil is moderately suited to most urban uses. This soil has no significant limitations for dwellings or for local roads and streets. Slope is a moderate limitation for small commercial buildings. The slope limitation can be overcome by adapting the design to conform to the natural slope or by shaping the site. Permeability is a moderate limitation to use of this soil as septic tank absorption fields. The permeability limitation can be overcome by increasing the size of or modifying the septic tank absorption field.

This Noark soil is in capability subclass IIIe and is in woodland suitability group 6F8.

43—Noark very cherty silt loam, 8 to 20 percent slopes. This soil is deep, strongly sloping to moderately steep, and well drained. It is on hillsides. The slopes are smooth and convex. The mapped areas range from 10 to 1,000 acres.

Noark soil generally is covered by a thin layer of partly decomposed pine needles, leaves, and twigs. Under that layer, the typical sequence, depth, and composition of the layers of this Noark soil are as follows:

Surface layer:
0 to 4 inches; dark grayish brown very cherty silt loam

Subsurface layer:
4 to 14 inches; pale brown very cherty silt loam

Subsoil:

Figure 10.—Grain sorghum on Noark very cherty silt loam, 3 to 8 percent slopes, is ready for harvest.

14 to 30 inches; yellowish red very cherty silty clay
30 to 43 inches; yellowish red very cherty clay
43 to 72 inches; red very cherty clay

Important soil properties of Noark soil:

Permeability: Moderate

Available water capacity: Moderate

Organic matter content: Low

Natural fertility: Low

Soil reaction: Slightly acid to strongly acid in the surface layer and strongly acid or very strongly acid in the subsoil

Surface runoff: Rapid

Erosion hazard: Very severe

Root zone: Deep

Included with this soil in mapping are small areas of Arkana, Clarksville, and Moko soils. Also included are some very narrow areas of cobbly soils on flood plains; small areas of soils that have rock outcrops; and some small areas of soils that are similar to Noark soil but have chert or limestone bedrock at a depth of less than 60 inches.

In most areas, this Noark soil is used as woodland. A few areas have been cleared and are used as pasture (fig. 11).

This soil is moderately suited to pasture. Suitable pasture plants include tall fescue, white clover, and bermudagrass. Slope and surface chert are the main limitations for pasture management and haying operations. Concerns in management include proper stocking and weed and brush control.

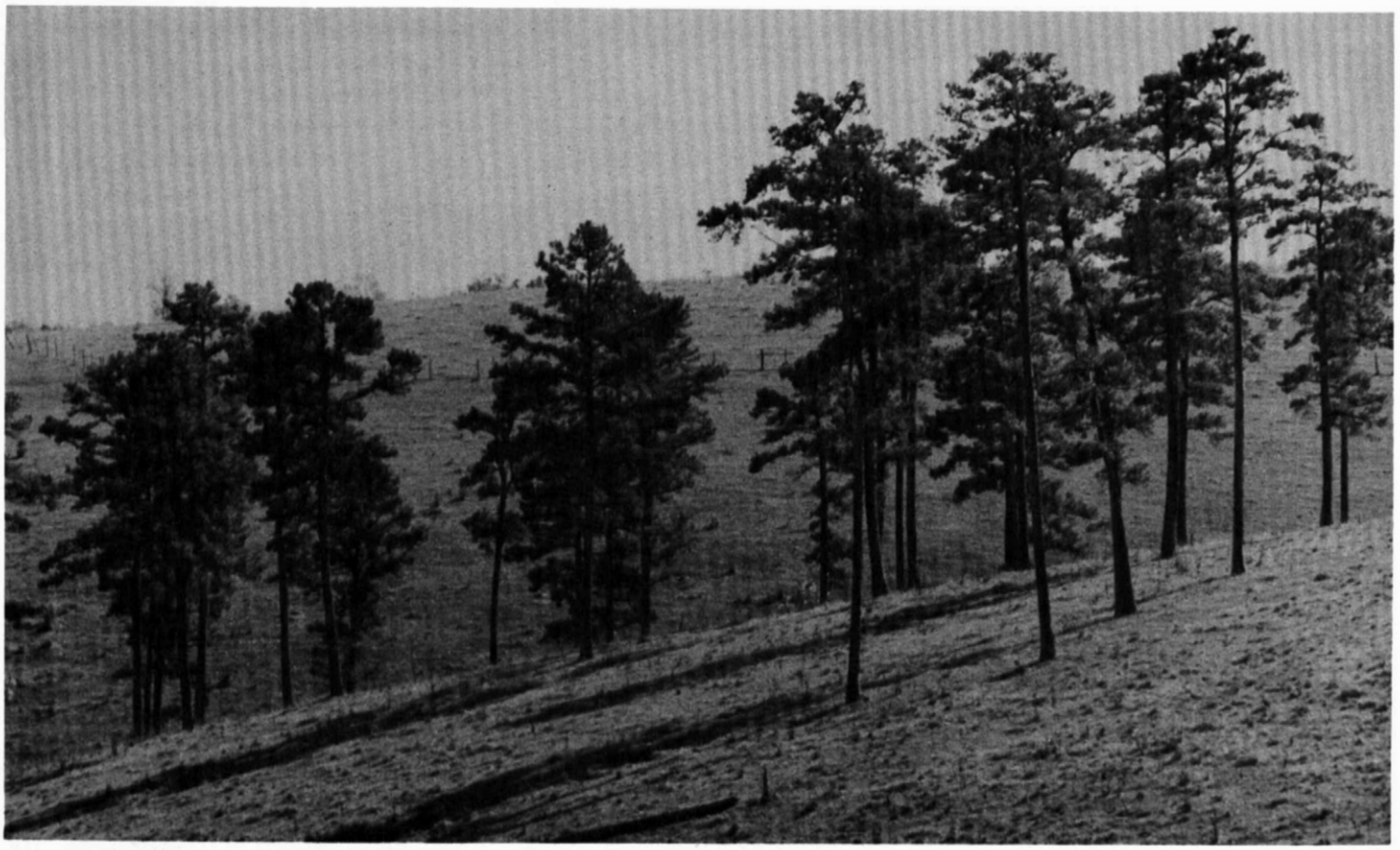

Figure 11.—This pasture of tall fescue and scattered shortleaf pine is on Noark very cherty silty loam, 8 to 20 percent slopes. Most areas are in woodland, but this soil is suited to pasture.

This soil is not suited to cultivated crops. Slope, surface chert, and a very severe erosion hazard are the main limitations.

This soil has the capability of producing about 86 cubic feet per acre, per year, of shortleaf pine commercial forest products. Suitable trees include northern red oak, shortleaf pine, loblolly pine, and white oak. Chert is a moderate limitation for woodland use and management because it restricts the use of equipment and increases seedling mortality.

This soil is moderately suited to most urban uses. Slope is a moderate limitation for dwellings and for local roads and streets. Slope is a severe limitation for small commercial buildings. The slope limitation can be overcome by adapting the design to conform to the natural slope and by shaping the site. Slope and moderate permeability are moderate limitations to use of this soil as septic tank absorption fields. The slope limitation can be overcome by adapting the design to conform to the natural slope. The permeability limitation can be overcome by enlarging or modifying the septic tank absorption field.

This Noark soil is in capability subclass VIe and is in woodland suitability group 6F8.

44—Noark very cherty silt loam, 20 to 40 percent slopes. This soil is deep, steep, and well drained. It is on hillsides. The slopes are smooth and convex. The mapped areas range from 20 to 1,000 acres.

Noark soil generally is covered by a thin layer of partly decomposed pine needles, leaves, and twigs. Under that layer, the typical sequence, depth, and composition of the layers of this Noark soil are as follows:

Surface layer:

0 to 4 inches; dark grayish brown very cherty silt loam

Subsurface layer:

4 to 14 inches; pale brown very cherty silt loam

Subsoil:

14 to 30 inches; yellowish red very cherty silty clay
30 to 43 inches; yellowish red very cherty clay

43 to 72 inches; red very cherty clay

Important soil properties of Noark soil:

Permeability: Moderate

Available water capacity: Moderate

Organic matter content: Low

Natural fertility: Low

Soil reaction: Slightly acid to strongly acid in the surface layer and strongly acid or very strongly acid in the subsoil

Surface runoff: Rapid

Erosion hazard: Very severe

Root zone: Deep

Included with this soil in mapping are small areas of Arkana, Clarksville, and Moko soils. Also included are some very narrow areas of cobbly soils on flood plains; some small areas of soils that have rock outcrops; some small areas of soils that are similar to Noark soil but have chert or limestone bedrock at a depth of less than 60 inches; and some small areas of soils that have slopes of more than 40 percent.

In most areas, this Noark soil is used as woodland. A few areas have been cleared and are used for pasture.

This soil is not suited to cultivated crops and pasture. Slope, surface chert, rapid runoff, and a very severe hazard of erosion are the main limitations.

This soil has the capacity of producing about 86 cubic feet per acre, per year, of shortleaf pine commercial forest products. Suitable trees include northern red oak, shortleaf pine, and white oak. Steep slopes and low available water capacity are moderate limitations for woodland use and management. The low available water capacity increases seedling mortality. The hazard of erosion is severe and the use of equipment is restricted because of steep slopes.

This soil is poorly suited to most urban uses. Slope is a severe limitation for dwellings, small commercial buildings, local roads and streets, and septic tank absorption fields. This limitation is difficult to overcome. The slope limitation can be avoided by selecting soils on the less sloping areas or inclusions in the map unit and using special design and proper construction.

This Noark soil is in capability subclass VIIe and is in woodland suitability group 6R8.

45—Peridge silt loam, 3 to 8 percent slopes. This soil is deep, gently sloping, and well drained. It formed in residuum of limestone and is on the uplands. The slopes are smooth and convex. The mapped areas range from about 10 to 40 acres.

The typical sequence, depth, and composition of the layers of this Peridge soil are as follows:

Surface layer:
0 to 9 inches; dark brown silt loam

Subsoil:
9 to 24 inches; yellowish red silty clay loam
24 to 44 inches; red silty clay loam
44 to 48 inches; red gravelly silty clay loam
48 to 72 inches; red silty clay

Important soil properties of Peridge soil:

Permeability: Moderate

Available water capacity: High

Organic matter content: Moderate

Natural fertility: Moderate

Soil reaction: Very strongly acid to medium acid throughout

Surface runoff: Medium

Erosion hazard: Severe

Tilth: Good; easily tilled throughout a wide range of moisture content

Root zone: Deep; easily penetrated by plant roots

Included with this soil in mapping are some small areas of Nixa and Noark soils. Also included are some eroded areas where plowing has mixed the surface layer and subsoil material, a few areas of soils in shallow gullies, and some areas of soils that are similar to Peridge soil but have bedrock at a depth of less than 60 inches.

This Peridge soil is well suited to pasture, and this is its main use. Adapted pasture plants include tall fescue, lespedeza, white clover, and bermudagrass. This soil has no significant limitations for pasture. Deferred grazing, rotation grazing, brush and weed control, and proper stocking help to control erosion.

This soil is moderately suited to cultivated crops. Adapted crops include corn and small grains. Erosion is a severe hazard. With good management and adequate erosion control, clean-tilled crops can be grown in rotation with grasses. Terraces, contour farming, minimum tillage, proper management of crop residue, and the use of cover crops reduce runoff and help to control erosion. Conservation practices need to be intensified as slope length and gradient increase.

This soil has the capability of producing about 114 cubic feet per acre, per year, of shortleaf pine

commercial forest products. Adapted trees include shortleaf pine, red oak, hickory, and eastern redcedar. This soil has no significant limitations for woodland use and management.

This soil is moderately suited to most urban uses. It has no significant limitations for dwellings. Low strength is a severe limitation for local roads and streets. The low strength limitation can be overcome by using suitable subgrade or base materials. Slope is a moderate limitation for small commercial buildings. The slope limitation can be overcome by adapting the design to conform to the natural slope and by shaping the site. Permeability is a moderate limitation to use of this soil as septic tank absorption fields. The permeability limitation can be overcome by enlarging or by modifying the septic tank absorption field.

This Peridge soil is in capability subclass IIIe and is in woodland suitability group 8A7.

46—Portia sandy loam, 3 to 8 percent slopes. This soil is deep, gently sloping, and well drained. It is on hilltops and foot slopes. The slopes are smooth and convex. The mapped areas range from about 10 to 100 acres.

The typical sequence, depth, and composition of the layers of this Portia soil are as follows:

Surface layer:
0 to 4 inches; dark brown sandy loam

Subsoil:
4 to 15 inches; dark brown loam
15 to 28 inches; yellowish red loam
28 to 41 inches; yellowish red sandy clay loam
41 to 58 inches; red sandy clay loam
58 to 72 inches; red sandy clay

Important soil properties of Portia soil:

Permeability: Moderately slow

Available water capacity: Moderate

Organic matter content: Low

Natural fertility: Low

Soil reaction: Slightly acid to strongly acid in the surface layer and medium acid to very strongly acid in the subsoil

Surface runoff: Medium

Erosion hazard: Severe

Tilth: Easily tilled throughout a wide range of moisture content

Root zone: Deep; easily penetrated by plant roots

Depth to bedrock: None within a depth of 5 feet

Included with this soil in mapping are small areas of Estate, Lily, and Udorthents soils. Also included are some small areas of soils that are similar to Portia soil but have a stony or gravelly surface layer; some small areas of soils that are eroded; and a few areas of soils that are in shallow gullies.

This soil is used mainly as pasture.

This Portia soil is well suited to pasture. Adapted pasture plants include bermudagrass, bahiagrass, tall fescue, and white clover. Deferred grazing, rotation grazing, brush and weed control, and proper stocking help control erosion.

This soil is moderately suited to cultivated crops. Adapted crops include soybeans, grain sorghum, winter small grains, and truck crops that are adapted to the local climate. Erosion is a severe hazard. With good management and adequate erosion control, clean-tilled crops can be grown in rotation with grasses. Terraces, contour farming, minimum tillage, proper management of crop residue, and the use of cover crops reduce runoff and help control erosion. Conservation practices need to be intensified as slope length and gradient increase.

This soil has the capability of producing about 114 cubic feet per acre, per year, of shortleaf pine commercial forest products. Adapted trees include shortleaf pine, loblolly pine, and sweetgum. This soil has no significant limitations for woodland use and management.

This soil is moderately suited to most urban uses. This soil has no significant limitations for dwellings or for local roads and streets. Slope is a moderate limitation for small commercial buildings. The slope limitation can be overcome by adapting the design to conform to the natural slope or by shaping the site. The moderately slow permeability is a severe limitation to use of this soil as septic tank absorption fields. This permeability limitation can be overcome by enlarging or modifying the septic tank absorption field.

This Portia soil is in capability subclass IIIe and is in woodland suitability group 8A7.

47—Portia sandy loam, 8 to 12 percent slopes. This soil is deep, strongly sloping, and well drained. It is on hilltops and foot slopes. The slopes are smooth and convex. The mapped areas range from about 10 to 100 acres.

The typical sequence, depth, and composition of the layers of this Portia soil are as follows:

Surface layer:
0 to 4 inches; dark brown sandy loam

Subsoil:
4 to 15 inches; dark brown loam
15 to 28 inches; yellowish red loam

28 to 41 inches; yellowish red sandy clay loam
41 to 58 inches; red sandy clay loam
58 to 72 inches; red sandy clay

Important soil properties of Portia soil:

Permeability: Moderately slow

Available water capacity: Moderate

Organic matter content: Low

Natural fertility: Low

Soil reaction: Slightly acid to strongly acid in the surface layer and medium acid to very strongly acid in the subsoil

Surface runoff: Rapid

Erosion hazard: Severe

Tilth: Easily tilled throughout a wide range of moisture content

Root zone: Deep; easily penetrated by plant roots

Depth to bedrock: None within a depth of 5 feet

Included with this soil in mapping are small areas of Estate, Lily, and Udorthents soils. Also included are some small areas of soils that are similar to Portia soil but have a stony or gravelly surface layer; some small areas of soils that are eroded; and a few areas of soils in shallow gullies.

This soil is used mainly as pasture.

This Portia soil is well suited to pasture. Adapted pasture plants include bermudagrass, bahiagrass, tall fescue, and white clover. This soil has no significant limitations for pasture. Deferred grazing, rotation grazing, brush and weed control, and proper stocking help control erosion.

This soil is poorly suited to cultivated crops. Adapted crops include grain sorghum, winter small grains, and truck crops that are adapted to the local climate. Erosion is a very severe hazard. With good management and adequate erosion control, minimum-tilled crops can be grown. Terraces and contour farming, minimum tillage, proper management of crop residue, and the use of cover crops reduce runoff and control erosion. Conservation practices need to be intensified as slope length and gradient increase.

This soil has the capability of producing about 114 cubic feet per acre, per year, of shortleaf pine commercial forest products. Adapted trees include shortleaf pine, loblolly pine, and sweetgum. This soil has no significant limitations for woodland use and management.

This soil is moderately suited to or poorly suited to most urban uses. Slope is a moderate limitation for dwellings and local roads and streets. Slope is a severe limitation for small commercial buildings. Adapting the design to conform to the natural slope or shaping the site can help to overcome the slope limitation. Moderately slow permeability is a severe limitation for septic tank absorption fields. The permeability limitation can be overcome by enlarging or modifying the septic tank absorption field.

This Portia soil is in capability subclass IVe and is in woodland suitability group 8A7.

48—Razort loam, occasionally flooded. This soil is deep, level to nearly level, and well drained. It is on flood plains that parallel streams. Flooding occurs less often than once every 2 years under normal weather conditions. If flooding occurs, it generally is for brief periods during the winter or early in the spring. The mapped areas range from about 5 to 100 acres. The slopes range from 0 to 3 percent.

The typical sequence, depth, and composition of the layers of this Razort soil are as follows:

Surface layer:
0 to 5 inches; dark brown loam

Subsoil:
5 to 43 inches; dark brown loam
43 to 55 inches; dark brown fine sandy loam

Substratum:
55 to 65 inches; dark yellowish brown gravelly sandy loam

Important soil properties of Razort soil:

Permeability: Moderate

Available water capacity: High

Organic matter content: Moderate

Natural fertility: Moderate

Soil reaction: Neutral or slightly acid in the surface layer and slightly acid or medium acid in the subsoil

Surface runoff: Slow to medium

Erosion hazard: Slight

Tilth: Easily tilled throughout a wide range of moisture content

Root zone: Deep; easily penetrated by plant roots

Shrink-swell potential: Low

Flood hazard: Occasional flooding of brief duration; less often than once every 2 years

Included with this soil in mapping are small areas of Ceda, Peridge, and Wideman soils. Also included are small areas of sandy or gravelly overwash that is several feet thick along streambanks, some areas of sandy overwash that is a few inches to about 18 inches thick that are not along the streams, and some areas of soils that are similar to Razort soil but are frequently flooded.

This soil is mainly used for pasture and hay (fig. 12).

Razort soil is well suited to pasture and hay. Adapted pasture plants include bahiagrass, bermudagrass, tall fescue, and white clover. Good management practices include proper stocking, controlled grazing, and weed and brush control. This soil has no significant limitations for pasture use.

This soil is also well suited to cultivated crops. Adapted crops include soybeans, truck crops, and small grains. Occasional flooding during the winter and early in the spring for very brief periods is the main limitation for crop production. During these periods of flooding, the fast-moving floodwaters can cause severe damage in a short time if the soil does not have a vegetative cover.

This soil has the capability of producing about 130 cubic feet per acre, per year, of shortleaf pine commercial forest products. Adapted trees include shortleaf pine, northern red oak, white oak, black walnut, American sycamore, and eastern cottonwood. Flooding increases seedling mortality.

This soil is poorly suited to most urban uses. Occasional flooding is a severe hazard for dwellings, small commercial buildings, local roads and streets, and septic tank absorption fields. A major flood control system is needed to overcome this limitation. The flooding hazard can be avoided by selecting a soil that is more suited to urban uses and that is not subject to flooding.

This Razort soil is in capability subclass IIw and is in woodland suitability group 9W8.

Figure 12.—Fescue hay on Razort loam, occasionally flooded. This soil is mainly used for pasture and hay.

49—Riverwash, frequently flooded. This miscellaneous area occurs along the larger drainageways in Newton County. It is mainly along the Buffalo River and Little Buffalo River and their tributaries.

Riverwash consists of gravelly, sandy, and cobbly sediment on streambanks and in stream channels. Islands are formed by Riverwash in many places. Some of these Riverwash areas are vegetated by willow, sycamore, and sweetgum trees. Also in these areas are river birch, water willow, and smartweed. Other areas have little or no vegetation. Because of the very low available water capacity, droughtiness is a severe limitation for shallow-rooted plants.

Riverwash land is constantly being changed and reworked by frequent flooding. These areas are best suited to habitat for wildlife and recreation.

This miscellaneous area is in capability subclass VIIIs. It has not been assigned to a woodland suitability group.

50—Spadra loam, occasionally flooded. This soil is deep, nearly level, and well drained. It is on low stream terraces. Flooding occurs infrequently during periods of heavy rains on an average of less than once every 2 years. If flooding occurs, it generally is for very brief periods during the winter or early in the spring. The mapped areas range from about 5 to 40 acres. The slopes are 0 to 3 percent.

The typical sequence, depth, and composition of the layers of this Spadra soil are as follows:

Surface layer:
0 to 7 inches; dark brown loam

Subsoil:
7 to 14 inches; dark brown loam
14 to 25 inches; dark brown sandy clay loam
25 to 40 inches; strong brown sandy clay loam
40 to 58 inches; reddish brown fine sandy loam that has strong brown mottles

Substratum:
58 to 72 inches; reddish brown gravelly fine sandy loam

Important soil properties of Spadra soil:

Permeability: Moderate

Available water capacity: Moderate

Organic matter content: Moderate

Natural fertility: Moderate

Soil reaction: Medium acid to very strongly acid throughout except in areas where the surface layer has been limed

Surface runoff: Slow

Erosion hazard: Moderate

Tilth: Easily tilled throughout a wide range of moisture content

Root zone: Deep; easily penetrated by plant roots

Shrink-swell potential: Low

Flood hazard: Occasional flooding of very brief duration; less often than once every 2 years

Included with this soil in mapping are small areas of Ceda and Kenn soils. Also included are small areas of soils that are poorly drained and some areas of soils that have a gravelly surface layer.

This Spadra soil is mainly used as pasture.

This soil is well suited to use as pasture. Adapted pasture plants are bahiagrass, bermudagrass, tall fescue, and white clover. This soil has no significant limitations for pasture use. Proper stocking, deferred grazing, and brush and weed control help control erosion.

This soil is moderately suited to cultivated crops. The hazard of flooding limits its use for cultivated crops. Adapted crops are soybeans, grain sorghum, winter small grains, and truck crops that are adapted to the local climate. Erosion is a moderate hazard. With good management and adequate erosion control, clean-tilled crops can be grown in rotation with grasses. Terraces and contour farming, minimum tillage, proper management of crop residue, and the use of cover crops reduce runoff and help control erosion.

This soil has the capability of producing about 130 cubic feet per acre, per year, of shortleaf pine commercial forest products. Adapted trees are shortleaf pine, loblolly pine, black walnut, red oak, and eastern redcedar. Flooding increases seedling mortality.

This soil is poorly suited to most urban uses. Occasional flooding is a severe hazard for dwellings, small commercial buildings, local roads and streets, and septic tank absorption fields. Major flood control systems are needed to overcome the flooding hazard.

This Spadra soil is in capability subclass IIw and is in woodland suitability group 9W8.

51—Spadra loam, 2 to 5 percent slopes. This soil is deep, nearly level to gently sloping, and well drained. It is on stream terraces. The mapped areas range from about 5 to 40 acres.

The typical sequence, depth, and composition of the layers of this Spadra soil are as follows:

Surface layer:
0 to 7 inches; dark brown loam

Subsoil:
7 to 14 inches; dark brown loam
14 to 25 inches; dark brown sandy clay loam

25 to 40 inches; strong brown sandy clay loam
40 to 58 inches; reddish brown fine sandy loam that has strong brown mottles

Substratum:
58 to 72 inches; reddish brown gravelly fine sandy loam

Important soil properties of Spadra soil:

Permeability: Moderate

Available water capacity: Moderate

Organic matter content: Moderate

Natural fertility: Moderate

Soil reaction: Medium acid to very strongly acid throughout except in areas where the surface layer has been limed

Surface runoff: Medium

Erosion hazard: Severe

Tilth: Easily tilled throughout a wide range of moisture content

Root zone: Deep; easily penetrated by plant roots

Shrink-swell potential: Low

Included with this soil in mapping are small areas of Kenn soils. Also included are small areas of soils that are poorly drained and some areas of soils that have a gravelly surface layer.

This Spadra soil is mainly used as pasture.

This soil is well suited to use as pasture. Adapted pasture plants are bahiagrass, bermudagrass, tall fescue, and white clover. This soil has no significant limitations for use as pasture. Proper stocking, deferred grazing, rotation grazing, and weed and brush control help control erosion.

This soil is moderately suited to cultivated crops. Adapted crops are soybeans, grain sorghum, winter small grains, and truck crops that are adapted to the local climate. Erosion is a severe hazard. With good management and adequate erosion control, clean-tilled crops can be grown in rotation with grasses. Terraces and contour farming, minimum tillage, proper management of crop residue, and the use of cover crops reduce runoff and help to control erosion. Conservation practices need to be intensified as slope length and gradient increase.

This soil has the capability of producing about 130 cubic feet per acre, per year, of shortleaf pine commercial forest products. Adapted trees include shortleaf pine, loblolly pine, black walnut, red oak, and eastern redcedar. This soil has no significant limitations for woodland use and management.

This soil is well suited to or moderately suited to most urban uses. This soil has no significant limitations for dwellings, small commercial buildings, and local roads and streets. Permeability is a moderate limitation to use of this soil as septic tank absorption fields. This limitation can be overcome by enlarging or modifying the septic tank absorption field.

This Spadra soil is in capability subclass IIIe and is in woodland suitability group 9A7.

52—Steprock gravelly loam, 3 to 8 percent slopes. This soil is moderately deep, gently sloping, and well drained. It is on upland crests and mountaintops. The slopes are convex. The mapped areas range from about 5 to more than 100 acres.

Steprock soil generally is covered by a thin layer of partly decomposed leaves and twigs. Under this layer, the typical sequence, depth, and composition of the layers of this Steprock soil are as follows:

Surface layer:
0 to 3 inches; dark brown gravelly loam

Subsurface layer:
3 to 10 inches; yellowish brown gravelly loam

Subsoil:
10 to 15 inches; strong brown very gravelly loam
15 to 32 inches; yellowish red very gravelly sandy clay loam

Substratum:
32 to 38 inches; weathered, platy, level-bedded sandstone that has yellowish red sandy clay loam between the plates (soft)

Important soil properties of Steprock soil:

Permeability: Moderate

Available water capacity: Very low

Organic matter content: Low

Natural fertility: Low

Soil reaction: Strongly acid or very strongly acid throughout

Surface runoff: Moderate to rapid

Erosion hazard: Severe

Root zone: At a depth of 20 to 40 inches; in places, roots restricted by fractured sandstone

Depth to bedrock: At a depth of 20 to 40 inches (soft)

Included with this soil in mapping are small areas of Mountainburg, Enders, and Linker soils. Also included are some areas of soils that have large stones on the surface layer and some small areas of rock outcrop.

This Steprock soil is mainly used as pasture.

This soil is moderately suited to use as pasture. Adapted pasture plants are bahiagrass, bermudagrass, tall fescue, and white clover. Concerns in management include proper stocking, controlled grazing, maintaining fertility level, and weed and brush control.

This soil is moderately suited to cultivated crops. Suitable crops are corn, small grains, and truck crops that are adapted to the local climate. If cultivated crops are grown, runoff is moderate to rapid. Erosion is a severe hazard. Surface gravel can hinder some tillage operations. Contour farming, terraces, and minimum tillage should be used if crops that leave a large amount of residue on the surface are to be safely grown year after year on the less sloping areas. Conservation practices need to be intensified as slope length and gradient increase.

This soil has the capability of producing about 78 cubic feet per acre, per year, of shortleaf pine commercial forest products. Adapted trees include shortleaf pine, loblolly pine, and eastern redcedar. This soil has no significant limitations for woodland use and management.

Steprock soil is moderately suited to most urban uses. This soil has no significant limitations for dwellings and for local roads and streets. Slope is a moderate limitation for small commercial buildings. Adapting the design to conform to the natural slope and land shaping can help to overcome the slope limitation. Depth to bedrock is a severe limitation to use of this soil as septic tank absorption fields. The depth to bedrock limitation can be avoided by installing septic tank absorption field lines in areas that have soils that are deep.

This Steprock soil is in capability subclass IIIe and is in woodland suitability group 5A7.

53—Wideman loamy fine sand, frequently flooded. This soil is deep, level to nearly level, and excessively drained. It is on flood plains and natural levees along streams. The slopes are smooth and undulating. Flooding occurs for very brief periods in winter and spring in most years. The mapped areas are long and narrow and range from 5 to 30 acres. The slopes range from 0 to 3 percent.

The typical sequence, depth, and composition of the layers of this Wideman soil are as follows:

Surface layer:

0 to 7 inches; dark yellowish brown loamy fine sand

Underlying material:

7 to 15 inches; dark brown loamy fine sand
15 to 32 inches; dark yellowish brown fine sand
32 to 34 inches; dark yellowish brown fine sandy loam
34 to 46 inches; yellowish brown fine sand
46 to 51 inches; dark yellowish brown fine sand
51 to 58 inches; yellowish brown fine sand
58 to 62 inches; dark brown fine sandy loam
62 to 72 inches; yellowish brown fine sand

Important soil properties of Wideman soil:

Permeability: Moderately rapid

Available water capacity: Low

Organic matter content: Low

Natural fertility: Low

Soil reaction: Strongly acid or medium acid in the surface layer and strongly acid to neutral in the underlying material

Surface runoff: Slow

Erosion hazard: Slight if kept vegetated, severe if vegetation has been removed and flooding occurs

Tilth: Good

Root zone: Deep

Flood hazard: Frequently for very brief periods in winter and in the spring in most years

Included with this soil in mapping are small areas of Ceda, Portia, and Razort soils. These included soils are well drained. Ceda soils are in a similar position as Wideman soil on flood plains but have a gravelly or cobbly surface layer. Portia soils are on foot slopes and stream terraces. Razort soils are on natural levees that are occasionally flooded and on flood plains. Also included are some areas of soils that have loamy sand overwash, narrow overflow channels, and gravel bars.

This Wideman soil is moderately suited to pasture. Adapted pasture plants are bermudagrass, lespedeza, tall fescue, and white clover. Concerns in management include proper stocking, controlled grazing, and weed and brush control.

This soil is not suited to cultivated crops because of very brief periods of flooding. If the soil does not have a good vegetative cover, these fast-moving floodwaters can cause severe damage.

This soil has the capability of producing about 79 cubic feet per acre, per year, of sweetgum commercial forest products. Suitable trees include shortleaf pine, loblolly pine, sweetgum, cottonwood, and sycamore. The sandy surface layer restricts the use of equipment and increases seedling mortality.

This soil is poorly suited to most urban uses. Frequent flooding is a severe hazard for dwellings, small commercial buildings, local roads and streets, and septic tank absorption fields. A major flood control system is necessary to overcome this limitation. In this map unit, the included soils, which are on higher elevations and are not subject to flooding or other soils in nearby areas that are more suitable for urban use, should be considered.

This Wideman soil is in capability subclass Vw and is in woodland suitability group 6S8.

Prime Farmland

In this section, prime farmland is defined and discussed, and the prime farmland soils in Newton County 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 2 to 8 percent.

The following map units, or soils, make up prime farmland in Newton County. 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 5. 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.

Prime farmland is scattered throughout the western and southern parts of Newton County on gently sloping mountaintops and plateaus and along the larger streams that drain through the county. These prime farmland soils are mainly in map units 1 and 5 on the general soil map. Most of the acreage is used for woodland or for pasture and hay.

Most of the prime farmland in Newton County is being held in some agricultural use. No significant trend in land use has caused the loss of prime farmland to industrial and urban uses. Because of the relatively small acreage of prime farmland in the county, it is extremely important for these areas to remain in some agricultural use. The loss of prime farmland to other uses puts pressure on marginal land, which generally is more erodible, droughty, or difficult to cultivate and is less productive than prime farmland.

The following soil map units make up prime farmland in Newton County:

22 Linker loam, 3 to 8 percent slopes
23 Linker gravelly loam, 3 to 8 percent slopes
46 Portia sandy loam, 3 to 8 percent slopes
48 Razort loam, occasionally flooded
50 Spadra loam, occasionally flooded
51 Spadra loam, 2 to 5 percent slopes

Use and Management of the Soils

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

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

Johnie D. Thompson, district conservationist, Soil Conservation Service, helped prepare this section.

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

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

About 36,088 acres in Newton County was used for crops and pasture in 1978, according to the Census of Agriculture *(15)*. Of that acreage, about 7,362 acres was harvested cropland and 28,726 acres was used for pasture or was left idle. In addition, about 9,622 acres was in improved and unimproved pasture. About 15,000 acres of wooded pasture was not included in the above acreage.

Most cleared land in the county is used for pasture or hay. The acreage in row crops is small. Areas of soils well suited to row crops are primarily on bottom lands and terraces along the Buffalo River and the Little Buffalo River, on terraces above the flood plains along smaller streams, and in a few small, gently sloping upland areas. Crops suited to these soils are grain sorghum, soybeans, corn, and small grains.

Some gently sloping to moderately sloping upland soils are moderately suited to or well suited to drilled or sown crops, mainly oats, wheat, and grain sorghum.

Most soils in the county are poorly suited to or not suited to intensive use for crops. Surface stoniness, slope, shallow depth to bedrock, high content of coarse fragments, or a combination of these are the main limitations.

Contour farming, vegetated waterways, and terraces are needed on sloping soils used for tilled crops. Annual cover crops or grasses and legumes should be grown regularly in the cropping system if the hazard of erosion is severe or very severe.

If left without vegetation, most soils tend to pack and crust over after heavy rains. Growing cover crops and managing crop residue help to maintain good tilth. Crop residue should be shredded and spread evenly to provide a protective cover and add organic matter to the soil. Conservation tillage should be practiced to the extent practical for the soil conditions and the crop requirement.

Generally, the upland soils in the county have inherent fertility. The kinds and amounts of fertilizer applied are

generally based on soil tests, crops to be grown, past experience, capability of the soil to produce, and expected yields. On most soils, lime is necessary for satisfactory production of alfalfa, white clover, red clover, vegetables, and other specialty crops.

Small acreages are in commercial and home orchards and gardens. Although the acreage and cash income from these enterprises are small, they are important. Most farm families and many urban families can and freeze homegrown fruit and vegetables for home use.

Perennial grasses or mixtures of grasses and legumes are grown for pasture and hay. Mixtures generally consist of either a warm-season or a cool-season perennial grass and a suitable legume.

Forage production is a major enterprise in Newton County. Proper grazing is essential for the production of high quality forage, stand survival, and erosion control. This helps plants to maintain sufficient top growth during the growing season. It also may require restricting grazing of tall fescue and other cool-season grasses during the hot, dry summer. Brush control is essential, and weed control is generally needed. Rotation grazing and renovation are also important.

Pasture grasses respond well to nitrogen fertilizer. Grass and legume mixtures may require application of phosphate, potash, and lime at rates based on soil test results.

Tall fescue is the most common forage grass in the area. It is a cool-season perennial that is propagated by seeding, generally in the fall. Common bermudagrass and improved bermudagrass are also grown. These are warm-season perennials that are propagated by sprigging, generally in the spring. The bermudagrass is generally sprigged because stands started by seeding are more susceptible to winterkill. Red clover, white clover, annual lespedeza, and sericea lespedeza are the most commonly grown legumes. Alfalfa is suited to the fertile, well drained Razort and Spadra soils on bottom lands and terraces along the Buffalo River, Little Buffalo River, and other large streams in the county.

Yields Per Acre

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

The 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 6 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 rangeland, for woodland, and for engineering purposes.

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

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.

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.

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

The capability classification of each map unit is given in the section "Detailed Soil Map Units."

Woodland Management and Productivity

Kelly M. Koonce, forester, Soil Conservation Service, helped prepare this section.

About 465,431 acres, or 88 percent, of Newton County is in woodland. Of this woodland acreage, 47 percent, or 217,971 acres, is in private ownership; 51 percent, or 239,640 acres, is in federal ownership; and 2 percent, or 11,715 acres, is in industrial ownership. Approximately 2,300 forest landowners are in Newton County. This data is from a 1978 unpublished inventory by the Soil Conservation Service. About 20 forestry-related industries are in Newton County.

The principal forest cover type *(8)* is the *Oak-hickory type,* which represents over 350,000 acres in the county. Other types are the *Oak-pine,* which occurs on 41,000 acres; *Loblolly-shortleaf pine,* which occurs on 35,000 acres; *Eastern redcedar,* which occurs on 32,000 acres; and *Oak-gum-cypress,* which occurs on 5,000 acres. These forest types contain about 257,000 acres of sawlog-sized trees, 185,000 acres of pole timber, and 23,000 acres of seedlings and saplings.

The main trees are white oak, red oak, shortleaf pine, eastern redcedar, sweetgum, blackgum, post oak, and various hickories. On most of the soils in the county, trees can be grown for commercial timber, habitat for wildlife, and recreation and esthetic value and for the conservation of soil and water.

This section explains how soils affect the growth of trees and management of timber resources in the county.

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

This soil survey can be used by woodland managers planning ways to increase the productivity of forest land. Some soils respond better to fertilization than others, some are more susceptible to landslides and erosion after building roads and harvesting timber, and some 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 *woodland suitability group* for each soil. The first part of the woodland suitability group, 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 woodland suitability group, 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 *X* indicates that a soil has restrictions because of stones or rocks on the surface. The letter *W* indicates a soil in which excessive water, either seasonal or year-round, causes a significant limitation. The letter *D* indicates a soil that has a limitation because of restricted rooting depth, such as a shallow soil that is underlain by hard rock, hardpan, or other layers that restrict roots. The letter *C* indicates a soil that has a limitation because of the kind or amount of clay in the upper part of the soil. The letter *S* indicates a dry, sandy soil. The letter *F* indicates a soil that has a large amount of coarse fragments in the soil profile. The letter *A* indicates a soil that has no significant restrictions or limitations for forest use and management. If a soil has more than one limitation, the priority is as follows: R, X, W, D, C, S, and F.

The third element in the group, a numeral, indicates the kind of trees to which the soils in the group are best suited and also indicates the severity of the hazard or limitation. The numerals 1, 2, and 3 indicate slight,

moderate, and severe limitations, respectively, and suitability for needleleaved trees. The numerals 4, 5, and 6 indicate slight, moderate, and severe limitations, respectively, and suitability for broadleaved trees. The numerals 7, 8, and 9 indicate slight, moderate, and severe limitations, respectively, and suitability for both needleleaved and broadleaved trees.

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.

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. *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; *moderate* if expected mortality is between 25 and 50 percent; and *severe* if expected mortality exceeds 50 percent. Ratings of *moderate* or *severe* indicate that it may be necessary to use containerized or larger than usual planting stock or to make special site preparations, such as bedding, furrowing, installing surface drainage, or providing artificial shade for seedings. Reinforcement planting is often needed if the risk is *moderate* or *severe*.

Ratings of *windthrow hazard* consider the likelihood of trees being uprooted by the wind. Restricted rooting depth is the main reason for windthrow. Rooting depth can be restricted by a high water table, fragipan, or bedrock, or by a combination of such factors as soil wetness, texture, structure, and depth. The risk is *slight* if strong winds cause trees to break but do not uproot them; *moderate* if strong winds cause an occasional tree to be blown over and many trees to break; and *severe* if moderate or strong winds commonly blow trees over. Ratings of *moderate* or *severe* indicate the need for care in thinning or possibly not thinning. Specialized equipment may be needed to avoid damage to shallow root systems in partial cutting operations. A plan for periodic salvage of windthrown trees and the maintenance of a road and trail system may be needed.

Ratings of *plant competition* indicate the likelihood of the growth or invasion of undesirable plants. *Plant competion* 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 culminates.

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 for determining site index are given in the site index tables used for the Newton County soil survey *(3, 4, 5, 6, 10, 11)*.

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. It can be converted to board feet by multiplying by a factor of about 5. For example, a productivity class of 8 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.

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.

Wildlife Habitat

Paul Brady, biologist, Soil Conservation Service, helped prepare this section.

Outstanding scenery and good habitat for wildlife abound in Newton County. These are in areas that consist primarily of upland forests and grasslands in the Ozark Mountains.

About 88 percent, or 465,431 acres, is in woodland. About 80 percent of this woodland is in hardwoods (oak-hickory climax on uplands, oak-gum climax on lowlands). About 20 percent is in shortleaf pine and eastern redcedar. About 7 percent of the county, or 38,348 acres, is pasture, hayland, and forage areas. Tall fescue is the principal pasture grass. Other significant grasses are orchardgrass and common and hybrid bermudagrasses. White clover and annual lespedeza are the primary pasture legumes. Native grasses, such as bluestems, are also used for livestock forage. About 7,362 acres is used for cropland. Grain sorghum and sorghum-sudan hybrids are the major crops grown in Newton County.

Newton County includes 196,268 acres of federally-owned land in the Ozark National Forest and 43,372 acres in the Buffalo National River Area. Most of it is forested, and part of its management is directed toward maintaining and improving habitat for wildlife.

Some native plants of major importance to wildlife in this county include woolly croton, annual lespedeza, milkpea, panicgrass, partridge pea, paspalums, common ragweed, tickclover, and vetches. Native woody plants include oak, hickory, hackberry, shortleaf pine, redcedar, elderberry, grapes, dogwoods, blackberry, greenbrier,

Japanese honeysuckle, persimmon, wild cherry, and sumac.

The abundant hardwood forests, interspersed pastures, fence rows, and numerous edges provide abundant habitats for white-tailed deer, black bear, squirrels, bobwhite quail, wild turkey, raccoons, coyotes, skunks, opossum, foxes, bobcats, rabbits, owls, hawks, numerous nongame birds, small mammals, reptiles, and other wildlife.

The Arkansas Game and Fish Commission owns and manages the Buffalo River Wildlife Management Area covering 9,198 acres in eastern Newton County and western Searcy County. Major game animals in this area are deer, squirrels, turkeys, quail, and rabbits. Sightings of black bears in east-central Newton County and some other areas of the county are becoming almost common.

The Arkansas Game and Fish Commission has stocked elk in the more remote areas of Newton County. This small population seems to be thriving in this area where the human population is quite low and the wooded mountains are abundant.

Newton County has about 1,250 acres of ponds. These ponds are used primarily for stock water and for sport fishing for largemouth bass, bluegill, redear sunfish, and channel catfish.

About 160 miles of fishable streams are in the county. The largest and most important of these is the Buffalo River, Arkansas' most popular stream for canoeing and perhaps its most famous stream. The Buffalo River, Little Buffalo River, Big Creek, Big Piney Creek, and Little Piney Creek are the major streams in Newton County. All of these are cool-water streams that provide habitat and sport fishing for smallmouth bass, Kentucky bass, rock bass, longear sunfish and green sunfish, white suckers, sculpins, and various minnows, shiners, and darters.

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, bromegrass, clover, and alfalfa.

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

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

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

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, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, deer, and bear.

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

Engineering

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, and local roads and streets. 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; 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. A high water table, depth to bedrock, 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, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, and depth to a high water table affect the traffic-supporting capacity.

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, a high water table, depth to bedrock, and flooding affect absorption of the effluent. Large stones and bedrock interfere with installation.

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

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

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

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. 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, a high 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 high water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

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

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

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help 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 or stones, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

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

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and 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 and embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives the restrictive features that affect each soil for drainage, irrigation, 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 or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; and susceptibility to flooding. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock. The performance of a system is affected by the depth of the root zone and soil reaction.

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, toxic substances, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

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

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

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 *(13)*. 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.

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

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

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

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The

estimates are based on test data from the survey area, or from nearby areas, and on field examination.

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

Physical and Chemical Properties

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

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

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They 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 earthmoving operations.

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

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

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

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

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

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

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

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

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

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

The content of organic matter 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 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), *brief* (2 to 7 days), *long* (7 days to 1 month), and *very long* (more than 1 month). The time of year that floods are most likely to occur is expressed in months. 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, *perched, artesian*, or *apparent;* and the months of the year that the water table commonly is highest. A water table that is seasonally high for less than 1 month is not indicated in table 16.

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

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.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories *(14)*. 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 17 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*, meaning humid, 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, siliceous 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.

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 (13)*. Many of the technical terms used in the descriptions are defined in *Soil Taxonomy (14)*. 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."

Arkana Series

The Arkana series consists of moderately deep, well drained, very slowly permeable soils that formed in clayey residuum of limestone or cherty limestone bedrock. These gently sloping to steep soils are on limestone ridges and hillsides. The native vegetation is upland hardwoods and tall grasses in the open areas. The slopes range from 3 to 40 percent.

Arkana soils are associated with Clarksville, Moko, and Noark soils. Clarksville soils are on hillsides at high elevations. These soils have a loamy-skeletal control section. Bedrock is at a depth of more than 60 inches.

Moko soils are adjacent to and on similar landscapes as Arkana soil. These soils do not have an argillic horizon. Bedrock is at a depth of less than 20 inches. Noark soils are on hillsides and ridgetops at high elevations. These soils have a clayey-skeletal control section. Bedrock is at a depth of more than 60 inches.

Typical pedon of Arkana very cherty silt loam, in an area of Arkana-Moko complex, 20 to 40 percent slopes; in a wooded area; NE1/4SE1/4SW1/4 sec. 14, T. 16 N., R. 21 W.

A1—0 to 3 inches; very dark grayish brown (10YR 3/2) very cherty silt loam; weak fine granular structure; very friable; many fine and medium roots; about 45 percent, by volume, chert fragments, less than 3 inches in diameter; slightly acid; clear smooth boundary.

A2—3 to 7 inches; dark brown (10YR 3/3) very cherty silt loam; moderate medium granular structure; very friable; many fine roots; about 45 percent, by volume, chert fragments, less than 3 inches in diameter; slightly acid; clear smooth boundary.

Bt1—7 to 13 inches; reddish brown (5YR 4/4) cherty clay; moderate medium subangular blocky structure; firm; common fine roots; thin patchy clay films on faces of peds; about 30 percent, by volume, chert fragments, less than 3 inches in diameter; slightly acid; clear wavy boundary.

Bt2—13 to 21 inches; yellowish red (5YR 4/6) clay; moderate fine subangular blocky structure; firm, plastic; common fine roots; thick continuous clay films on faces of peds; about 5 percent, by volume, chert fragments, less than 3 inches in diameter; slightly acid; gradual wavy boundary.

Bt3—21 to 33 inches; yellowish brown (10YR 5/4) clay; many medium distinct strong brown (7.5YR 5/6) mottles; moderate fine angular blocky structure; firm, plastic; thick continuous clay films on faces of peds; neutral; abrupt smooth boundary.

R—33 to 35 inches; gray, hard, level-bedded limestone bedrock.

The thickness of the solum and depth to bedrock range from 20 to 45 inches. Reaction ranges from slightly acid or neutral in the A horizon and from slightly acid to moderately alkaline in the Bt horizon. The content of coarse fragments ranges from 35 to 60 percent in the A horizon, from 15 to 60 percent in the Bt1 horizon, and from 0 to 35 percent in the Bt2 and Bt3 horizons.

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

The Bt1 and Bt2 horizons have hue of 5YR, value of 4, and chroma of 4 or 6 or value of 5 and chroma of 6 or 8; or have hue of 2.5YR, value of 4 or 5, and chroma of 6. The Bt1 horizon is cherty silty clay loam, cherty silty clay, or cherty clay, or their very cherty analogs. The Bt2 horizon is clay or cherty clay. The Bt3 horizon has hue of 5YR, value of 4, and chroma of 4 or 6; or hue of 7.5YR, value of 5, and chroma of 6; or hue of 10YR, value of 4 or 5, and chroma of 4. This horizon has mottles in shades of brown. Texture is clay or cherty clay.

The R horizon is gray, level-bedded, hard limestone or cherty limestone bedrock.

Britwater series

The Britwater series consists of deep, well drained, moderately permeable soils that formed in old alluvial sediment and residuum of cherty limestone. These gently sloping soils are on stream terraces and uplands. The native vegetation is mixed hardwoods of oak, hickory, and black walnut. The slopes range from 3 to 8 percent.

Britwater soils are associated with Noark, Peridge, Razort, and Wideman soils. Noark soils are in higher positions on the landscape than Britwater soils. These soils have a clayey-skeletal control section. Peridge soils are adjacent to and on similar landscapes. These soils have a fine-silty control section. They have less gravel than Britwater soils. Razort soils are on flood plains. These soils have a mollic-colored surface layer. Wideman soils are on flood plains and natural levees. These soils have a sandy control section. They do not have an argillic horizon.

Typical pedon of Britwater gravelly silt loam, 3 to 8 percent slopes; in a pasture; NE1/4NW1/4SW1/4 sec. 24, T. 16 N., R. 21 W.

Ap—0 to 7 inches; dark brown (10YR 4/3) gravelly silt loam; weak fine granular structure; very friable; many fine and medium roots; about 20 percent, by volume, chert gravel, 1/2 inch to 2 inches in diameter; medium acid; abrupt smooth boundary.

Bt1—7 to 15 inches; yellowish red (5YR 4/6) gravelly silty clay loam; weak medium subangular blocky structure; friable; common fine and medium roots; thin patchy clay films on faces of peds and pore walls; many fine and medium pores; about 25 percent, by volume, chert gravel, 1/2 inch to 2 inches in diameter; strongly acid; gradual smooth boundary.

Bt2—15 to 29 inches; yellowish red (5YR 4/6) very gravelly silty clay loam; moderate medium angular blocky structure; friable; common fine roots; medium discontinuous clay films on faces of peds and pore walls; many fine and medium pores; about 35 percent, by volume, chert gravel, 1/2 inch to 2 inches in diameter; strongly acid; gradual smooth boundary.

Bt3—29 to 45 inches; red (2.5YR 4/6) very gravelly silty clay loam; moderate medium subangular blocky structure; friable; few fine roots; thin continuous clay films on faces of peds and pore walls; common fine and medium pores; about 35 percent, by volume,

chert gravel, 1/2 inch to 2 inches in diameter; strongly acid; gradual smooth boundary.

Bt4—45 to 72 inches; red (2.5YR 4/6) very gravelly silty clay loam; moderate medium subangular blocky structure; firm; thin continuous clay films; common fine and medium pores; about 45 percent, by volume, chert gravel, 1/2 inch to 2 inches in diameter; strongly acid.

The thickness of the solum ranges from 60 to more than 80 inches. Reaction is medium acid or strongly acid throughout.

The A horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. The content of gravel ranges from 15 to 20 percent.

Some pedons have a BA horizon that has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4. Texture is silt loam, gravelly loam, or gravelly silt loam. The content of gravel ranges from 10 to 25 percent. The Bt1 horizon has hue of 5YR, value of 4 or 5, and chroma of 6 or 8; or hue of 7.5YR, value of 5, and chroma of 6. Texture is silty clay loam or clay loam, or their gravelly analogs. The content of gravel ranges from 5 to 30 percent. The Bt2 horizon has hue of 5YR or 2.5YR, value of 4 or 5, and chroma of 6. Texture is very gravelly silty clay loam or gravelly silty clay loam. The content of gravel ranges from 15 to 45 percent. The Bt3 and Bt4 horizons have hue of 2.5YR, value of 3 or 4 and chroma of 6; or hue of 5YR, value of 4, and chroma of 6; or hue of 5YR, value of 5, and chroma of 6 or 8. Some pedons have mottles in shades of red or brown. Texture is gravelly silty clay loam or very gravelly silty clay loam. The content of gravel ranges from 15 to 50 percent.

Ceda Series

The Ceda series consists of deep, well drained, rapidly permeable soils that formed in gravelly and loamy alluvium. These level to nearly level soils are on flood plains. In most years, these soils are flooded at least once a year for very brief periods from December to April. The native vegetation is mixed hardwoods and cedars. The slopes range from 0 to 3 percent.

Ceda soils are associated with Enders, Kenn, Nella, Razort, Spadra, and Steprock soils. Enders soils are on adjacent side slopes or foot slopes. These soils have a clayey control section. They have an argillic horizon. Kenn soils are in slightly higher positions on flood plains than Ceda soils. These soils have a fine-loamy control section. They have an argillic horizon. Nella soils are on adjacent side slopes. These soils have a fine-loamy control section. They have an argillic horizon. Razort soils are on similar landscapes. These soils have a fine-loamy control section. They have an argillic horizon. Spadra soils are on adjacent stream terraces. These soils have a fine-loamy control section. They have an argillic horizon. Steprock soils are on adjacent side slopes. These soils have an argillic horizon. Bedrock is at a depth of less than 40 inches.

Typical pedon of Ceda cobbly loam, in an area of Ceda-Kenn complex, frequently flooded; SE1/4NW1/4SE1/4, sec. 22, T. 15 N., R. 23 W.

A1—0 to 10 inches; dark brown (10YR 4/3) cobbly loam; weak fine granular structure; friable; 20 percent, by volume, sandstone cobbles and 10 percent, by volume, rounded sandstone gravel; common fine and medium roots; many fine pores; slightly acid; clear smooth boundary.

C1—10 to 15 inches; yellowish brown (10YR 5/4) very gravelly loam; massive; friable; 40 percent, by volume, sandstone gravel and 10 percent, by volume, sandstone cobbles; common medium roots; few fine pores; medium acid; clear smooth boundary.

C2—15 to 34 inches; strong brown (7.5YR 5/6) very gravelly loam; massive; friable; 20 percent, by volume, sandstone gravel and 15 percent, by volume, sandstone cobbles; few medium roots; few fine pores; medium acid; clear smooth boundary.

C3—34 to 72 inches; strong brown (7.5YR 5/6) very gravelly loam; massive; friable; 30 percent, by volume, sandstone gravel and 20 percent, by volume, sandstone cobbles; medium acid.

The thickness of the gravelly and loamy sediments ranges from 60 to 72 inches or more. Reaction is slightly acid or medium acid throughout.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. An A horizon that has a moist color value of 3 or less is less than 7 inches thick. The content of coarse fragments ranges from 15 to 35 percent, by volume.

The C horizon has hue of 10YR, value of 4, and chroma of 3 or 4 or value of 5 and chroma of 4 or 6; or it has hue of 7.5YR, value of 4, and chroma of 4 or value of 5 and chroma of 6. Texture of the fine-earth fraction is loam, fine sandy loam, or clay loam. The content of gravelly and cobbly coarse fragments ranges from 35 to 75 percent, by volume.

Clarksville Series

The Clarksville series consists of deep, somewhat excessively drained, moderately rapidly permeable soils that formed in residuum of cherty limestone. These very cherty, steep and very steep soils are on hillsides. The native vegetation is mixed hardwoods and pines. The slopes range from 20 to 50 percent.

Clarksville soils are associated with Arkana, Moko, Nixa, and Noark soils. Arkana soils are adjacent to but on lower elevations than Clarksville soils. These soils have a very-fine control section. Bedrock is at a depth of less than 45 inches. Moko soils are on lower hilltops and

side slopes. These soils do not have an argillic horizon. Bedrock is at a depth of less than 20 inches. Nixa soils are adjacent to but on higher ridgetops. These soils have a fragipan. Noark soils are on adjacent similar landscapes. These soils have a clayey-skeletal control section.

Typical pedon of Clarksville very cherty silt loam, 20 to 50 percent slopes; in a wooded area; SE1/4SE1/4NW1/4 sec. 5, T. 16 N., R. 20 W.

A—0 to 4 inches; brown (10YR 5/3) very cherty silt loam; weak fine granular structure; very friable; many fine roots; about 55 percent, by volume, chert fragments, up to 8 inches in diameter; medium acid; clear smooth boundary.

E—4 to 14 inches; pale brown (10YR 6/3) extremely cherty silt loam; weak fine granular structure; very friable; many fine roots; about 65 percent, by volume, chert fragments, up to 8 inches in diameter; medium acid; clear smooth boundary.

BE—14 to 23 inches; yellowish brown (10YR 5/4) extremely cherty silt loam; weak fine subangular blocky structure; very friable; common fine roots; many fine pores; about 80 percent, by volume, chert fragments, up to 8 inches in diameter; very strongly acid; clear smooth boundary.

Bt1—23 to 41 inches; strong brown (7.5YR 5/6) extremely cherty silt loam; weak fine subangular blocky structure; friable; common fine roots; many fine pores; thin continuous clay films on faces of peds and in pores and root channels; about 85 percent, by volume, chert fragments, up to 8 inches in diameter; very strongly acid; gradual wavy boundary.

Bt2—41 to 59 inches; strong brown (7.5YR 5/6) extremely cherty silt loam; weak fine subangular blocky structure; firm; few fine roots; many fine pores; thin continuous clay films on faces of peds and in pores and root channels; about 90 percent, by volume, chert fragments, up to 8 inches in diameter; very strongly acid; clear smooth boundary.

Bt3—59 to 69 inches; yellowish red (5YR 5/6) extremely cherty silt loam; weak fine subangular blocky structure; firm; many fine pores; thin continuous clay films on faces of peds and in pores and root channels; about 85 percent, by volume, chert fragments, up to 8 inches in diameter; very strongly acid; clear smooth boundary.

Bt4—69 to 75 inches; red (2.5YR 5/6) extremely cherty silty clay; moderate fine subangular blocky structure; firm; common fine pores; thick continuous clay films on faces of peds; few dark ped coatings; about 85 percent, by volume, chert fragments, up to 8 inches in diameter; very strongly acid.

The thickness of the solum ranges from 60 to more than 72 inches. Reaction ranges from medium acid to very strongly acid in the A and E horizons and is strongly acid or very strongly acid in the B horizon.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3 or value of 5 and chroma of 3. An A horizon that has value of 3 is less than 7 inches thick. The content of chert ranges from 35 to 60 percent, by volume.

The E horizon has hue of 10YR, value of 5 or 6, and chroma of 2 or 3. The content of chert ranges from 60 to 80 percent, by volume.

The BE horizon has hue of 10YR, value of 5, and chroma of 4 or 6. The Bt1 horizon has hue of 7.5YR, value of 4 or 5, and chroma of 4 or 6. Texture is extremely cherty silt loam or extremely cherty silty clay loam. The content of chert in the BE and Bt1 horizons ranges from 60 to 90 percent, by volume. The Bt2, Bt3, and Bt4 horizons have hue of 7.5YR, value of 5, and chroma of 6; or they have hue of 5YR or 2.5YR, value of 4 or 5, and chroma of 4 or 6. Texture of the Bt2 and Bt3 horizons is extremely cherty silt loam or extremely cherty silty clay loam. Texture of the Bt4 horizon is extremely cherty silty clay loam or extremely cherty silty clay. The content of chert ranges from 60 to 90 percent, by volume, in the lower part of the B horizon.

Eden Series

The Eden series consists of moderately deep, well drained, slowly permeable soils that formed in residuum of interbedded calcareous shale and limestone. These strongly sloping to very steep soils are on mountainsides and foot slopes. The native vegetation is upland hardwoods and cedars. The slopes range from 8 to 60 percent.

Eden soils are associated with Enders, Nella, and Newnata soils. Enders soils are on adjacent foot slopes and mountainsides. These soils have a lower base saturation. Soft shale bedrock is at a depth of 40 to 60 inches. Nella soils are on adjacent foot slopes and mountainsides. These soils have a fine-loamy control section. The solum is more than 60 inches thick. Newnata soils are on similar landscapes. Hard limestone bedrock is at a depth of 40 to 60 inches.

Typical pedon of Eden flaggy silty clay loam, in an area of Eden-Newnata complex, 20 to 40 percent slopes; in a wooded area; NW1/4NE1/4NW1/4 sec. 2, T. 15 N., R. 21 W.

A—0 to 5 inches; very dark grayish brown (10YR 3/2) flaggy silty clay loam; moderate medium granular structure; friable; many fine roots; about 25 percent, by volume, limestone flagstones, up to 6 inches in diameter; slightly acid; clear smooth boundary.

Bt1—5 to 13 inches; dark yellowish brown (10YR 4/4) flaggy silty clay; moderate medium subangular blocky structure; firm, sticky; common fine roots; thin continuous clay films; about 25 percent, by volume,

limestone flagstones, up to 6 inches in diameter and about 5 percent, by volume, fine shale fragments; moderately alkaline; gradual smooth boundary.

BC—13 to 22 inches; dark yellowish brown (10YR 4/4) flaggy silty clay; common medium distinct light olive brown (2.5Y 5/4) mottles; weak medium angular blocky structure; firm, sticky; about 15 percent, by volume, limestone flagstone, up to 6 inches in diameter and about 5 percent, by volume, fine shale fragments; moderately alkaline; clear smooth boundary.

Cr1—22 to 42 inches; dark grayish brown (2.5Y 4/2) moderately weathered, calcareous shale.

Cr2—42 to 60 inches; dark grayish brown (2.5 4/2) firm, dry, interbedded, calcareous shale and limestone.

The thickness of the solum ranges from 14 to 40 inches. The depth to paralithic contact ranges from 20 to 40 inches. Reaction ranges from medium acid to moderately alkaline in the A and B horizons and is mildly alkaline or moderately alkaline in the C horizon.

The A horizon has hue of 10YR, value of 2, 3, or 4, and chroma of 2 or 3. An A horizon that has a moist color value of 2 or 3 is less than 6 inches thick. The content of coarse fragments of limestone and shale ranges from 15 to 25 percent, by volume.

The B and BC horizons have hue of 10YR, value of 4 or 5, and chroma of 3 or 4; or hue of 2.5Y, value of 4 or 5, and chroma of 4 or value of 5 and chroma of 6. Some pedons have mottles in shades of olive and brown. Texture is silty clay or clay, or their flaggy analogs. The content of limestone flagstone and fine shale fragments ranges from 10 to 35 percent, by volume.

The Cr horizon is weathered, fractured, soft shale in shades of black, gray, or brown. This horizon has thin strata of fossiliferous limestone.

Enders Series

The Enders series consists of deep, well drained, very slowly permeable soils that formed in residuum and colluvium of acid shale or interbedded shale and sandstone. These gently sloping to steep soils are on upland crests, mountainsides and foot slopes. The native vegetation is upland hardwoods. The slopes range from 3 to 40 percent.

Enders soils are associated with Ceda, Eden, Kenn, Leesburg, Linker, Mountainburg, Nella, Newnata, and Steprock soils. Ceda soils are on adjacent flood plains. These soils have a loamy-skeletal control section. They do not have an argillic horizon. Eden soils are on adjacent mountainsides. These soils have a higher base saturation than Enders soils. Soft bedrock is at a depth of 20 to 40 inches. Kenn soils are on flood plains. These soils have a fine-loamy control section. They are moderately permeable. Leesburg soils are on adjacent similar landscapes. These soils have a fine-loamy control section. The solum is more than 60 inches thick. Linker soils are on mountaintops. These soils have a fine-loamy control section. Hard sandstone bedrock is at a depth of less than 40 inches. Mountainburg soils are on mountaintops and on the higher mountainsides. These soils have a loamy-skeletal control section. Hard sandstone bedrock is at a depth of less than 20 inches. Nella soils are on similar landscapes as Enders soils. These soils have a fine-loamy control section. The solum is more than 60 inches thick. Newnata soils are on adjacent mountainsides. These soils have a higher base saturation than Enders soils. Steprock soils are on similar landscapes. These soils have a loamy-skeletal control section. Sandstone bedrock is at a depth of less than 40 inches.

Typical pedon of Enders stony loam, in an area of Enders-Leesburg stony loams, 8 to 20 percent slopes; SE1/4NW1/4NW1/4, sec. 10, T. 15 N., R. 23 W.

A—0 to 5 inches; very dark grayish brown (10YR 3/2) stony loam; weak fine granular structure; very friable; many fine roots; common fine pores; 25 percent, by volume, sandstone fragments, 10 to 60 inches in diameter; very strongly acid; clear wavy boundary.

BE—5 to 9 inches; strong brown (7.5YR 5/6) gravelly loam; weak fine subangular blocky structure; friable; common medium and fine roots; common medium pores; 15 percent, by volume, sandstone fragments, mostly less than 3 inches in diameter; very strongly acid; clear wavy boundary.

Bt1—9 to 21 inches; red (2.5YR 5/8) silty clay; moderate fine subangular blocky structure; firm; thin continuous clay films on faces of peds; common medium roots; few fine pores; very strongly acid; gradual wavy boundary.

Bt2—21 to 27 inches; red (2.5YR 4/8) silty clay; moderate medium subangular blocky structure; firm; thick continuous clay films on faces of peds; common medium roots; very strongly acid; gradual wavy boundary.

Bt3—27 to 46 inches; red (2.5YR 4/6) shaly clay that has many medium distinct strong brown (7.5YR 5/6) and few medium distinct yellowish red (5YR 5/8) mottles; moderate medium angular blocky structure; firm; thick continuous clay films on faces of peds; 15 percent, by volume, soft, thin, black shale fragments; very strongly acid; gradual wavy boundary.

BC—46 to 49 inches; mottled red (2.5YR 4/6) and light brownish gray (10YR 6/2) shaly clay; moderate medium angular blocky structure; firm; thick continuous clay films on faces of peds; 25 percent, by volume, soft, thin black shale fragments; very strongly acid; clear smooth boundary.

Cr/Bt—49 to 55 inches; level-bedded, thin, platy, weathered dark gray shale that has light brownish gray (10YR 6/2) clay between fragments.

Cr—55 to 57 inches; black, level-bedded, fissile shale.

The thickness of the solum ranges from 32 to 59 inches. Depth to shale bedrock ranges from 40 to more than 60 inches. Reaction ranges from strongly acid to extremely acid throughout. The content of coarse fragments ranges from 15 to 35 percent sandstone fragments in the A and E horizons and from 0 to 35 percent sandstone and shale fragments in the BE, B, and BC horizons.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. An A horizon that has value of 3 is less than 7 inches thick. Texture is gravelly loam or stony loam.

Some pedons have an E horizon that has hue of 10YR, value of 5, and chroma of 3 or 4. Texture is gravelly loam or stony loam.

The BE horizon has hue of 7.5YR, value of 5, and chroma of 4 or 6. Texture is loam or gravelly loam. The Bt horizon has hue of 5YR, value of 4 or 5, and chroma of 6 or value of 5 and chroma of 8; or it has hue of 2.5YR, value of 4 or 5, and chroma of 6 or 8. The lower part of the Bt horizon is commonly mottled in shades of brown, red, or gray. Texture of the Bt1 and Bt2 horizons is silty clay and clay. Texture of the Bt3 horizon is silty clay or clay, or their shaly or gravelly analogs. The BC horizon is mottled in shades of brown, red, and gray. Texture is shaly silty clay or shaly clay.

The Cr horizon is dark gray to black extremely acid, weathered shale grading to hard shale bedrock.

Estate Series

The Estate series consists of deep, well drained, slowly permeable soils that formed in residuum of interbedded sandstone and limestone. These strongly sloping to steep soils are on hilltops and hillsides. The native vegetation is upland hardwoods and cedars. The slopes range from 8 to 40 percent.

Estate soils are associated with Lily and Portia soils. Lily soils are on similar landscapes as Estate soils. These soils have a fine-loamy control section. Bedrock is at a depth of 20 to 40 inches. Portia soils are on foot slopes and hilltops. These soils have a fine-loamy control section. Bedrock is at a depth of more than 60 inches.

Typical pedon of Estate stony fine sandy loam, in an area of Estate-Lily-Portia complex, 8 to 20 percent slopes; in a wooded area; SW1/4NE1/4SW1/4, sec. 15, T. 16 N., R. 19 W.

A—0 to 4 inches; dark yellowish brown (10YR 4/4) stony fine sandy loam; weak fine granular structure; very friable; common fine and medium roots; about 5 percent, by volume, sandstone gravel and 15 percent, by volume, sandstone stones, more than 10 inches in diameter; medium acid; clear smooth boundary.

E—4 to 11 inches; yellowish brown (10YR 5/4) gravelly sandy loam; weak fine granular structure; very friable; common fine and medium roots; about 15 percent, by volume, sandstone gravel; medium acid; gradual smooth boundary.

BE—11 to 16 inches; strong brown (7.5YR 4/6) sandy loam; moderate medium granular structure; friable; common fine and medium roots; about 10 percent, by volume, sandstone gravel; strongly acid; clear smooth boundary.

Bt1—16 to 25 inches; yellowish red (5YR 5/6) sandy clay; moderate medium subangular blocky structure; firm; thin patchy clay films on faces of peds; few fine and medium roots; medium acid; clear smooth boundary.

Bt2—25 to 40 inches; red (2.5YR 4/8) clay; moderate medium subangular blocky structure; firm; thick continuous clay films on faces of peds; few fine roots; common black stains; medium acid; gradual smooth boundary.

Bt3—40 to 58 inches; red (2.5YR 4/8) clay; moderate medium angular blocky structure; firm; thick continuous clay films on faces of peds; few fine roots; slightly acid; abrupt smooth boundary.

R—58 to 62 inches; hard, undulating limestone bedrock.

The thickness of the solum and depth to bedrock range from 40 to 60 inches. Reaction ranges from strongly acid to neutral in the A, E, and BE horizons and from medium acid to neutral in the Bt horizon.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2, 3, or 4. An A horizon that has a moist color value of 3 is less than 7 inches thick. The content of coarse fragments ranges from 15 to 30 percent, by volume.

The E horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. Texture is fine sandy loam or sandy loam, or their stony or gravelly analogs. The content of coarse fragments ranges from 5 to 30 percent, by volume.

The BE horizon has hue of 7.5YR, value of 4 or 5, and chroma of 6. It is sandy loam or sandy clay loam, or their gravelly analogs. The content of coarse fragments ranges from 5 to 25 percent, by volume. The Bt horizon has hue of 5YR or 2.5YR, value of 4 or 5, and chroma of 6 or 8. Texture is clay, clay loam, or sandy clay, or their gravelly or cobbly analogs. The content of coarse fragments ranges from 0 to 25 percent, by volume, in the B horizon.

The R horizon is level-bedded to undulating, hard limestone or interbedded sandstone and limestone.

Kenn Series

The Kenn series consists of deep, well drained, moderately permeable soils that formed in loamy alluvium. These level to nearly level soils are on flood plains. In most years, these soils are flooded at least once for very brief periods from December to April. The native vegetation is mixed hardwoods and pines. The slopes range from 0 to 3 percent.

Kenn soils are associated with Ceda, Enders, Nella, Spadra, and Steprock soils. Ceda soils are on slightly lower elevations on the flood plains. These soils have a loamy-skeletal control section. They do not have an argillic horizon. Enders soils are on adjacent side slopes and foot slopes. These soils have a clayey control section. They are very slowly permeable. Nella soils are on adjacent side slopes. These soils have a lower base saturation. The solum is more than 60 inches thick. Spadra soils are on adjacent stream terraces. These soils have a lower base saturation and have a less gravelly subsoil and substratum than Kenn soils. Steprock soils are on adjacent side slopes. These soils have a loamy-skeletal control section. Soft bedrock is at a depth of less than 40 inches.

Typical pedon of Kenn fine sandy loam, in an area of Ceda-Kenn complex, frequently flooded; SE1/4NW1/4SE1/4, sec. 22; T. 15 N., R. 23 W.

Ap—0 to 7 inches; dark brown (10YR 4/3) fine sandy loam; weak fine granular structure; friable; common fine roots; few fine pores; 10 percent, by volume, sandstone gravel; slightly acid; abrupt smooth boundary.

BA—7 to 13 inches; brown (7.5YR 5/4) fine sandy loam; weak fine granular structure; friable; common fine roots; few fine pores; 10 percent, by volume, sandstone gravel; slightly acid; clear smooth boundary.

Bt—13 to 25 inches; strong brown (7.5YR 5/6) sandy clay loam; weak fine subangular blocky structure; friable; few thin patchy clay films on faces of peds; few fine roots; few fine pores; 10 percent, by volume, sandstone gravel; strongly acid; clear smooth boundary.

2BC—25 to 43 inches; dark brown (7.5YR 4/4) extremely gravelly clay loam; weak fine subangular blocky structure; friable; about 60 percent, by volume, sandstone gravel and cobbles; strongly acid; clear smooth boundary.

2C—43 to 60 inches; brown (7.5YR 5/4) extremely gravelly loam; massive; friable; about 70 percent, by volume, sandstone gravel and cobbles; strongly acid.

The thickness of the solum ranges from 40 to 60 inches. Reaction ranges from slightly acid to strongly acid in the A and BA horizons and from strongly acid or very strongly acid in the B, 2BC, and 2C horizons.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2, 3, or 4. An A horizon that has a moist color value of 3 is less than 6 inches thick. The content of coarse fragments ranges from 5 to 15 percent, by volume.

The BA horizon has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 4 or 6. Texture is loam, fine sandy loam, gravelly loam, or gravelly fine sandy loam. The content of coarse fragments ranges from 5 to 35 percent, by volume. The Bt horizon has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 6. Texture is clay loam, sandy clay loam, gravelly clay loam, or gravelly sandy clay loam. The content of coarse fragments ranges from 5 to 35 percent, by volume. The 2BC horizon has hue of 7.5YR or 5YR, value of 4 or 5, and chroma of 4 or 6. Texture is very gravelly clay loam or very gravelly sandy clay loam, or their extremely gravelly or very cobbly analogs. The content of coarse fragments ranges from 35 to 75 percent, by volume.

The 2C horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 or 6. Texture is extremely gravelly loam or extremely gravelly fine sandy loam, or their extremely cobbly analogs. The content of coarse fragments ranges from 60 to 90 percent, by volume.

Leadvale Series

The Leadvale series consists of deep, moderately well drained, slowly permeable soils that formed in loamy residuum of interbedded sandstone, siltstone, and shale. These gently sloping soils are on plateaus and mountaintops. The native vegetation is mainly mixed upland hardwoods and some pines. The slopes range from 3 to 8 percent.

Leadvale soils are associated with Enders, Linker, and Mountainburg soils. Enders soils are on crests, mountainsides, and foot slopes. These soils have a clayey control section. They do not have a fragipan. Linker soils are on mountaintops. These soils do not have a fragipan. Sandstone bedrock is at a depth of 20 to 40 inches. Mountainburg soils are on mountaintops, mountainsides, and benches. These soils have a loamy-skeletal control section. Sandstone bedrock is at a depth of less than 20 inches.

Typical pedon of Leadvale silt loam, 3 to 8 percent slopes; SW1/4NW1/4SE1/4 sec. 32, T. 15 N., R. 23 W.

Ap—0 to 5 inches; dark brown (10YR 4/3) silt loam; weak fine granular structure; friable; many fine roots; few fine pores; 5 percent, by volume, sandstone gravel; strongly acid; abrupt smooth boundary.

BE—5 to 10 inches; yellowish brown (10YR 5/6) silt loam; weak fine subangular blocky structure; friable; many fine roots; many fine pores; 5 percent, by volume, sandstone gravel; strongly acid; clear smooth boundary.

Bt—10 to 25 inches; strong brown (7.5YR 5/6) silty clay loam; moderate medium subangular blocky structure; friable; common fine roots; many fine and medium pores; thin patchy clay films on faces of peds; strongly acid; abrupt smooth boundary.

Bx1—25 to 34 inches; strong brown (7.5YR 5/8) silty clay loam; many medium prominent red (2.5YR 5/6) mottles; strong medium angular blocky structure; very firm and brittle; few medium pores; thin continuous clay films on faces of peds; strongly acid; clear smooth boundary.

Bx2—34 to 47 inches; strong brown (7.5YR 5/8) silty clay loam; many medium prominent red (2.5YR 4/6) and many medium distinct gray (10YR 6/1) mottles; strong medium angular blocky structure; very firm and brittle; few medium pores; thin continuous clay films on faces of peds; strongly acid; clear smooth boundary.

BC—47 to 52 inches; mottled yellowish brown (10YR 5/8), gray (10YR 6/1) and red (2.5YR 4/6) clay; moderate medium angular blocky structure; firm; thin continuous clay films on faces of peds; about 2 percent, by volume, sandstone gravel; very strongly acid; abrupt smooth boundary.

R—52 to 54 inches; interbedded shale, siltstone, and sandstone bedrock.

The thickness of the solum and depth to bedrock range from about 4 feet to more than 8 feet. Depth to the fragipan ranges from 20 to 36 inches. Reaction is strongly acid or very strongly acid throughout.

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

The BE horizon has hue of 10YR, value of 5, and chroma of 6 or 8. Texture is silt loam or loam. The Bt horizon has hue of 7.5YR or 10YR, value of 5, and chroma of 6 or 8. Texture is silty clay loam or silt loam. The Bx horizon has hue of 7.5YR or 10YR, value of 5, and chroma of 6 or 8. This horizon is mottled in shades of gray, brown, and red. Texture is silty clay loam or silt loam. The BC horizon is mottled in shades of gray, brown, and red. Texture is clay, silty clay, or silty clay loam.

The R horizon is interbedded shale, siltstone, and sandstone.

Leesburg Series

The Leesburg series consists of deep, well drained, moderately permeable soils that formed in colluvium of interbedded acid sandstone and shale. These strongly sloping to steep soils are on mountainsides and benches. The native vegetation is mixed upland hardwoods. The slopes range from 8 to 40 percent.

Leesburg soils are associated with Enders, Mountainburg, Nella, and Steprock soils. Enders soils are on foot slopes and side slopes. These soils have a clayey control section. The solum is less than 60 inches thick. Mountainburg soils are on hilltops and on steep and very steep side slopes. These soils have a loamy-skeletal control section. Bedrock is at a depth of less than 20 inches. Nella soils are on similar landscapes as Leesburg soils. These soils have a yellowish red or red argillic horizon. Steprock soils are on similar landscapes. These soils have a loamy-skeletal control section. Bedrock is at a depth of 20 to 40 inches.

Typical pedon of Leesburg stony loam, in an area of Enders-Leesburg stony loams, 20 to 40 percent slopes; SW1/4NW1/4SW1/4, sec. 2, T. 16 N., R. 23 W.

A—0 to 5 inches; dark grayish brown (10YR 4/2) stony loam; weak fine granular structure; very friable; many fine roots; 10 percent, by volume, sandstone fragments, less than 10 inches in diameter; 20 percent, by volume, sandstone fragments, more than 10 inches in diameter; very strongly acid; clear smooth boundary.

E—5 to 10 inches; yellowish brown (10YR 5/4) stony loam; moderate medium granular structure; friable; many fine and common medium roots; 10 percent, by volume, sandstone fragments, less than 10 inches in diameter; 20 percent, by volume, sandstone fragments, more than 10 inches in diameter; very strongly acid; clear smooth boundary.

Bt1—10 to 19 inches; strong brown (7.5YR 5/8) gravelly sandy clay loam; moderate fine subangular blocky structure; firm; common medium roots; thin patchy clay films on faces of peds; 20 percent, by volume, sandstone fragments, less than 10 inches in diameter; 10 percent, by volume, sandstone fragments, more than 10 inches in diameter; very strongly acid; gradual smooth boundary.

Bt2—19 to 33 inches; strong brown (7.5YR 5/6) gravelly clay loam; moderate medium subangular blocky structure; firm; few medium roots; thin patchy clay films on faces of peds; 25 percent, by volume, sandstone fragments, mostly less than 3 inches in diameter; very strongly acid; gradual wavy boundary.

Bt3—33 to 72 inches; strong brown (7.5YR 5/6) cobbly clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; few fine roots; thin patchy clay films on faces of peds; 25 percent, by volume, sandstone fragments, less than 10 inches in diameter; very strongly acid.

The thickness of the solum is more than 60 inches. Depth to bedrock is 6 feet or more. Reaction is strongly acid or very strongly acid throughout. The content of sandstone fragments ranges from 10 to 30 percent, by volume, throughout.

The A horizon has hue of 10YR, value of 3, 4, or 5, and chroma of 3 or 4 or value of 4 and chroma of 2. An A horizon that has a moist color value of 3 is less than 5 inches thick.

The E horizon has hue of 10YR, value of 5 or 6 and chroma of 3 or 4. Texture is sandy loam or loam, or their gravelly or stony analogs.

Some pedons have a BE horizon that has hue of 10YR or 7.5YR, value of 5, and chroma of 4. Texture is sandy loam or loam, or their gravelly or stony analogs. The Bt horizon has hue of 7.5YR or 10YR, value of 5, and chroma of 6 or 8. The lower part of the Bt horizon is commonly mottled in shades of red, brown, and yellow. Texture of the upper part of the Bt horizon is sandy clay loam or clay loam, or their gravelly or cobbly analogs. Texture of the lower part of the Bt horizon is sandy clay loam, clay loam, or clay, or their gravelly or cobbly analogs.

Lily Series

The Lily series consists of moderately deep, well drained, moderately rapidly permeable soils that formed in residuum of sandstone. These strongly sloping to steep soils are on hilltops and hillsides. The native vegetation is mixed hardwoods and shortleaf pines. The slopes range from 8 to 40 percent.

Lily soils are associated with Estate and Portia soils. Estate soils are on similar landscapes as Lily soils. These soils have a fine control section. Bedrock is at a depth of 40 to 60 inches. Portia soils are on foot slopes and hilltops. Bedrock is at a depth of more than 60 inches.

Typical pedon of Lily stony fine sandy loam, in an area of Lily-Udorthents-Rock outcrop complex, 8 to 20 percent slopes; in a wooded area; NW1/4SW1/4SE1/4, sec. 30, T. 17 N., R. 20 W.

A—0 to 4 inches; dark brown (10YR 3/3) stony fine sandy loam, weak fine granular structure; very friable; common fine roots; about 15 percent, by volume, sandstone fragments, up to 20 inches in diameter; slightly acid; clear smooth boundary.

BA—4 to 9 inches; dark yellowish brown (10YR 4/4) fine sandy loam; weak fine granular structure; very friable; common fine roots; about 5 percent, by volume, sandstone fragments; strongly acid; clear smooth boundary.

Bt1—9 to 21 inches; yellowish red (5YR 5/6) sandy clay loam; moderate medium subangular blocky structure; firm; common fine roots; about 10 percent, by volume, sandstone fragments; thin patchy clay films on faces of peds; very strongly acid; clear smooth boundary.

BC—21 to 29 inches; mottled light brownish gray (10YR 6/2), red (2.5YR 4/8), and strong brown (7.5YR 5/6) loamy sand; weak medium subangular blocky structure; firm; very strongly acid; gradual smooth boundary.

Cr—29 to 36 inches; thin strata of light brownish gray (10YR 6/2), strong brown (7.5YR 5/6), and yellowish brown (10YR 5/4) soft, weakly cemented, level-bedded sandstone that crushes to loamy sand; firm; very strongly acid; abrupt smooth boundary.

R—36 to 38 inches; hard, level-bedded, gray sandstone bedrock.

The thickness of the solum and depth to sandstone bedrock range from 20 to 40 inches. Reaction ranges from strongly acid to extremely acid throughout except in areas where the surface layer has been limed. The content of coarse fragments ranges from 15 to 30 percent, by volume, in the A and E horizon and ranges from 0 to 30 percent in the BA, Bt, and BC horizons.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. An A horizon that has a moist color value of 3 is less than 6 inches thick.

Some pedons have an E horizon that has hue of 10YR, value of 4, 5, or 6, and chroma of 2, 3, or 4. Texture is loam or fine sandy loam, or their stony or gravelly analogs.

The BA horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 or 6. Texture is loam or fine sandy loam, or their gravelly analogs. The Bt horizon has hue of 7.5YR, value of 4 or 5, and chroma of 4 or 6; or hue of 5YR, value of 4 or 5, and chroma of 4 or 6 or value of 5 and chroma of 8. In some pedons, the lower part of the Bt horizon is mottled in shades of brown and red. Texture is clay loam, sandy clay loam, or loam, or their gravelly analogs.

The BC and Cr horizons are mottled in shades of gray, brown, and red. Texture of the BC horizon is loamy sand, loam, or sandy clay loam. The Cr horizon consists of thin strata of weakly cemented, level-bedded sandstone that crushes to loamy sand.

The R horizon is hard, level-bedded, red, brown, yellow, or gray sandstone bedrock.

Linker Series

The Linker series consists of moderately deep, well drained, moderately permeable soils that formed in loamy residuum of acid sandstone bedrock. These gently sloping to moderately steep soils are on mountaintops and benches. The native vegetation is mixed hardwoods and some shortleaf pines. The slopes range from 3 to 20 percent.

Linker soils are associated with Enders, Leadvale, Mountainburg, Nella, and Steprock soils. Enders soils are on adjacent side slopes. These soils have a clayey control section. Bedrock is at a depth of more than 40 inches. Leadvale soils are on similar landscapes as Linker soils. These soils have a fragipan. Bedrock is at a depth of more than 40 inches. Mountainburg soils are on similar landscapes. These soils have a loamy-skeletal control section. Sandstone bedrock is at a depth of less than 20 inches. Nella soils are in colluvial positions on side slopes. Bedrock is at a depth of more than 60 inches. Steprock soils are on similar mountaintop

positions as Linker soils and on the adjacent steeper side slopes. These soils have a loamy-skeletal control section.

Typical pedon of Linker loam, 3 to 8 percent slopes; in a moist field; SW1/4NW1/4SE1/4, sec. 9, T. 15 N., R. 20 W.

Ap—0 to 5 inches, dark brown (10YR 4/3) loam; weak fine granular structure; friable; many fine and medium roots; common fine pores; slightly acid; abrupt smooth boundary.
BA—5 to 10 inches; dark brown (7.5YR 4/4) loam; moderate medium granular structure; friable; many fine and medium roots; common fine pores; strongly acid; abrupt smooth boundary.
Bt1—10 to 18 inches; yellowish red (5YR 4/6) clay loam; moderate medium subangular blocky structure; firm; common medium roots; common fine pores; thin patchy clay films on faces of peds; strongly acid; common smooth boundary.
Bt2—18 to 28 inches; red (2.5YR 4/6) clay loam; moderate medium subangular blocky structure; firm; about 5 percent, by volume, sandstone gravel; thin patchy clay films on faces of peds; strongly acid; clear smooth boundary.
BC—28 to 37 inches; mottled red (2.5YR 4/6) yellowish red (5YR 4/6), and brown (10YR 5/3) gravelly clay loam; weak fine subangular blocky structure; firm; about 15 percent, by volume, sandstone gravel; strongly acid; abrupt smooth boundary.
R—37 to 39 inches; hard, level-bedded, acid, red sandstone bedrock.

The thickness of the solum and depth to bedrock range from 20 to 40 inches. Reaction ranges from strongly acid to extremely acid throughout except in areas where the surface layer has been limed. The content of coarse fragments ranges from 0 to 25 percent, by volume, throughout.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or value of 4 and chroma of 2 or 4. The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2, 3, or 4. An A horizon that has a moist color value of 3 is less than 6 inches thick. Texture is loam or gravelly loam.

Some pedons have an E horizon that has hue of 10YR, value of 5, and chroma of 3 or 4. Texture is fine sandy loam or loam, or their gravelly analogs.

The BA horizon has hue of 5YR, value of 4, and chroma of 6 or value of 5 and chroma of 6 or 8; or it has hue of 7.5YR, value of 4 or 5, and chroma of 4 or 6. Texture is fine sandy loam or loam, or their gravelly analogs. The Bt horizon has hue of 5YR, value of 4, and chroma of 6 or value of 5 and chroma of 6 or 8; or it has hue of 2.5YR, value of 4 or 5, and chroma of 6 or 8. Texture is sandy clay loam, clay loam, or loam, or their gravelly analogs. In some pedons, the lower part of the Bt horizon is mottled in shades of brown and red. The BC horizon has colors and textures that are similar to those of the Bt horizon or is mottled in shades of red, brown, or gray.

Some pedons have a Cr horizon of red, brown, or gray, weathered, soft sandstone.

The R horizon is hard, level-bedded, acid, red, brown, or gray sandstone bedrock.

Moko Series

The Moko series consists of shallow, well drained, moderately permeable soils that formed in residuum of dolomite or limestone. These strongly sloping to very steep soils are on hilltops and hillsides. The native vegetation is cedar and hardwood trees and native grasses in the open areas. The slopes range from 8 to 50 percent.

Moko soils are associated with Arkana, Clarksville, and Noark soils. Arkana soils are adjacent to and on similar landscapes as Moko soils. These soils have a very-fine control section. They have an argillic horizon. Bedrock is at a depth of more than 45 inches. Clarksville soils are on hillsides at a higher elevation than Moko soils. These soils have an argillic horizon. Bedrock is at a depth of more than 60 inches. Noark soils are on ridges and hillsides at a higher elevation. These soils have an argillic horizon. Bedrock is at a depth of more than 60 inches.

Typical pedon of Moko very stony silt loam, in an area of Arkana-Moko complex, 20 to 40 percent slopes; in a wooded area; SW1/4SW1/4NE1/4, sec. 14, T. 16 N., R. 21 W.

A1—0 to 4 inches; very dark gray (10YR 3/1) very stony silt loam; weak fine granular structure; friable; many fine roots; common fine pores; 35 percent, by volume, limestone fragments, more than 10 inches in diameter; 25 percent, by volume, limestone fragments, less than 10 inches in diameter; neutral; clear smooth boundary.
A2—4 to 13 inches; very dark grayish brown (10YR 3/2) very stony silty clay loam; moderate fine granular structure; friable; common fine and medium roots; 30 percent, by volume, limestone fragments, more than 10 inches in diameter; 25 percent, by volume, limestone fragments, less than 10 inches in diameter; mildly alkaline; abrupt smooth boundary.
R—13 to 15 inches; hard, level-bedded limestone bedrock.

The thickness of the solum and depth to bedrock range from 10 to 20 inches. Reaction ranges from neutral or mildly alkaline throughout. The content of coarse fragments ranges from 35 to 60 percent, by volume, throughout.

The A1 horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The A2 horizon has similar colors as

the A1 horizon. Texture is very stony silt loam, very stony silty clay loam, or very stony loam.

The R horizon is hard, level-bedded limestone or dolomite bedrock.

Mountainburg Series

The Mountainburg series consists of shallow, well drained, moderately rapidly permeable soils that formed in loamy residuum of acid sandstone. These gently sloping to very steep soils are on mountaintops, mountainsides, ridges, and benches. The native vegetation is upland hardwoods. The slopes range from 3 to 60 percent.

Mountainburg soils are associated with Enders, Leadvale, Leesburg, Linker, Nella, and Steprock soils. Enders soils are on crests, mountainsides, and foot slopes. These soils have a clayey control section. Shale bedrock is at a depth of more than 40 inches. Leadvale soils are on similar mountaintop landscapes as Mountainburg soils. These soils have a fine-silty control section. Bedrock is at a depth of more than 48 inches. Leesburg soils are on mountainsides and benches. These soils have a fine-loamy control section. Bedrock is at a depth of more than 60 inches. Linker soils are on similar mountaintop landscapes. These soils have a fine-loamy control section. Sandstone bedrock is at a depth of 20 to 40 inches. Nella soils are on mountainsides and benches. These soils have a fine-loamy control section. Bedrock is at a depth of more than 60 inches. Steprock soils are on similar landscapes as Mountainburg soils. Weathered sandstone bedrock is at a depth of 20 to 40 inches.

Typical pedon of Mountainburg very stony fine sandy loam, 20 to 40 percent slopes; in a wooded area; NW1/4NE1/4NW1/4 sec. 28, T. 17 N., R. 19 W.

A—0 to 4 inches; dark brown (10YR 4/3) very stony fine sandy loam; weak fine granular structure; friable; many medium roots; about 45 percent sandstone fragments, mostly 5 to 28 inches in diameter; medium acid; clear smooth boundary.

E—4 to 9 inches; yellowish brown (10YR 5/4) very stony fine sandy loam; weak medium granular structure; friable; common medium and fine roots; about 40 percent sandstone fragments, mostly 5 to 28 inches in diameter; very strongly acid; clear smooth boundary.

Bt—9 to 19 inches; strong brown (7.5YR 5/6) very stony sandy clay loam; moderate medium subangular blocky structure; firm; few medium and fine roots; few thin patchy clay films on faces of peds; about 40 percent sandstone fragments, mostly 5 to 18 inches in diameter; very strongly acid; abrupt smooth boundary.

R—19 to 21 inches; hard, level-bedded, acid sandstone bedrock.

The thickness of the solum and depth to bedrock range from 12 to 20 inches. Reaction ranges from strongly acid or medium acid in the A horizon and from strongly acid or very strongly acid in the B horizon. The content of coarse fragments ranges from 15 to 60 percent in the A and E horizons and from 35 to 60 percent, by volume, in the Bt horizon.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. An A horizon that has a moist color value of 3 is less than 5 inches thick. Texture is gravelly fine sandy loam, stony fine sandy loam, very stony loam, or very stony fine sandy loam. Some pedons have an Ap horizon that has hue of 10YR, value of 4 or 5, and chroma of 3 or value of 4 and chroma of 2.

The E horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. The texture of the E horizon is gravelly fine sandy loam or gravelly sandy loam, or their very gravelly, stony, or very stony analogs.

The Bt horizon has hue of 10YR, 7.5YR, or 5YR, value of 5, and chroma of 6. Texture is very gravelly loam, very gravelly sandy clay loam, very stony loam, or very stony sandy clay loam.

The R horizon is hard, level-bedded to undulating, acid sandstone bedrock.

Nella Series

The Nella series consists of deep, well drained, moderately permeable soils that formed in residuum or in colluvium weathered from acid sandstone or shale. These gently sloping to very steep soils are on mountainsides, hillsides, foot slopes, and benches. The native vegetation is mixed upland hardwoods and some pines. The slopes range from 3 to 60 percent.

Nella soils are associated with Ceda, Enders, Kenn, Leesburg, Linker, Mountainburg, and Steprock soils. Ceda soils are on flood plains. These soils have a loamy-skeletal control section. They do not have an argillic horizon. Enders soils are on foot slopes and side slopes. These soils have a clayey control section. Shale to bedrock is at a depth of less than 60 inches. Kenn soils are on flood plains. These soils have a solum that extends to a depth of less than 60 inches. They have a higher base saturation than Nella soils. Leesburg soils are in similar positions on the landscape as Nella soils. These soils have a yellowish brown or strong brown argillic horizon. Linker soils are on mountaintops and benches. Sandstone bedrock is at a depth of 20 to 40 inches. Mountainburg soils are on mountaintops and steep and very steep side slopes. These soils have a loamy-skeletal control section. Bedrock is at a depth of less than 20 inches. Steprock soils are in similar positions on the landscape as Nella soils. These soils have a loamy-skeletal control section. Bedrock is at a depth of 20 to 40 inches.

Typical pedon of Nella stony loam, in an area of Nella-Enders stony loams, 8 to 20 percent slopes; in a wooded area; NE1/4NW1/4NE1/4 sec. 20, T. 14 N., R. 22 W.

A—0 to 3 inches; dark grayish brown (10YR 4/2) stony loam; weak fine granular structure; very friable; many fine and medium roots; about 25 percent sandstone fragments, 50 percent of fragments more than 10 inches in diameter; strongly acid; clear smooth boundary.

E—3 to 7 inches; dark brown (10YR 4/3) cobbly loam; weak fine granular structure; friable; many fine and medium roots; about 15 percent sandstone fragments, 50 percent of fragments more than 3 inches in diameter; strongly acid; abrupt smooth boundary.

BE—7 to 16 inches; reddish brown (5YR 4/4) loam; weak fine subangular blocky structure; friable; many fine and medium roots; about 10 percent sandstone fragments, 5 percent of fragments more than 3 inches in diameter; strongly acid; clear smooth boundary.

Bt1—16 to 32 inches; yellowish red (5YR 4/6) cobbly clay loam; moderate medium subangular blocky structure; firm; common fine roots; thin patchy clay films on faces of peds; about 20 percent sandstone fragments, 15 percent of fragments more than 3 inches in diameter; very strongly acid; gradual smooth boundary.

Bt2—32 to 52 inches; yellowish red (5YR 4/6) cobbly clay loam; moderate medium subangular blocky structure; firm; few fine roots; thin patchy clay films on faces of peds; about 20 percent sandstone fragments, 10 percent of fragments more than 3 inches in diameter; very strongly acid; gradual smooth boundary.

Bt3—52 to 72 inches; yellowish red (5YR 4/6) cobbly clay loam; many medium distinct yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; firm; few fine roots; thin patchy clay films on faces of peds; about 30 percent sandstone fragments, 20 percent of fragments more than 3 inches in diameter; very strongly acid.

The thickness of the solum ranges from 60 to more than 80 inches. Reaction is strongly acid or very strongly acid throughout. The content of sandstone fragments ranges from 15 to 50 percent, by volume, in the A horizon and from 10 to 35 percent, by volume, in the E and B horizons.

The A horizon has hue of 10YR, value of 4, and chroma of 2 or 3. Texture is gravelly loam, stony loam, or very stony loam.

The E horizon has hue of 10YR, value of 4, and chroma of 3 or value of 5 and chroma of 3 or 4. Texture is fine sandy loam, sandy loam, or loam, or their gravelly or cobbly analogs.

The BE horizon has hue of 7.5YR, value of 5, and chroma of 6; or hue of 5YR, value of 4 or 5, and chroma of 4 or 6 or value of 5 and chroma of 8. Texture is loam, gravelly loam, or cobbly loam. The Bt horizon has hue of 5YR, value of 4, and chroma of 6 or value of 5 and chroma of 6 or 8; or it has hue of 2.5YR, value of 4, and chroma of 6 or 8. The lower part is commonly mottled in shades of red, brown, and yellow. Texture is sandy clay loam or clay loam, or their gravelly or cobbly analogs.

Newnata Series

The Newnata series consists of deep, well drained, slowly permeable soils that formed in residuum of interbedded limestone and calcareous shale. These strongly sloping to very steep soils are on foot slopes and mountainsides. The native vegetation is mixed upland hardwoods and cedars. The slopes range from 8 to 60 percent.

Newnata soils are associated with Eden, Enders, and Nella soils. Eden soils are on similar landscapes as Newnata soils. Shale bedrock is at a depth of less than 40 inches. Enders and Nella soils are on adjacent foot slopes and mountainsides. These soils have a lower base saturation than Newnata soils. Nella soils have a fine-loamy control section.

Typical pedon of Newnata stony silt loam, in an area of Eden-Newnata complex, 8 to 20 percent slopes; in a wooded area; SW1/4NW1/4NW1/4, sec. 18, T. 13 N., R. 21 W.

A—0 to 3 inches; very dark grayish brown (10YR 3/2) stony silt loam; weak fine granular structure; friable; many fine and medium roots; 30 percent, by volume, limestone and sandstone fragments, 1 inch to 24 inches in diameter; slightly acid; clear smooth boundary.

BA—3 to 7 inches; yellowish brown (10YR 5/4) silty clay loam; weak fine subangular blocky structure; friable; common fine and medium roots; common medium pores; 10 percent, by volume, limestone and sandstone fragments, 1 inch to 6 inches in diameter; slightly acid; clear smooth boundary.

Bt1—7 to 22 inches; yellowish brown (10YR 5/6) clay; moderate medium subangular blocky structure; firm; few fine and medium roots; few fine pores; continuous thick clay films on faces of peds; 10 percent, by volume, limestone and sandstone fragments, 1 inch to 6 inches in diameter; slightly acid; gradual wavy boundary.

Bt2—22 to 34 inches; yellowish brown (10YR 5/6) clay; common medium faint pale brown (10YR 6/3) mottles; moderate fine angular blocky structure; firm; few fine roots; few fine pores; continuous thick clay films on faces of peds; 5 percent, by volume, limestone fragments, 1 inch to 6 inches in diameter; slightly acid; gradual wavy boundary.

BC—34 to 44 inches; light olive brown (2.5Y 5/6) clay; moderate fine angular blocky structure; firm; few fine pores; continuous thick clay films on faces of peds; 5 percent, by volume, limestone fragments, 1 inch to 10 inches in diameter; few calcium carbonate concretions; slightly acid; abrupt wavy boundary.
R—44 to 46 inches; gray, hard limestone bedrock.

The thickness of the solum and depth to hard bedrock range from 40 to 60 inches. Reaction ranges from strongly acid to slightly acid in the A and E horizons and from strongly acid to mildly alkaline in the B horizon.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. An A horizon that has a moist color value of 3 is less than 7 inches thick.

Some pedons have an E horizon that has hue of 10YR, value of 5 or 6, and chroma of 2, 3, or 4. Texture is gravelly silt loam or flaggy silt loam. The content of coarse fragments ranges from 15 to 35 percent, by volume, in the A and E horizons.

The BA horizon has hue of 10YR or 7.5YR, value of 5, and chroma of 4 or 6. Texture is silty clay loam, or their gravelly or flaggy analogs. The content of coarse fragments ranges from 0 to 25 percent, by volume. The Bt horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 or 6. Texture is silty clay loam, silty clay, or clay, or their gravelly or flaggy analogs. The content of coarse fragments ranges from 0 to 20 percent, by volume. The Bt horizon has few to common mottles in shades of red or brown. The BC horizon has hue of 10YR or 2.5Y, value of 5, and chroma of 4 or 6. Texture is silty clay or clay, or their gravelly or flaggy analogs. The content of coarse fragments ranges from 0 to 20 percent, by volume.

Some pedons have a Cr horizon of soft, platy shale that has clay or silty clay between plates. The soil material has the same colors and texture as that of the Bt horizon.

The R horizon is hard, gray limestone or hard, fractured shale.

Nixa Series

The Nixa series consists of deep, moderately well drained, very slowly permeable soils that formed in residuum of cherty limestone. These very cherty, gently sloping to strongly sloping soils are on ridgetops. The native vegetation is mixed upland hardwoods and some pines. The slopes range from 3 to 12 percent.

Nixa soils are associated with Clarksville, Noark, and Peridge soils. Clarksville soils are adjacent to but are on lower hillsides than Nixa soils. These soils do not have a fragipan. Noark soils are on hillsides and ridgetops. These soils have a clayey-skeletal control section. They do not have a fragipan. Peridge soils are on gently sloping upland flats. These soils have a fine-silty control section. They do not have a fragipan.

Typical pedon of Nixa very cherty silt loam, 8 to 12 percent slopes; in a wooded area; NE1/4NW1/4SE1/4 sec. 35, T. 17 N., R. 21 W.

A—0 to 4 inches; dark grayish brown (10YR 4/2) very cherty silt loam; weak fine granular structure; friable; many fine and medium roots; about 55 percent, by volume, chert fragments, 1 inch to 4 inches in diameter; strongly acid; clear smooth boundary.
E—4 to 11 inches; brown (10YR 5/3) very cherty silt loam; weak fine granular structure; friable; many fine and medium roots; about 55 percent, by volume, chert fragments, 1 inch to 4 inches in diameter; strongly acid; clear smooth boundary.
Bw—11 to 19 inches; yellowish brown (10YR 5/6) very cherty silt loam; weak medium subangular blocky structure; friable; common fine and medium roots; about 55 percent, by volume, chert fragments, 1 inch to 4 inches in diameter; strongly acid; gradual smooth boundary.
Btx1—19 to 26 inches; strong brown (7.5YR 5/6) extremely cherty silt loam; many medium distinct pale brown (10YR 6/3) mottles; moderate fine subangular blocky structure; firm and brittle; many fine vesicular pores; thin patchy clay films on faces of peds and on chert fragments; few fine roots; about 70 percent, by volume, chert fragments, 1 inch to 6 inches in diameter; strongly acid; gradual wavy boundary.
Btx2—26 to 41 inches; mottled strong brown (7.5YR 5/6), yellowish brown (10YR 5/4), and light brownish gray (10YR 6/2) extremely cherty silt loam; strong fine subangular blocky structure; firm and brittle; common fine vesicular pores; thin patchy clay films on faces of peds and on chert fragments; about 75 percent, by volume, chert fragments, 1 inch to 8 inches in diameter; very strongly acid; clear smooth boundary.
Bt—41 to 72 inches; mottled red (2.5YR 4/6), strong brown (7.5YR 5/6), and light brownish gray (10YR 6/2) extremely cherty silty clay; moderate medium subangular blocky structure; firm; about 80 percent, by volume, chert fragments, 1 inch to 8 inches in diameter; thin continuous clay films on faces of peds; very strongly acid.

Depth to the fragipan ranges from 14 to 24 inches. Depth to consolidated bedrock is more than 60 inches. Reaction ranges from strongly acid or very strongly acid throughout except in areas where the surface layer has been limed.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2. In cultivated areas, the Ap horizon has hue of 10YR, value of 4 or 5 and chroma of 3. An A horizon that has a moist color value of 3 is less than 6 inches thick.

The E horizon has hue of 10YR, value of 5 or 6, and chroma of 3 or 4. The content of chert fragments ranges from 35 to 60 percent, by volume, in the A and E horizons.

The Bw horizon has hue of 10YR, value of 5, and chroma of 4 or 6. Texture is very cherty silt loam, very cherty silty clay loam, or very cherty loam, or their extremely cherty analogs. The content of chert fragments ranges from 35 to 75 percent, by volume. The Bx horizon has hue of 10YR, value of 5, and chroma of 4 or 6; or hue of 7.5YR, value of 5, and chroma of 4 or 6. Some pedons are mottled in shades of brown, gray, or red. Texture is very cherty silt loam or very cherty silty clay loam, or their extremely cherty analogs. The content of chert fragments ranges from 40 to 75 percent, by volume. The Bt horizon has hue of 2.5YR, value of 3, and chroma of 6 or value of 4 or 5 and chroma of 4, 6, or 8; or it has hue of 5YR, value of 4, and chroma of 4 or 6 or value of 5, and chroma of 4, 6, or 8. Some pedons are mottled in shades of red, brown, and gray. Texture is extremely cherty clay, extremely cherty silty clay, very cherty silty clay, or very cherty silty clay loam. The content of chert fragments ranges from 50 to 85 percent, by volume.

Noark Series

The Noark series consists of deep, well drained, moderately permeable soils that formed in residuum of cherty limestone bedrock. These gently sloping to steep soils are on hillsides and ridgetops. The native vegetation is upland hardwoods and pines. The slopes range from 3 to 40 percent.

Noark soils are associated with Arkana, Britwater, Clarksville, Moko, Nixa, and Peridge soils. Arkana soils are on hillsides but at lower elevations than Noark soils. These soils have a very-fine control section. Bedrock is at a depth of less than 45 inches. Britwater soils are on landscapes at lower elevations than Noark soils. These soils have a fine-loamy control section. Clarksville soils are on adjacent similar side slopes. These soils have a loamy-skeletal control section. Moko soils are on hillsides near limestone outcrops at lower elevations. These soils do not have an argillic horizon. Bedrock is at a depth of less than 20 inches. Nixa soils are on ridgetops. These soils have a loamy-skeletal control section. They have a fragipan. Peridge soils are on gently sloping uplands. These soils have a fine-silty control section. They have a higher base saturation than Noark soils.

Typical pedon of Noark very cherty silt loam, 8 to 20 percent slopes; in a wooded area; SW1/4SE1/4NE1/4 sec. 25, T. 16 N., R. 21 W.

A—0 to 4 inches; dark grayish brown (10YR 4/2) very cherty silt loam; weak fine granular structure; very friable; many fine and medium roots; about 50 percent angular chert fragments, 1/2 inch to 5 inches in diameter; slightly acid; clear smooth boundary.

E—4 to 14 inches; pale brown (10YR 6/3) very cherty silt loam; weak fine granular structure; very friable; many fine and medium roots; about 55 percent angular chert fragments, 1/2 inch to 6 inches in diameter; medium acid; abrupt smooth boundary.

Bt1—14 to 30 inches; yellowish red (5YR 4/6) very cherty silty clay; moderate medium subangular blocky structure; friable; few fine pores; common fine and medium roots; thin patchy clay films on faces of peds; about 55 percent angular chert fragments, 1/2 inch to 6 inches in diameter; strongly acid; gradual smooth boundary.

Bt2—30 to 43 inches; yellowish red (5YR 4/6) very cherty clay; moderate medium subangular blocky structure; firm; thin continuous clay films on faces of peds; few fine pores; common medium roots; about 55 percent angular chert fragments, 1/2 inch to 6 inches in diameter; very strongly acid; gradual smooth boundary.

Bt3—43 to 72 inches; red (2.5YR 4/6) very cherty clay; few medium distinct yellowish brown (10YR 5/4) mottles; weak medium angular blocky structure; firm, sticky; thin continuous clay films on faces of peds; few medium roots; about 60 percent angular chert fragments, 1/2 inch to 6 inches in diameter; very strongly acid.

The thickness of the solum ranges from 60 to 80 inches or more. Reaction ranges from strongly acid to slightly acid in the A horizon, from strongly acid or medium acid in the E horizon, and from very strongly acid or strongly acid in the B horizon. The content of chert fragments ranges from 35 to 60 percent in the A and E horizons, from 35 to 70 percent in the BE and Bt1 horizons, and from 50 to 80 percent, by volume, in the Bt2 and Bt3 horizons.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. An A horizon that has a moist color value of 3 is less than 6 inches thick. In cultivated areas, the Ap horizon has hue of 10YR, value of 4, and chroma of 4.

The E horizon has hue of 10YR, value of 5 or 6, and chroma of 3 or 4.

Some pedons have a BE horizon that has hue of 5YR, value of 4 or 5, and chroma of 6; or hue of 7.5YR or 10YR, value of 5, and chroma of 4 or 6. Texture is very cherty silt loam or very cherty silty clay loam, or their extremely cherty analogs. The Bt horizon has hue of 5YR or 2.5YR, value of 4 or 5, and chroma of 6 or 8. Texture is very cherty clay, very cherty silty clay, extremely cherty clay, or extremely cherty silty clay. In some pedons, the Bt horizon has mottles in shades of gray and brown below a depth of 30 inches.

Peridge Series

The Peridge series consists of deep, well drained, moderately permeable soils that formed in residuum of limestone. These gently sloping soils are on uplands. The native vegetation is mixed upland hardwoods. The slopes range from 3 to 8 percent.

Peridge soils are associated with Britwater, Nixa, Noark, and Razort soils. Britwater soils are on adjacent similar landscapes as Peridge soils. These soils have a fine-loamy control section. They have a higher content of gravel. Nixa soils are on adjacent ridgetops. These soils have a loamy-skeletal control section. They have a fragipan. Noark soils are on adjacent hillsides, ridges, and uplands. These soils have a clayey-skeletal control section. They have a lower base saturation than Peridge soils. Razort soils are on flood plains. These soils have a fine-loamy control section.

Typical pedon of Peridge silt loam, 3 to 8 percent slopes; in a pasture; SE1/4SE1/4NW1/4, sec. 24, T. 17 N., R. 19 W.

Ap—0 to 9 inches; dark brown (7.5YR 4/4) silt loam; moderate medium granular structure; friable; many fine and medium roots; strongly acid; clear smooth boundary.

Bt1—9 to 24 inches; yellowish red (5YR 4/6) silty clay loam; moderate fine subangular blocky structure; friable; common fine and medium roots; thin patchy clay films on faces of peds; strongly acid; clear smooth boundary.

Bt2—24 to 44 inches; red (2.5YR 4/6) silty clay loam; moderate medium subangular blocky structure; firm; few fine roots; thin patchy clay films on faces of peds; common black stains on faces of peds; very strongly acid; gradual smooth boundary.

Bt3—44 to 48 inches; red (2.5YR 4/6) gravelly silty clay loam; moderate medium subangular blocky structure; firm; thin patchy clay films on faces of peds; about 15 percent gravel, less than 3 inches in diameter; common black stains on faces of peds; very strongly acid; clear smooth boundary.

Bt4—48 to 60 inches; red (2.5YR 4/8) silty clay; few fine prominent yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; firm; thin continuous clay films on faces of peds; very strongly acid; gradual smooth boundary.

Bt5—60 to 72 inches; red (2.5YR 4/8) silty clay; few fine faint yellowish brown mottles; moderate medium subangular blocky structure; firm; thin continuous clay films on faces of peds; very strongly acid.

The thickness of the solum is 80 inches or more. Reaction ranges from very strongly acid to medium acid throughout. The content of gravel ranges from 0 to 5 percent, by volume, in the upper 40 inches and from 0 to 30 percent, by volume, below 40 inches.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 3; or hue of 7.5YR, value of 4, and chroma of 4.

Some pedons have a BE horizon that has hue of 7.5YR, value of 4 or 5, and chroma of 6. The Bt1 and Bt2 horizons have hue of 5YR, value of 4 or 5, and chroma of 6 or value of 5 and chroma of 8; or have hue of 2.5YR, value of 4, and chroma of 6 or 8. Texture is silt loam or silty clay loam. The Bt3 horizon has colors that are similar to those of the Bt1 and Bt2 horizons. Mottles in shades of red, brown, or gray range from none to common. Texture is silty clay loam or gravelly silty clay loam. The Bt4 and Bt5 horizons have colors that are similar to those of the Bt1 and Bt2 horizons. The Bt4 and Bt5 horizons have mottles in shades of red, brown, or gray. Texture is silty clay loam, silty clay, or clay, or their gravelly analogs.

Portia Series

The Portia series consists of deep, well drained, moderately slowly permeable soils that formed in loamy residuum or colluvium of interbedded sandstone and limestone. These gently sloping to steep soils are on foot slopes and hilltops of the Salem Plateau. The native vegetation is mixed upland hardwoods and pines. The slopes range from 3 to 30 percent.

Portia soils are associated with Estate and Lily soils. Estate soils are on hilltops and hillsides. These soils have a fine control section. Bedrock is at a depth of less than 60 inches. Lily soils are on hillsides and ridges. Bedrock is at a depth of less than 40 inches.

Typical pedon of Portia sandy loam, 3 to 8 percent slopes; in a pasture; SE1/4SE1/4SW1/4 sec. 15, R. 19 W., T. 16 N.

Ap—0 to 4 inches; dark brown (10YR 4/3) sandy loam; weak medium granular structure; friable; many fine and medium roots; slightly acid; clear smooth boundary.

BA—4 to 15 inches; dark brown (7.5YR 4/4) loam; weak medium granular structure; friable; many fine and medium roots; medium acid; clear smooth boundary.

Bt1—15 to 28 inches; yellowish red (5YR 5/6) loam; moderate medium subangular blocky structure; friable; common fine and medium roots; thin patchy clay films on faces of peds; strongly acid; gradual smooth boundary.

Bt2—28 to 41 inches; yellowish red (5YR 4/6) sandy clay loam; moderate medium subangular blocky structure; firm; common fine roots; common dark stains on faces of peds; thin patchy clay films on faces of peds; strongly acid; gradual smooth boundary.

Bt3—41 to 58 inches; red (2.5YR 4/6) sandy clay loam; moderate medium subangular blocky structure; firm; thin patchy clay films on faces of peds; common

dark stains on faces of peds; strongly acid; about 5 percent gravel; gradual smooth boundary.

Bt4—58 to 72 inches; red (2.5YR 4/6) sandy clay; moderate medium subangular blocky structure; firm; thin clay films on faces of peds; common dark stains on faces of peds; strongly acid.

The thickness of the solum ranges from 60 to 80 inches or more. Reaction ranges from strongly acid to slightly acid in the A horizon, from very strongly acid to medium acid in the BE, Bt1, and Bt2 horizons, and from strongly acid or medium acid in the Bt3 and Bt4 horizons. The content of coarse fragments ranges from 0 to 10 percent, by volume, throughout.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. An A horizon that has value of 3 is less than 6 inches thick. In cultivated areas, the Ap horizon has hue of 10YR, value of 4, and chroma of 2, 3, or 4.

Some pedons have an E horizon that has hue of 10YR, value of 5, and chroma of 3 or 4. Texture is sandy loam or loam.

The BE or BA horizon has hue of 5YR, value of 4 or 5, and chroma of 4 or 6; or it has hue of 7.5YR, value of 4, and chroma of 4 or value of 5 and chroma of 4, 6, or 8. Texture is fine sandy loam or loam. The Bt1 horizon has hue of 5YR, value of 4, and chroma of 6 or value of 5 and chroma of 6 or 8; or it has hue of 2.5YR, value of 4 or 5, and chroma of 6 or 8. Texture is sandy clay loam or loam. The Bt2 horizon has hue of 5YR, value of 4, and chroma of 6 or value of 5 and chroma of 6 or 8; or it has hue of 2.5YR, value of 4 or 5, and chroma of 6 or 8. Texture is sandy clay loam, clay loam, or sandy clay. The Bt2 horizon has mottles in shades of brown. The Bt3 and Bt4 horizons have hue of 5YR or 2.5YR, value of 4, and chroma of 6 or 8. These horizons have mottles in shades of brown. Texture is sandy clay loam, clay loam, or sandy clay.

Razort Series

The Razort series consists of deep, well drained, moderately permeable soils that formed in loamy alluvium. These level to nearly level soils are on flood plains. These soils are occasionally flooded for brief periods from December to April. The native vegetation is mixed bottom land hardwoods. The slopes range from 0 to 3 percent.

Razort soils are associated with Britwater, Ceda, Peridge, and Wideman soils. Britwater soils are on higher stream terraces than Razort soils. These soils do not have a mollic-colored surface layer. Ceda soils are on similar landscapes. These soils have a loamy-skeletal control section. They do not have an argillic horizon. Peridge soils are on uplands and on high terraces. These soils have a fine-silty control section. They have a red argillic horizon. Wideman soils are on lower-lying flood plains than Razort soils. These soils have a sandy control section. They do not have an argillic horizon.

Typical pedon of Razort loam, occasionally flooded; in a meadow; NE1/4SW1/4NW1/4 sec. 30, T. 16 N., R. 20 W.

Ap—0 to 5 inches; dark brown (10YR 3/3) loam; weak fine granular structure; friable; many fine roots; slightly acid; clear smooth boundary.

BA—5 to 12 inches; dark brown (10YR 3/3) loam; moderate fine subangular blocky structure; friable; common fine roots; few fine pores; slightly acid; gradual smooth boundary.

Bt1—12 to 21 inches; dark brown (10YR 3/3) loam; moderate medium subangular blocky structure; firm; common fine roots; common fine pores; thin patchy clay films on faces of peds; common dark stains on faces of peds; slightly acid; clear smooth boundary.

Bt2—21 to 36 inches; dark brown (10YR 3/3) loam; moderate medium subangular blocky structure; firm; common medium pores; medium continuous clay films on faces of peds; common dark stains on faces of peds; slightly acid; clear smooth boundary.

Bt3—36 to 43 inches; dark brown (10YR 3/3) loam; moderate medium subangular blocky structure; firm; common medium pores; medium continuous clay films on faces of peds; common dark stains on faces of peds; 5 percent, by volume, gravel; slightly acid; clear smooth boundary.

2BC—43 to 55 inches; dark brown (10YR 3/3) fine sandy loam; moderate medium subangular blocky structure; firm; few fine pores; common dark stains on faces of peds; 10 percent, by volume, rounded gravel; slightly acid; clear smooth boundary.

2C—55 to 65 inches; dark yellowish brown (10YR 4/4) gravelly sandy loam; massive; firm; few fine pores; common dark stains on faces of peds; 25 percent, by volume, rounded gravel; slightly acid.

The thickness of the solum ranges from 40 to 60 inches. Reaction ranges from slightly acid or neutral in the A horizon and from medium acid or slightly acid in the B horizon.

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

The BA horizon has hue of 10YR, value of 3 or 4, and chroma of 3 or 4. Texture is loam or silt loam. The Bt horizon has hue of 10YR, value of 3 or 4, and chroma of 3 or 4; or it has a hue of 7.5YR, value of 4, and chroma of 4. Texture is silt loam, loam, or clay loam, or their gravelly analogs. The content of gravel ranges from 0 to 25 percent, by volume.

The underlying 2C horizon is stratified loamy, sandy, and gravelly material.

This soil was correlated as a taxadjunct to the Razort series because the base saturation of the argillic horizon is more than 50 percent throughout the subhorizons.

Behavior, use, and management are so similar that a new series is not needed.

Spadra Series

The Spadra series consists of deep, well drained, moderately permeable soils that formed in alluvium. These level to gently sloping soils are on stream terraces. In some areas, these soils are occasionally flooded for brief periods from December to April. The native vegetation is mixed hardwoods and pines. The slopes range from 0 to 5 percent.

Spadra soils are associated with Ceda, Kenn, Mountainburg, Nella, and Steprock soils. Ceda soils are on adjacent flood plains. These soils have a loamy-skeletal control section. They do not have an argillic horizon. Kenn soils also are on adjacent flood plains. These soils have a higher base saturation than Spadra soils. They have more gravel in the subsoil and substratum. Mountainburg soils are on adjacent steeper slopes. These soils have a loamy-skeletal control section. Bedrock is at a depth of less than 20 inches. Nella soils are on adjacent side slopes. These soils have a fine-loamy control section. Bedrock is at a depth of more than 60 inches. Steprock soils are on adjacent side slopes. These soils have a loamy-skeletal control section. Bedrock is at a depth of 20 to 40 inches.

Typical pedon of Spadra loam, 2 to 5 percent slopes; in a moist field; NW1/4NE1/4SW1/4, sec. 4, T. 14 N., R. 19 W.

Ap—0 to 7 inches; dark brown (10YR 4/3) loam; weak fine granular structure; very friable; many fine roots; slightly acid; clear smooth boundary.

Bt1—7 to 14 inches; dark brown (7.5YR 4/4) loam; weak medium subangular blocky structure; friable; thin patchy clay films on faces of peds; many fine roots; medium acid; gradual smooth boundary.

Bt2—14 to 25 inches; dark brown (7.5YR 4/4) sandy clay loam; moderate medium subangular blocky structure; firm; thin patchy clay films on faces of peds; common dark stains on faces of peds; common fine roots; few fine and medium pores; medium acid; gradual smooth boundary.

Bt3—25 to 40 inches; strong brown (7.5YR 5/6) sandy clay loam; moderate medium subangular blocky structure; firm; thin patchy clay films on faces of peds; common dark stains on faces of peds; common fine roots; few fine and medium pores; medium acid; clear smooth boundary.

BC—40 to 58 inches; reddish brown (5YR 4/4) fine sandy loam; common medium distinct strong brown (7.5YR 5/6) mottles; weak fine subangular blocky structure; firm; common dark stains on faces of peds; few hard concretions; few fine pores; strongly acid; clear smooth boundary.

C—58 to 72 inches; reddish brown (5YR 4/4) gravelly fine sandy loam; massive; firm; 20 percent, by volume, rounded quartz gravel; strongly acid.

The thickness of the solum ranges from 40 to 60 inches, and depth to bedrock is more than 72 inches. Reaction ranges from medium acid to very strongly acid throughout except in areas where the surface layer has been limed. The content of gravel ranges from 0 to 5 in the A and B horizons and from 0 to 20 in the BC and C horizons.

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

The Bt horizon has hue of 5YR, value of 4 or 5, and chroma of 4 or 6; or hue of 7.5YR, value of 4, and chroma of 4 or value of 5 and chroma of 6. Some pedons have mottles in shades of yellow or brown. Texture is loam or sandy clay loam.

The BC and C horizons have hue of 7.5YR or 5YR, value of 4, and chroma of 4 or 6; or hue of 10YR, value of 4 or 5, and chroma of 3 or 4. Texture is sandy loam, fine sandy loam, gravelly sandy loam, or gravelly fine sandy loam. Some pedons have mottles in shades of brown.

Steprock Series

The Steprock series consists of moderately deep, well drained, moderately permeable soils that formed in the residuum of sandstone bedrock. These gently sloping to very steep soils are on mountaintops, benches, and side slopes. The native vegetation is upland hardwoods and pines. The slopes range from 3 to 60 percent.

Steprock soils are associated with Ceda, Enders, Kenn, Leesburg, Linker, Nella, and Mountainburg soils. Ceda soils are on adjacent flood plains. These soils do not have an argillic horizon. Bedrock is at a depth of more than 60 inches. Enders soils are in similar positions on the landscape as Steprock soils. These soils have a clayey control section. Shale bedrock is at a depth of 40 to 60 inches. Kenn soils are on adjacent flood plains. These soils have a fine-loamy control section. They have a solum that extends to a depth of 40 to 60 inches. Linker soils are in similar positions on the mountaintops as Steprock soils. These soils have a fine-loamy control section. Leesburg and Nella soils are in similar positions on the landscape as Steprock soils. These soils have a solum that extends to a depth of more than 60 inches. They have a fine-loamy control section. Mountainburg soils are in similar positions on the landscape and have hard sandstone bedrock at a depth of less than 20 inches.

Typical pedon of Steprock very stony loams, in an area of Nella-Steprock-Mountainburg very stony loams, 20 to 40 percent slopes; in a wooded area; NE1/4NW1/4NW1/4 sec. 27, T. 16 N., R. 22 W.

A—0 to 3 inches; dark brown (10YR 4/3) very stony loam; weak fine granular structure; very friable; many fine and medium roots; few fine pores; about 40 percent, by volume, sandstone fragments, up to 2 feet in diameter; very strongly acid; clear smooth boundary.

E—3 to 10 inches; yellowish brown (10YR 5/4) very gravelly loam; weak fine subangular blocky structure; friable; many fine and medium roots; common medium pores; about 35 percent, by volume, sandstone fragments, up to 5 inches in diameter; very strongly acid; clear smooth boundary.

BE—10 to 15 inches; strong brown (7.5YR 5/6) very gravelly loam; weak medium subangular blocky structure; friable; many fine and medium roots; few medium pores; about 35 percent, by volume, sandstone fragments, up to 4 inches in diameter; very strongly acid; clear smooth boundary.

Bt1—15 to 21 inches, yellowish red (5YR 5/6) very gravelly sandy clay loam; moderate medium subangular blocky structure; friable; common fine and medium roots; few medium pores; few thin patchy clay films on faces of peds; about 20 percent, by volume, sandstone fragments, 3 to 10 inches in diameter and 35 percent, by volume, sandstone fragments, less than 3 inches in diameter; very strongly acid; gradual wavy boundary.

Bt2—21 to 32 inches; yellowish red (5YR 5/8) very gravelly sandy clay loam; common fine distinct red (2.5YR 4/8) mottles; moderate medium subangular blocky structure; friable; few fine roots; few medium pores; few thin patchy clay films on faces of peds; about 45 percent, by volume, sandstone fragments, 15 percent of fragments 3 to 10 inches in diameter and 30 percent of fragments less than 3 inches in diameter; very strongly acid; abrupt smooth boundary.

Cr—32 to 38 inches; soft, weathered, platy, level-bedded sandstone that has yellowish red (5YR 5/8) sandy clay loam between sandstone plates.

The thickness of the solum and depth to Cr horizon range from 20 to 40 inches. Reaction is strongly acid or very strongly acid throughout. The content of coarse fragments ranges from 25 to 60 percent, by volume, throughout.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. In cultivated areas, the Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. An A horizon that has a moist color value of 3 is less than 5 inches thick. Texture is very stony loam or very gravelly loam.

The E horizon has hue of 10YR, value of 5 or 6, and chroma of 3 or 4. The texture is very gravelly loam or very gravelly fine sandy loam.

The BE horizon has hue of 7.5YR, value of 5, and chroma of 6 or 8. Texture is very gravelly fine sandy loam or very gravelly loam. The Bt horizon has hue of 5YR, value of 5, and chroma of 6 or 8; or it has hue of 2.5YR, value of 4 or 5, and chroma of 6 or 8. Texture is very gravelly sandy clay loam, very gravelly clay loam, or very gravelly loam.

The Cr horizon is soft, weathered, level-bedded sandstone bedrock that has less than 5 percent fines.

Wideman Series

The Wideman series consists of deep, excessively drained, moderately rapidly permeable soils that formed in sandy, recent alluvium. These level and nearly level soils are on flood plains and natural levees along streams. In most years, these soils are frequently flooded for very brief periods from December to May. The native vegetation is bottom land hardwood trees. The slopes range from 0 to 3 percent.

Wideman soils are associated with Britwater and Razort soils. Britwater soils are on higher-lying stream terraces than Wideman soils. These soils have a fine-loamy control section. They have an argillic horizon. Razort soils are on slightly higher flood plains than Wideman soils. These soils have a fine-loamy control section. They have an argillic horizon.

Typical pedon of Wideman loamy fine sand, frequently flooded; in a meadow; NW1/4NW1/4SW1/4 sec. 17, T. 16 N., R. 22 W.

Ap—0 to 7 inches; dark yellowish brown (10YR 4/4) loamy fine sand; weak fine granular structure; very friable; many fine and medium roots; medium acid; clear smooth boundary.

C1—7 to 15 inches; dark brown (10YR 4/3) loamy fine sand; weak fine granular structure; very friable; many fine and medium roots; slightly acid; clear smooth boundary.

C2—15 to 32 inches; dark yellowish brown (10YR 4/4) fine sand; single grained; very friable; common fine roots; slightly acid; abrupt smooth boundary.

C3—32 to 34 inches; dark yellowish brown (10YR 3/4) fine sandy loam; weak fine granular structure; friable; few fine roots; few fine pores; slightly acid; abrupt smooth boundary.

C4—34 to 46 inches; yellowish brown (10YR 5/4) fine sand; single grained; very friable; few fine roots; 5 percent, by volume, coarse sand; strongly acid; clear wavy boundary.

C5—46 to 51 inches; dark yellowish brown (10YR 4/4) fine sand; single grained; very friable; 10 percent, by volume, coarse sand; strongly acid; clear wavy boundary.

C6—51 to 58 inches; yellowish brown (10YR 5/4) fine sand; single grained; very friable; medium acid; abrupt smooth boundary.

C7—58 to 62 inches; dark brown (10YR 4/3) fine sandy loam; massive; friable; slightly acid; abrupt smooth boundary.
C8—62 to 72 inches; yellowish brown (10YR 5/4) fine sand; single grained; very friable; medium acid.

The thickness of the sandy sediment ranges from 60 to 80 inches or more. Reaction ranges from strongly acid or medium acid in the surface layer and from strongly acid to neutral in the C horizon.

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

The C horizon has hue of 10YR, value of 4, 5, or 6, and chroma of 3 or 4. Texture is dominantly loamy fine sand, fine sand, or sand that has strata of fine sandy loam or finer textures. The content of gravel ranges from 0 to 10 percent, by volume.

Formation of the Soils

Factors of Soil Formation

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

The interaction of five main factors results in differences among soils *(12)*. These factors are the physical and chemical composition of the parent material, the climate during and after accumulation of the parent material, the kinds of plants and organisms living in the soils, the relief of the land and its effect on runoff, and the length of time it took the soil to form.

The influence of any one factor can vary from place to place, but the interaction of all factors determines the kind of soil that forms. In the following paragraphs the factors of soil formation as they relate to the soils in the survey area are explained.

Parent Material

The soils of Newton County formed in material that weathered from consolidated bedrock of the Ordovician through Pennsylvanian Periods of the Paleozoic Era *(7, 9)*.

Newton County is in the Salem, Springfield, and Boston Mountain Plateaus of the Ozark Plateau Province. The Salem Plateau is the oldest, lowest in elevation, and northernmost of the three surfaces. It roughly parallels the Buffalo River from the west part of the county to the east part. The Springfield Plateau is intermediate in age and elevation. It is south of the Salem Plateau. The Boston Mountain Plateau is the youngest and the highest in elevation of the surfaces. It covers the northwest and southern parts of the county.

The St. Peter Sandstone and Everton Formation of Middle Ordovician age are exposed over most of the Salem Plateau (fig. 13). Areas of the Powell dolomite are exposed along the larger streams in Newton County.

The Everton Formation consists of brownish gray, sandy crystalline dolomite in the lower part. This grades into fine- to medium-grained sandstone. The Upper Everton Formation consists of sandy oolitic limestone that grades laterally into sandy dolomite. St. Peter Sandstone overlies the Everton Formation. It consists of massive upper and lower fine- to medium-grained sandstone units that have fine-grained sandstone interbedded with dolomite between them. Plattin Limestone, Fernvale Limestone, Cason Shale, and St. Clair Limestone of the Upper Ordovician and Silurian periods form discontinuous wedges between outcrops of the St. Peter Sandstone and the Boone Formation. In outcrops above the St. Peter Sandstone and below the Boone Formation, one or more of these formations are exposed. Estate and Lily soils formed in residuum from these formations.

The Boone Formation of the Mississippian Periods caps the upland and the ridges throughout the north central part of Newton County. This formation forms the Springfield Plateau, which is highly eroded and dissected. The Boone Formation consists of three distinct lithologic units. The basal unit is a fine- to coarse-grained sandstone that ranges in thickness from a few inches to a few feet. The middle unit, the St. Joe Limestone Member, consists of very finely crystalline limestone. The upper unit, which is the thickest unit, is interbedded light gray, medium-crystalline, fossiliferous limestone and medium gray to brownish gray chert. The chert content varies vertically and laterally in the formation. The limestone weathers more rapidly than the chert. Clarksville, Nixa, and Noark soils, which contain large quantities of chert, formed in these areas.

Fayetteville Shale and Pitkin Limestone are exposed on the north escarpment of the Boston Mountains. Fayetteville Shale consists of dark gray shale and dark gray, microcrystalline, petroliferous limestone. Pitkin Limestone consists of medium gray limestone that has thin beds of dark gray limy shale. This unit contains small quantities of dark gray chert. Eden and Newnata soils formed in these areas.

The Hale Formation is exposed in most of the Boston Mountain Plateau in Newton County. This formation is made up of the Cane Hill Member, Bloyd Shale, and the Prairie Grove Member. These members consist mainly of fine- to coarse-grained sandstones and shales. Enders, Nella, and Steprock soils formed in these areas.

Sediment deposited by the Buffalo River, Little Buffalo River, and numerous smaller streams is the parent material of soils on terraces and flood plains. This alluvium is a mixture of material derived from many different kinds of soil, rock, and unconsolidated material. It was transported by water from uplands in Newton County and from counties to the west. Razort, Ceda, Wideman, and Spadra soils formed in this material.

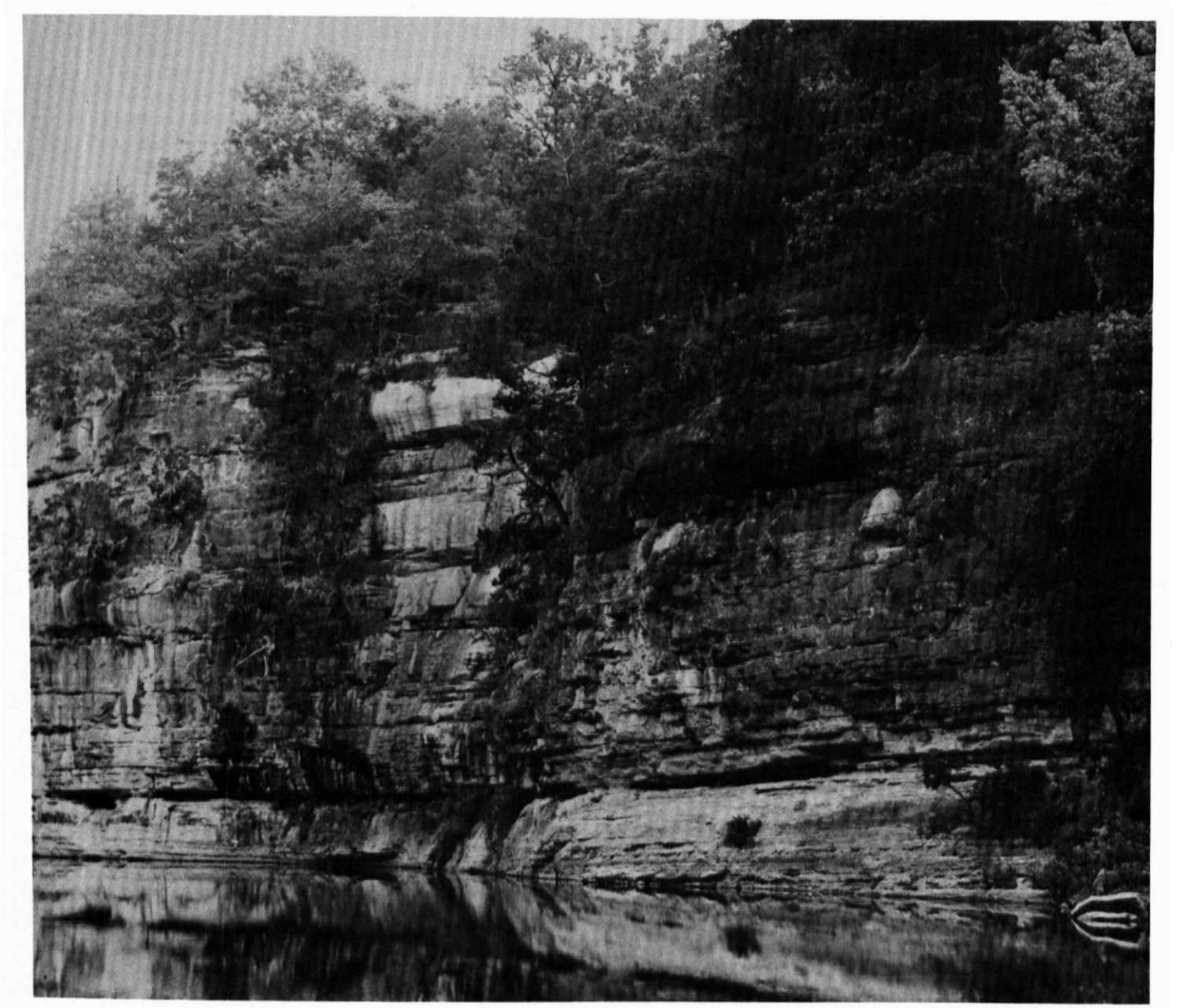

Figure 13.—The St. Peter Sandstone and Everton Formation are exposed along the Buffalo River. Lily and Udorthents soils formed in this formation.

Climate

The climate of today in Newton County is similar to the climate under which the soils formed. It is characterized by relatively cool winters and warm to hot summers with fairly abundant rainfall. The average daily maximum temperature is 91 degrees Fahrenheit in July and 46 degrees Fahrenheit in January. Annual rainfall is about 48 inches and is generally well distributed throughout the year. For additional information about the climate, refer to the section "General Nature of the County."

The warm, moist climate promotes rapid soil formation and encourages rapid chemical reactions. The large amount of water that moves through the soil is instrumental in moving dissolved or suspended materials downward in the soil profile. Plant remains decompose

rapidly; and the organic acid that forms hastens the removal of carbonates and hastens the formation of clay. Because the soil is frozen only to a shallow depth and for a relatively short period, soil formation continues almost the year round. The climate throughout the survey area is relatively uniform, but its effect is modified locally by elevation and slope aspect. Climate alone does not account for differences in the soils in the county.

Living Organisms

Plants and animals, including insects, bacteria, and fungi, are important in the formation of soils. Among the changes they cause are gains in organic matter and nitrogen in the soil, gains or losses in plant nutrients, and changes in structure and porosity.

Before Newton County was settled, the native vegetation had more influence on soil formation than did animal activity. Stands of hardwood trees or mixed hardwoods and shortleaf pine forests covered most of the survey area.

Scattered across the northern part of the county on the uplands are shallow soils underlain by limestone, dolomite, or sandstone. These soils supported savannas. The vegetation on these savannas was eastern redcedar or mixed eastern redcedar and hardwoods. Grasses grew tall in openings between the trees. Udorthents and Moko soils are dominant in these areas. These soils have a surface layer that has been darkened to a depth of several inches by the accumulation of organic matter.

The native vegetation on most of the gently sloping to very steep, dissected uplands was mixed stands of upland oaks, hickory, and shortleaf pine. The soils in these areas have a significant accumulation of organic matter and are dark colored only in the uppermost few inches. Brockwell, Enders, Estate, Linker, Nella, Nixa, and Noark soils formed on these uplands. They differ mainly in parent material, relief, and age and in degree of weathering.

In the alluvial areas, the native vegetation was mainly hardwood trees, such as cottonwood, sycamore, elm, black walnut, oak, and hickory. The understory vegetation was mainly cane, vines, and briers. Razort, Ceda, Spadra, and Wideman soils formed in these areas.

Variations in native vegetation in the county are related partly to variations in the available water capacity and in the surface and internal drainage of the soils. Slope aspect and soil fertility cause minor variations.

Only the major differences in the original vegetation are reflected to any extent in the characteristics of the soils.

Man is important to the future rate and direction of soil formation. He clears the forest, cultivates the land, and introduces new kinds of plants. He applies fertilizer, organic residue, lime, and chemicals for insect, disease, and weed control. He builds dams for flood control, he cuts and fills and grades and compacts the soil surface, and he covers the surface with structures and pavement. Some of the results of these actions will not become known for many centuries; nevertheless, the way that other living organisms affect soil formation in the county has been drastically changed by man.

Relief

The relief in Newton County is the result of geologic erosion and entrenchment of streams and drainage channels into the land surface; in a few places, it is the result of faulting. The highest point in Newton County, which is about 2,561 feet above sea level, is about 1 mile west of Arkansas State Highway 43 at the Buffalo Lookout tower. The lowest point, which is about 680 feet above sea level, is in the eastern part of the county where the Buffalo River leaves the county.

Some of the greatest differences in the soils of Newton County are caused by differences in relief through its effect on drainage, runoff, erosion, and percolation of water through the soil. Relief ranges from nearly vertical bluffs to broad, nearly level and gently sloping areas.

Some soils on the steeper slopes, narrow ridges, and mountaintops are shallow because they have lost so much material through geologic erosion. Moko and Mountainburg soils are examples. In other areas of strong relief, soils formed in cherty limestone. These soils contain large quantities of chert residue from weathered limestone. Clarksville and Noark soils are examples. The chert mantle retards geologic erosion. In contrast, soils that are on nearly level to gently sloping uplands, such as Leadvale, Peridge, and Linker soils, have lost little soil material through geologic erosion.

Nella and Leesburg soils formed on colluvial slopes in deep accumulations of material that washed or sloughed down from adjacent higher slopes. Spadra and Britwater soils, which are on gently sloping stream terraces, formed in deep loamy material that washed from uplands and was deposited on stream flood plains before the streams were further entrenched.

The soils on the flood plains and low terraces along streams in the survey area are level or nearly level. These soils are subject to flooding. The Spadra, Ceda, Kenn, and Razort soils formed in these areas in deep, silty or loamy alluvium that contains chert or gravel in places.

Time

The length of time required for soils to form depends mainly on other factors of soil formation. Generally, less time is required if the climate is warm and humid and the vegetation is luxuriant. If other factors are equal, less time is required if the parent material is loamy than if it is clayey.

In terms of geologic time, most of the soils in Newton County are old, regardless of whether they are on

mountaintops, hillsides, or stream terraces. The young soils formed either in recent alluvium along streams or in residuum where geologic erosion has nearly kept pace with weathering of the bedrock.

The soils on uplands formed in material that weathered from rocks of Ordovician to Pennsylvanian age. Most of these soils are old. Most of the cations have been leached out, and the reaction is strongly acid or very strongly acid. Considerable weathering and translocation of clay have taken place, and the horizons are clearly expressed. Iron, as well as clay, has been translocated from the A horizon to the B horizon and then oxidized, giving the B horizon stronger red, brown, and yellow colors than the A horizon. Nella, Enders, Linker, Leesburg, Noark, and Peridge soils clearly show the effect of time acting with other soil-forming factors on parent material.

Ceda and Wideman soils are young soils. They formed in recent alluvium on flood plains of the streams in Newton County. No definite horizons have formed below the A horizon; instead, these soils still have the depositional bedding planes and have no soil structure. Base saturation is high, and the reaction is generally medium acid to slightly acid, which indicates that leaching has been slight. The content of organic matter decreases irregularly with depth. Except for the slight changes caused by worms and roots, little evidence of soil-forming activity is present.

Razort and Spadra soils are intermediate in age. They formed in loamy alluvium on flood plains and low terraces of large streams. Horizonation is weakly expressed, but clay translocation is evident.

Soil Horizon Differentiation

The effects of the soil-forming factors are reflected in the soil profile, which is a succession of layers, or horizons, from the surface down to the parent material. The parent material has been little altered by soil-forming processes. The horizons differ in one or more properties, such as color, texture, structure, consistence, porosity, or reaction.

Most soil profiles contain four major soil genetic horizons, the A, E, B, and C horizons. Young soils do not have a B horizon.

The horizon of maximum accumulation of organic matter is called the A horizon, or the surface layer. An Ap horizon is a plowed surface layer. The horizon of maximum leaching of dissolved or suspended materials is called the E horizon, or the subsurface layer.

The B horizon lies immediately below the A or E horizon and is sometimes called the subsoil *(16)*. It is the horizon of maximum accumulation of dissolved or suspended materials, such as iron and clay. Commonly, the B horizon has blocky structure and is firmer than the horizons immediately above or below it.

The C horizon lies below the B horizon. Typically, it has been little affected by the soil-forming processes, although in some places it is materially modified by weathering. In some young soils, the C horizon has been only slightly modified by living organisms and by weathering, and it immediately underlies the A horizon.

Several processes have been active in the formation of soil horizons in the Newton County. Among these processes are the accumulation of organic matter, the leaching of carbonates and bases, the oxidation or reduction and transfer of iron, and the formation and translocation of silicate clay minerals. In most of the soils, more than one of these processes were involved.

The physical weathering of rocks, through heating and cooling and wetting and drying, slowly breaks them into small pieces that form the parent material for the residual soils. This is most evident in Moko and Mountainburg soils.

The accumulation of organic matter in the upper part of the profile (A horizon) is readily evident in the Nixa and Enders soils. These soils have a light-colored subsurface layer from which organic matter, clay, and iron oxides have been removed.

Leaching of carbonates and bases has occurred in nearly all the soils in the county. Generally, bases are leached downward in soils before silicate clay minerals begin to move. Most of the soils are strongly leached, but Razort soils are moderately leached, and Moko soils are only slightly leached.

Oxidation of iron is evident in moderately well drained and well drained soils, such as Peridge, Linker, and Nella soils. If the B horizon is red or brown, this is an indication of the oxidation of iron.

Reduction and transfer of iron has occurred to a significant degree in poorly drained and somewhat poorly drained soils. This process is called gleying. Gray colors or gray mottles below the surface layer indicate the reduction and loss of iron. Some horizons contain red, brown, or yellow mottles and dark iron or manganese concretions. This condition is most pronounced in the Leadvale soils.

The translocation of silicate clay minerals has contributed to horizon development in most of the soils in Newton County. In the areas where the soils are cultivated, or have been cultivated, most of the eluviated E horizon has been destroyed. Where it remains, however, the E horizon has weak fine blocky structure to granular structure, has less clay than the lower horizons, and is lighter colored than the rest of the soil. Clay films generally have accumulated in pores and on the faces of peds in the B horizon. The soils were probably leached of carbonates and soluble salts to a great extent before the translocation of silicate clay occurred. Enders and Noark soils are examples of the effects of these processes.

In Newton County, leaching of bases and translocation of silicate clay are among the most important processes of horizon differentiation in the soils.

References

(1) American Association of State Highway and Transportation Officials. 1982. Standard specifications for highway materials and methods of sampling and testing. Ed. 13, 2 vol., illus.

(2) American Society for Testing and Materials. 1985. Standard test method for classification of soils for engineering purposes. ASTM Stand. D 2487.

(3) Briscoe, C.B. and M.D. Ferrill. 1958. Height growth of American sycamore in southeastern Louisiana. Louisiana State Univ. Agric. Exp. Stn. Res. Release Note 19.

(4) Broadfoot, W.M. and R.M. Krinard, 1959. Guide for evaluating sweetgum sites. U.S. Dep. Agr., Forest Serv., South. Forest Exp. Stn. Occas. Pap. 176, 8 pp., illus.

(5) Broadfoot, W.M. 1960. Field guide for evaluating cottonwood sites. U.S. Dep. Agric., Forest Serv., South. Forest Exp. Stn. Occas. Pap. 178, 6 pp., illus.

(6) Coile, T.S. and F.X. Schumacher. 1953. Site index of young stands of loblolly and shortleaf pines in the Piedmont Plateau Region. J. For. 51: 432-435, illus.

(7) Croneis, Carey. 1930. Geology of the Arkansas Paleozoic Area. Ark. Geol. Surv. Bull. 3, 457 pp., illus.

(8) Eyre, F.H. 1980. Forest cover types of the United States and Canada. Soc. of Amer. For., 148 pp.

(9) Haley, Boyd R. and others. 1976. Geology map of Arkansas. U.S. Geol. Surv.

(10) Olson, D.J. 1959. Site index curves for upland oak in the southeast. U.S. Dep. Agric. Forest Serv., Southeast. Forest Exp. Stn. Res. Note 125, 2 pp.

(11) Tennessee Valley Authority. 1948. Site curves for eastern redcedar. (Unpublished, processed curves based on 271 observations from plots throughout the Tennessee Valley).

(12) United States Department of Agriculture. 1938. Soils and men. U.S. Dep. Agric. Yearb., 1,232 pp., illus.

(13) United States Department of Agriculture. 1951 (Being revised). Soil survey manual. U.S. Dep. Agric. Handb. 18, 503 pp., illus. (Supplements replacing pp. 173-188 issued May 1962.)

(14) United States Department of Agriculture. 1975. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. Soil Conserv. Serv., U.S. Dep. Agric. Handb. 436, 754 pp., illus.

(15) United States Department of Commerce, Bureau of Census. 1978. Census of Agriculture. 407 pp., illus.

(16) Winters, Eric and Roy W. Simonson. 1951. The subsoil. Adv. Agron. 3: 1-92.

Glossary

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

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

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

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

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

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

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

	Inches
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.

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

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

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

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

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

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

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

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.

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

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

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

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

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15 to 38 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.

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.

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

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

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

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

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

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

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

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

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

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

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

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

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist, 6 to 15 inches (15 to 37.5 centimeters) long.

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

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

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

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

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

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

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

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 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.

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

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.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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.

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

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

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

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

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

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

Moderately coarse textured soil. Sandy loam and fine sandy loam.

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

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

Mottling, soil. Irregular spots of different colors that vary in number and size. 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.

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

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.

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

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

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

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

Percolation. The downward movement of water through the soil.

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

Permeability. The quality of the soil that enables water 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.

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

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

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size

of the particles, density can be increased only slightly by compaction.

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

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

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

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

Reaction, soil. A measure of 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.

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

Rippable. Rippable bedrock or hardpan can be excavated using a single-tooth ripping attachment mounted on a tractor with a 200-300 draw bar horsepower rating.

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

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.

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

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

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

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

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

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

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

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.

Sinkhole. A depression in the landscape where limestone has been dissolved.

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

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

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.

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

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.5 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:

	Millimeters
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

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

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.

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

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

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

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

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."

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

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

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

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

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

Unstable fill (in tables). There is a risk of caving or sloughing on banks of fill material.

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

Valley fill. In glaciated regions, material deposited in stream valleys by glacial melt water. In nonglaciated regions, alluvium deposited in stream valleys by heavily loaded 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 course 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.

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

Tables

TABLE 1.--NUMBER OF LIVESTOCK IN NEWTON COUNTY IN SELECTED YEARS

LIVESTOCK	1974	1978
All cattle and calves on farms	19,143	15,866
Beef cows	9,189	8,051
Milk cows	876	551
Hogs and pigs	6,496	9,729

TABLE 2.--TEMPERATURE AND PRECIPITATION

(Based on data recorded in the period 1961-81 at Harrison, Arkansas

Month	Temperature						Precipitation				
				2 years in 10 will have--				2 years in 10 will have--			
	Average daily maximum	Average daily minimum	Average daily	Maximum temperature higher than--	Minimum temperature lower than--	Average number of growing degree days*	Average	Less than--	More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	43.7	23.6	33.7	71	-4	25	2.22	.95	3.28	5	4.1
February---	48.7	27.6	38.2	75	2	22	2.42	1.37	3.34	4	3.6
March------	58.1	36.7	47.4	83	13	125	4.29	1.83	6.37	7	3.0
April------	70.2	48.1	59.2	88	28	285	4.49	2.55	6.20	7	.6
May--------	76.3	55.4	65.9	89	38	493	4.91	2.81	6.77	7	.0
June-------	83.5	63.4	73.5	94	49	705	5.25	2.94	7.29	7	.0
July-------	88.8	68.2	78.5	99	54	884	3.44	1.82	4.86	5	.0
August-----	87.0	65.6	76.3	99	54	815	3.86	1.73	5.67	6	.0
September--	79.5	59.3	69.4	94	40	582	4.48	1.75	6.77	6	.0
October----	70.9	48.1	59.5	89	28	310	3.72	1.14	5.81	5	.0
November---	57.6	37.9	47.8	78	16	73	4.02	1.56	6.08	5	1.2
December---	48.0	29.0	38.5	73	2	10	3.38	1.33	5.09	5	2.9
Yearly:											
Average--	67.7	46.9	57.3	---	---	---	---	---	---	---	---
Extreme--	---	---	---	101	.5	---	---	---	---	---	---
Total----	---	---	---	---	---	4,329	46.48	36.83	55.85	69	15.4

* 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 3.--FREEZE DATES IN SPRING AND FALL

(Based on data recorded in the period 1961-81 at Harrison, Arkansas)

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 6	April 14	April 25
2 years in 10 later than--	March 30	April 8	April 20
5 years in 10 later than--	March 17	March 28	April 9
First freezing temperature in fall:			
1 year in 10 earlier than--	October 28	October 20	October 10
2 years in 10 earlier than--	November 3	October 26	October 15
5 years in 10 earlier than--	November 15	November 7	October 24

TABLE 4--GROWING SEASON

(Based on data recorded in the period 1961-81 at Harrison, Arkansas)

Probability	Daily minimum temperature during growing season		
	Higher than 24 °F	Higher than 28 °F	Higher than 32 °F
	Days	Days	Days
9 years in 10	212	195	175
8 years in 10	222	205	183
5 years in 10	242	223	197
2 years in 10	262	241	212
1 year in 10	273	251	220

TABLE 5.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
1	Arkana very cherty silt loam, 3 to 8 percent slopes	920	0.2
2	Arkana-Moko complex, 8 to 20 percent slope	4,580	0.9
3	Arkana-Moko complex, 20 to 40 percent slope	22,750	4.3
4	Britwater gravelly silt loam, 3 to 8 percent slopes	775	0.1
5	Ceda cobbly loam, frequently flooded	2,145	0.4
6	Ceda-Kenn complex, frequently flooded	3,390	0.6
7	Clarksville very cherty silt loam, 20 to 50 percent slopes	18,765	3.6
8	Eden-Newnata complex, 8 to 20 percent slopes	7,245	1.4
9	Eden-Newnata complex, 20 to 40 percent slopes	6,865	1.3
10	Eden-Newnata-Rock outcrop complex, 40 to 60 percent slopes	840	0.2
11	Enders gravelly loam, 3 to 8 percent slopes	5,545	1.0
12	Enders gravelly loam, 8 to 20 percent slopes	6,205	1.2
13	Enders stony loam, 3 to 20 percent slopes	14,515	2.8
14	Enders stony loam, 20 to 40 percent slopes	5,000	0.9
15	Enders-Leesburg stony loams, 8 to 20 percent slopes	26,720	5.1
16	Enders-Leesburg stony loams, 20 to 40 percent slopes	17,120	3.2
17	Estate-Lily-Portia complex, 8 to 20 percent slopes	4,900	0.9
18	Estate-Lily-Portia complex, 20 to 40 percent slopes	3,895	0.7
19	Leadvale silt loam, 3 to 8 percent slopes	1,060	0.2
20	Lily-Udorthents-Rock outcrop complex, 8 to 20 percent slopes	1,135	0.2
21	Lily-Udorthents-Rock outcrop complex, 20 to 40 percent slopes	5,255	1.0
22	Linker loam, 3 to 8 percent slopes	5,335	1.0
23	Linker gravelly loam, 3 to 8 percent slopes	5,245	1.0
24	Linker-Mountainburg complex, 3 to 8 percent slopes	6,980	1.3
25	Linker-Mountainburg complex, 8 to 20 percent slopes	6,715	1.3
26	Moko-Rock outcrop complex, 15 to 50 percent slopes	2,565	0.5
27	Mountainburg gravelly fine sandy loam, 3 to 8 percent slopes	885	0.2
28	Mountainburg very stony fine sandy loam, 3 to 8 percent slopes	850	0.2
29	Mountainburg very stony fine sandy loam, 8 to 20 percent slopes	2,410	0.5
30	Mountainburg very stony fine sandy loam, 20 to 40percent slopes	1,840	0.3
31	Nella gravelly loam, 3 to 12 percent slopes	4,880	0.9
32	Nella gravelly loam, 12 to 20 percent slopes	1,010	0.2
33	Nella stony loam, 8 to 20 percent slopes	7,285	1.4
34	Nella stony loam, 20 to 40 percent slopes	1,225	0.2
35	Nella-Enders stony loams, 8 to 20 percent slopes	56,285	10.7
36	Nella-Enders stony loams, 20 to 40 percent slopes	45,290	8.6
37	Nella-Steprock complex, 8 to 20 percent slopes	14,235	2.7
38	Nella-Steprock-Mountainburg very stony loams, 20 to 40 percent slopes	61,605	11.7
39	Nella-Steprock-Mountainburg very stony loams, 40 to 60 percent slopes	80,563	15.3
40	Nixa very cherty silt loam, 3 to 8 percent slopes	1,395	0.3
41	Nixa very cherty silt loam, 8 to 12 percent slopes	2,085	0.4
42	Noark very cherty silt loam, 3 to 8 percent slopes	5,195	1.0
43	Noark very cherty silt loam, 8 to 20 percent slopes	26,765	5.1
44	Noark very cherty silt loam, 20 to 40 percent slopes	9,120	1.7
45	Peridge silt loam, 3 to 8 percent slopes	855	0.2
46	Portia sandy loam, 3 to 8 percent slopes	1,045	0.2
47	Portia sandy loam, 8 to 12 percent slopes	1,045	0.2
48	Razort loam, occasionally flooded	4,475	0.8
49	Riverwash, frequently flooded	1,045	0.2
50	Spadra loam, occasionally flooded	4,705	0.9
51	Spadra loam, 2 to 5 percent slopes	810	0.2
52	Steprock gravelly loam, 3 to 8 percent slopes	2,675	0.5
53	Wideman loamy fine sand, frequently flooded	670	0.1
	Total	526,713	100.0

TABLE 6.--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	Oats	Corn	Improved bermudagrass	Tall fescue
		Bu	Bu	AUM*	AUM*
1---------- Arkana	IVe	---	---	---	5.0
2---------- Arkana-Moko	VIIs	---	---	---	3.5
3---------- Arkana-Moko	VIIs	---	---	---	---
4---------- Britwater	IIIe	55	55	7.0	7.0
5---------- Ceda	VIIw	---	---	7.0	6.0
6.**:					
Ceda----------	VIIw	---	---	7.0	6.0
Kenn----------	Vw	---	---	7.5	6.5
7---------- Clarksville	VIIs	---	---	---	---
8---------- Eden-Newnata	VIs	---	---	---	4.5
9**:					
Eden----------	VIIe	---	---	---	---
Newnata----------	VIIs	---	---	---	---
10**:					
Eden----------	VIIe	---	---	---	---
Newnata----------	VIIs	---	---	---	---
Rock outcrop----------	VIIIs	---	---	---	---
11---------- Enders	IVe	45	---	4.0	4.0
12---------- Enders	VIe	---	---	3.5	3.5
13---------- Enders	VIs	---	---	3.0	4.0
14---------- Enders	VIIs	---	---	---	---
15---------- Enders-Leesburg	VIs	---	---	3.5	---
16---------- Enders-Leesburg	VIIs	---	---	---	---

See footnotes at end of table.

TABLE 6.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Map symbol and soil name	Land capability	Oats	Corn	Improved bermudagrass	Tall fescue
		Bu	Bu	AUM*	AUM*
17---------- Estate-Lily-Portia	VIIs	---	---	4.0	---
18---------- Estate-Lily-Portia	VIIs	---	---	---	---
19---------- Leadvale	IIIe	55	60	6.5	6.0
20**, 21**: Lily-Udorthents----------	VIs	---	---	---	---
Rock outcrop----------	VIIIs	---	---	---	---
22, 23---------- Linker	IIIe	50	50	6.0	5.5
24**: Linker----------	IIIe	50	50	6.0	5.5
Mountainburg----------	VIs	---	---	---	3.0
25**: Linker----------	IVe	---	---	---	4.0
Mountainburg----------	VIs	---	---	---	3.0
26**: Moko----------	VIIs	---	---	---	---
Rock outcrop----------	VIIIs	---	---	---	---
27---------- Mountainburg	IVe	35	---	5.0	4.0
28---------- Mountainburg	VIs	---	---	---	3.0
29, 30---------- Mountainburg	VIIs	---	---	---	---
31---------- Nella	IVe	50	55	7.0	6.5
32---------- Nella	VIe	---	---	6.5	6.0
33---------- Nella	VIs	---	---	6.5	6.0
34---------- Nella	VIIs	---	---	---	---
35---------- Nella-Enders	VIs	---	---	5.5	5.0
36---------- Nella-Enders	VIIs	---	---	---	---
37---------- Nella-Steprock	VIs	---	---	4.5	4.0

See footnotes at end of table.

TABLE 6.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Map symbol and soil name	Land capability	Oats	Corn	Improved bermudagrass	Tall fescue
		Bu	Bu	AUM*	AUM*
38, 39---------- Nella-Steprock-Mountainburg	VIIs	---	---	---	---
40---------- Nixa	IIIs	---	---	4.5	5.0
41---------- Nixa	IVs	---	---	4.0	4.5
42---------- Noark	IIIe	60	55	7.0	7.0
43---------- Noark	VIe	---	---	5.5	6.0
44---------- Noark	VIIe	---	---	---	---
45---------- Peridge	IIIe	60	75	8.0	7.5
46---------- Portia	IIIe	60	75	7.5	7.0
47---------- Portia	IVe	50	50	6.5	6.0
48---------- Razort	IIw	70	80	10.0	10.0
49** Riverwash----------	VIIIs	---	---	---	---
50---------- Spadra	IIw	65	65	8.0	7.5
51---------- Spadra	IIIe	65	65	7.5	7.0
52---------- Steprock	IIIe	45	40	5.5	4.5
53---------- Wideman	Vw	---	---	5.5	4.5

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

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

TABLE 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	Woodland suitability group	Management concerns					Potential productivity		
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Common trees*	Site index	Productivity class**
1---------- Arkana	5C8	Slight	Moderate	Moderate	Moderate	Slight	Shortleaf pine------	55	78
							Southern red oak----	55	--
							Eastern redcedar----	35	--
							White oak----------	---	--
2***:									
Arkana----------	5C8	Slight	Moderate	Moderate	Moderate	Slight	Shortleaf pine------	55	78
							Southern red oak----	55	--
							Eastern redcedar----	35	--
							White oak----------	---	--
Moko----------	2X3	Slight	Severe	Severe	Severe	Slight	Eastern redcedar----	30	32
3***:									
Arkana----------	5R8	Moderate	Moderate	Moderate	Moderate	Slight	Shortleaf pine------	55	78
							Southern red oak----	55	--
							Eastern redcedar----	35	--
							White oak----------	---	--
Moko----------	2X3	Moderate	Severe	Severe	Severe	Slight	Eastern redcedar----	30	32
4---------- Britwater	8A7	Slight	Slight	Slight	Slight	Moderate	Shortleaf pine------	70	110
							Southern red oak----	70	--
							Eastern redcedar----	50	--
							Loblolly pine-------	80	--
5---------- Ceda	8W9	Slight	Slight	Severe	Slight	Moderate	Shortleaf pine------	70	110
							Southern red oak----	---	--
							White oak----------	---	--
							Sweetgum-----------	80	--
							American sycamore---	80	--
6***:									
Ceda----------	8W9	Slight	Slight	Severe	Slight	Moderate	Shortleaf pine------	70	110
							Southern red oak----	---	--
							White oak----------	---	--
							Sweetgum-----------	80	--
							American sycamore---	80	--
Kenn----------	8W9	Slight	Slight	Severe	Slight	Moderate	Shortleaf pine------	70	110
							Southern red oak----	70	--
							Sweetgum-----------	80	--
7---------- Clarksville	6R9	Moderate	Severe	Severe	Slight	Slight	Shortleaf pine------	61	90
							White oak----------	58	--
							Black oak----------	61	--
							Northern red oak----	75	--
8***:									
Eden----------	2C8	Slight	Moderate	Moderate	Moderate	Slight	Eastern redcedar----	35	37
							Black locust--------	---	--
							Red oak------------	---	--

See footnotes at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Map symbol and soil name	Woodland suitability group	Management concerns					Potential productivity		
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Common trees*	Site index	Productivity class**
8***:									
Newnata	3X8	Slight	Moderate	Slight	Moderate	Slight	Northern red oak	65	47
							Eastern redcedar	40	--
							Black locust	---	--
							White oak	---	--
							Green ash	---	--
							Shagbark hickory	---	--
9***:									
Eden	2R8	Slight	Moderate	Moderate	Moderate	Slight	Eastern redcedar	35	37
							Black locust	---	--
							Red oak	---	--
Newnata	3R8	Moderate	Moderate	Slight	Moderate	Slight	Northern red oak	65	47
							Eastern redcedar	40	--
							Black locust	---	--
							White oak	---	--
							Green ash	---	--
							Shagbark hickory	---	--
10***:									
Eden	2R9	Moderate	Severe	Moderate	Moderate	Slight	Eastern redcedar	35	37
							Black locust	---	--
							Red oak	---	--
Newnata	3R9	Severe	Severe	Slight	Moderate	Slight	Northern red oak	65	47
							Eastern redcedar	40	--
							Black locust	---	--
							White oak	---	--
							Green ash	---	--
							Shagbark hickory	---	--
Rock outcrop.									
11, 12 Enders	7A7	Slight	Slight	Slight	Slight	Moderate	Shortleaf pine	65	99
							Northern red oak	60	--
							White oak	60	--
13 Enders	6X8	Slight	Moderate	Slight	Slight	Slight	Shortleaf pine	60	88
							Northern red oak	60	--
							White oak	60	--
14 Enders (South and West slopes)	5R9	Moderate	Moderate	Severe	Slight	Slight	Shortleaf pine	50	68
							Northern red oak	50	--
							White oak	50	--
							Eastern redcedar	35	--
14 Enders (North and East slopes)	6R8	Moderate	Moderate	Slight	Slight	Slight	Shortleaf pine	60	88
							White oak	56	--
							Eastern redcedar	40	--

See footnotes at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Map symbol and soil name	Woodland suitability group	Management concerns					Potential productivity		
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Common trees*	Site index	Productivity class**
15***:									
Enders	6X8	Slight	Moderate	Slight	Slight	Slight	Shortleaf pine	60	86
							Northern red oak	60	--
							White oak	55	--
Leesburg	8X8	Slight	Moderate	Slight	Slight	Moderate	Shortleaf pine	70	110
							White oak	70	--
							Northern red oak	70	--
16***:									
Enders (South and West slopes)	5R9	Moderate	Moderate	Severe	Slight	Slight	Shortleaf pine	50	68
							Northern red oak	50	--
							White oak	50	--
							Eastern redcedar	35	--
Leesburg (South and West slopes)	6R9	Slight	Moderate	Severe	Slight	Slight	Shortleaf pine	60	88
							White oak	60	--
							Northern red oak	60	--
16***:									
Enders (North and East slopes)	6R8	Moderate	Moderate	Slight	Slight	Slight	Shortleaf pine	60	88
							White oak	56	--
							Eastern redcedar	40	--
Leesburg (North and East slopes)	8R8	Slight	Moderate	Slight	Slight	Moderate	Shortleaf pine	70	110
							White oak	70	--
							Northern red oak	70	--
17***:									
Estate	6X8	Slight	Moderate	Slight	Slight	Severe	Shortleaf pine	60	88
							Northern red oak	65	--
							Eastern redcedar	40	--
							Black locust	---	--
							White oak	---	--
							Black cherry	---	--
Lily	6X8	Slight	Moderate	Moderate	Moderate	Moderate	Shortleaf pine	60	88
							Northern red oak	60	--
Portia	8A7	Slight	Slight	Slight	Slight	Severe	Shortleaf pine	70	110
							Sweetgum	80	--
18***:									
Estate	6R8	Slight	Moderate	Slight	Slight	Severe	Shortleaf pine	60	88
							Northern red oak	65	--
							Eastern redcedar	40	--
							Black locust	---	--
							White oak	---	--
							Black cherry	---	--
Lily	6R8	Moderate	Moderate	Moderate	Moderate	Moderate	Shortleaf pine	60	88
							Northern red oak	60	--
Portia	8R8	Moderate	Moderate	Slight	Slight	Severe	Shortleaf pine	70	110
							Sweetgum	80	--

See footnotes at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Map symbol and soil name	Woodland suitability group	Management concerns					Potential productivity		
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Common trees*	Site index	Productivity class**
19---------- Leadvale	8A7	Slight	Slight	Slight	Moderate	Moderate	Shortleaf pine------	70	110
							White oak----------	70	--
							Loblolly pine-------	80	--
20***:									
Lily----------	6X8	Slight	Moderate	Moderate	Moderate	Moderate	Shortleaf pine------	60	88
							Northern red oak----	60	--
Udorthents.									
Rock outcrop.									
21***:									
Lily----------	6R8	Moderate	Moderate	Moderate	Moderate	Moderate	Shortleaf pine------	60	88
							Northern red oak----	60	--
Udorthents.									
Rock outcrop.									
22, 23---------- Linker	6A7	Slight	Slight	Slight	Moderate	Slight	Shortleaf pine------	60	88
							Northern red oak----	50	--
							White oak----------	50	--
							Eastern redcedar----	40	--
							Loblolly pine-------	---	--
24***, 25***:									
Linker----------	6A7	Slight	Slight	Slight	Moderate	Slight	Shortleaf pine------	60	88
							Northern red oak----	50	--
							White oak----------	50	--
							Eastern redcedar----	40	--
							Loblolly pine-------	---	--
Mountainburg------	5X8	Slight	Moderate	Moderate	Severe	Slight	Shortleaf pine------	50	68
							Eastern redcedar----	30	--
26***:									
Moko----------	2X3	Moderate	Severe	Severe	Severe	Slight	Eastern redcedar----	30	32
Rock outcrop.									
27---------- Mountainburg	5D8	Slight	Slight	Moderate	Severe	Slight	Shortleaf pine------	50	68
							Eastern redcedar----	30	--
							Loblolly pine-------	---	--
28, 29---------- Mountainburg	5X8	Slight	Moderate	Moderate	Severe	Slight	Shortleaf pine------	50	68
							Eastern redcedar----	30	--
30---------- Mountainburg	5R8	Moderate	Moderate	Moderate	Severe	Slight	Shortleaf pine------	50	68
							Blackjack oak-------	---	--
							Post oak----------		
31---------- Nella	8A7	Slight	Slight	Slight	Slight	Moderate	Shortleaf pine------	70	110
							Northern red oak----	70	--
							Eastern redcedar----	50	--
							White ash----------	---	--
							Black walnut--------	---	--

See footnotes at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Map symbol and soil name	Woodland suitability group	Management concerns					Potential productivity		
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Common trees*	Site index	Productivity class**
32---------- Nella	8R8	Slight	Moderate	Slight	Slight	Moderate	Shortleaf pine------	70	110
							Northern red oak----	70	--
							Eastern redcedar----	50	--
							White ash----------	---	--
							Black walnut--------	---	--
33---------- Nella	7X8	Slight	Slight	Slight	Slight	Moderate	Shortleaf pine------	65	99
							Northern red oak----	70	--
							Eastern redcedar----	50	--
							White ash----------	---	--
							Black walnut--------	---	--
34---------- Nella (South and West slopes)	6R9	Slight	Moderate	Severe	Slight	Moderate	Shortleaf pine------	60	88
							Northern red oak----	60	--
							Eastern redcedar----	40	--
34---------- Nella (North and East slopes)	7R8	Moderate	Moderate	Slight	Slight	Moderate	Shortleaf pine------	65	99
							Northern red oak----	70	--
							Eastern redcedar----	50	--
							White ash----------	---	--
							Black walnut--------	---	--
35***:									
Nella----------	7X8	Slight	Moderate	Slight	Slight	Moderate	Shortleaf pine------	65	99
							Northern red oak----	70	--
							Eastern redcedar----	50	--
							White ash----------	---	--
							Black walnut--------	---	--
Enders----------	6X8	Slight	Moderate	Slight	Slight	Slight	Shortleaf pine------	60	88
							Northern red oak----	60	--
36***:									
Nella---------- (South and West slopes)	6R9	Slight	Moderate	Severe	Slight	Slight	Shortleaf pine------	60	88
							Northern red oak----	60	--
							Eastern redcedar----	40	--
Enders---------- (South and West slopes)	5R9	Moderate	Moderate	Severe	Slight	Slight	Shortleaf pine------	50	68
							Northern red oak----	50	--
							White oak----------	50	--
							Eastern redcedar----	35	--
36***:									
Nella---------- (North and East slopes)	7R8	Slight	Moderate	Slight	Slight	Moderate	Shortleaf pine------	65	99
							Northern red oak----	70	--
							Eastern redcedar----	50	--
							White ash----------	---	--
							Black walnut--------	---	--
Enders---------- (North and East slopes)	6R8	Moderate	Moderate	Slight	Slight	Slight	Shortleaf pine------	60	88
							White oak----------	56	--
							Eastern redcedar----	40	--
							Northern red oak----	60	--
37***:									
Nella----------	7X8	Slight	Moderate	Slight	Slight	Moderate	Shortleaf pine------	65	99
							Eastern redcedar----	50	--
							Northern red oak----	60	--
							White ash----------	---	--
							Black walnut--------	---	--

See footnotes at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Map symbol and soil name	Woodland suitability group	Management concerns					Potential productivity		
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Common trees*	Site index	Productivity class**
37***:									
Steprock----------	6X8	Slight	Moderate	Slight	Moderate	Slight	Shortleaf pine------	58	84
							Northern red oak----	56	--
38***:									
Nella---------- (South and West slopes)	6R9	Slight	Moderate	Severe	Slight	Slight	Shortleaf pine------	60	88
							Northern red oak----	60	--
							Eastern redcedar----	40	--
Steprock---------- (South and West slopes)	5R9	Slight	Moderate	Severe	Moderate	Slight	Shortleaf pine------	50	68
							Northern red oak----	50	--
							White oak----------	50	--
							Eastern redcedar----	30	--
Mountainburg------ (South and West slopes)	4R9	Slight	Moderate	Severe	Severe	Slight	Shortleaf pine------	45	57
							Eastern redcedar----	30	--
Nella---------- (North and East slopes)	7R8	Slight	Moderate	Moderate	Slight	Moderate	Shortleaf pine------	65	99
							Northern red oak----	70	--
							Eastern redcedar----	50	--
							White ash----------	---	--
							Black walnut--------	---	--
Steprock---------- (North and East slopes)	6R8	Slight	Moderate	Moderate	Moderate	Slight	Shortleaf pine------	60	88
							White oak----------	56	--
							Eastern redcedar----	40	--
Mountainburg------ (North and East slopes)	5R8	Slight	Moderate	Moderate	Severe	Slight	Shortleaf pine------	50	72
							Blackjack oak-------	---	--
							Post oak-----------	---	--
39***:									
Nella---------- (South and West slopes)	6R9	Moderate	Severe	Severe	Slight	Slight	Shortleaf pine------	60	86
							Northern red oak----	60	--
							Eastern redcedar----	40	--
Steprock---------- (South and West slopes)	4R9	Moderate	Severe	Severe	Moderate	Slight	Shortleaf pine------	45	57
							Northern red oak----	50	--
							White oak----------	50	--
							Eastern redcedar----	30	--
Mountainburg------ (South and West slopes)	4R9	Moderate	Severe	Severe	Severe	Slight	Shortleaf pine------	45	57
							Blackjack oak-------	---	--
							Post oak-----------	---	--
39***:									
Nella---------- (North and East slopes)	7R9	Moderate	Severe	Moderate	Slight	Moderate	Shortleaf pine------	65	100
							Northern red oak----	70	--
							Eastern redcedar----	50	--
							White ash----------	---	--
Steprock---------- (North and East slopes)	5R9	Moderate	Severe	Moderate	Moderate	Slight	Shortleaf pine------	50	72
							White oak----------	50	--
Mountainburg------ (North and East slopes)	4R9	Moderate	Severe	Moderate	Severe	Slight	Shortleaf pine------	45	57
							White oak----------	50	--

See footnotes at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Map symbol and soil name	Woodland suitability group	Management concerns					Potential productivity		
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Common trees*	Site index	Productivity class**
40, 41---------- Nixa	6F8	Slight	Moderate	Moderate	Moderate	Moderate	Shortleaf pine------	60	86
							Northern red oak----	60	--
							White oak----------	60	--
							Eastern redcedar----	40	--
42, 43---------- Noark	6F8	Slight	Moderate	Moderate	Slight	Moderate	Shortleaf pine------	60	86
							Eastern redcedar----	40	--
							Northern red oak----	60	--
							White oak----------	---	--
44---------- Noark	6R8	Moderate	Moderate	Moderate	Slight	Moderate	Shortleaf pine------	60	86
							Eastern redcedar----	40	--
							Northern red oak----	60	--
							White oak----------	---	--
45---------- Peridge	8A7	Slight	Slight	Slight	Slight	Severe	Shortleaf pine------	70	114
							Northern red oak----	70	--
							Eastern redcedar----	50	--
							White oak----------	---	--
							White ash----------	---	--
46, 47---------- Portia	8A7	Slight	Slight	Slight	Slight	Severe	Shortleaf pine------	70	114
							Sweetgum-----------	80	--
48---------- Razort	9W8	Slight	Slight	Moderate	Slight	Severe	Shortleaf pine------	80	130
							Northern red oak----	80	--
							Eastern cottonwood--	90	--
							American sycamore---	85	--
							Sweetgum-----------	80	--
							White oak----------	75	--
49***: Riverwash.									
50---------- Spadra	9W8	Slight	Slight	Moderate	Slight	Severe	Shortleaf pine------	80	130
							Northern red oak----	80	--
							Eastern redcedar----	60	--
51---------- Spadra	9A7	Slight	Slight	Slight	Slight	Severe	Shortleaf pine------	80	130
							Northern red oak----	80	--
							Eastern redcedar----	60	--
52---------- Steprock	5A7	Slight	Slight	Slight	Moderate	Slight	Shortleaf pine------	55	78
							Northern red oak----	45	--
							White oak----------	45	--
							Eastern redcedar----	35	--
53---------- Wideman	6S8	Slight	Moderate	Moderate	Slight	Moderate	Sweetgum-----------	80	79
							Eastern cottonwood--	90	--
							American sycamore---	80	--
							Shortleaf pine------	80	--

* The first common tree is the indicator specie.

** Productivity class is the yield in cubic feet per acre per year calculated at the age of culmination of mean annual increment for fully stocked natural stands.

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

TABLE 8.--RECREATIONAL DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated)

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails
1--- Arkana	Severe: percs slowly.	Severe: percs slowly.	Severe: small stones, percs slowly.	Slight.
2*:				
Arkana---	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, small stones, percs slowly.	Slight.
Moko---	Severe: depth to rock.	Severe: depth to rock.	Severe: large stones, slope, small stones.	Severe: large stones.
3*:				
Arkana---	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: slope, small stones, percs slowly.	Severe: slope.
Moko---	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: large stones, slope, small stones.	Severe: large stones, slope.
4--- Britwater	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight.
5--- Ceda	Severe: flooding, large stones.	Severe: large stones.	Severe: flooding, large stones.	Moderate: flooding.
6*:				
Ceda---	Severe: flooding, large stones.	Severe: large stones.	Severe: flooding, large stones.	Moderate: flooding.
Kenn---	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.
7--- Clarksville	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.
8*:				
Eden---	Moderate: slope.	Moderate: slope.	Severe: large stones, slope, small stones.	Moderate: large stones.
Newnata---	Moderate: slope, percs slowly, small stones.	Moderate: slope, percs slowly, small stones.	Severe: slope, small stones.	Severe: erodes easily.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails
9*:				
Eden	Severe: slope.	Severe: slope.	Severe: large stones, slope, small stones.	Severe: slope.
Newnata	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope, erodes easily.
10*:				
Eden	Severe: slope.	Severe: slope.	Severe: large stones, slope, small stones.	Severe: slope.
Newnata	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope, erodes easily.
Rock outcrop.				
11 Enders	Severe: small stones, percs slowly.	Severe: small stones, percs slowly.	Severe: small stones, percs slowly.	Slight.
12 Enders	Severe: small stones, percs slowly.	Severe: small stones, percs slowly.	Severe: slope, small stones, percs slowly.	Slight.
13 Enders	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, small stones.	Moderate: large stones.
14 Enders	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: slope, small stones.	Severe: slope.
15*:				
Enders	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, small stones.	Moderate: large stones.
Leesburg	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
16*:				
Enders	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: slope, small stones.	Severe: slope.
Leesburg	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
17*:				
Estate	Moderate: slope, small stones, percs slowly.	Moderate: slope, small stones, percs slowly.	Severe: slope, small stones.	Moderate: large stones.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails
17*:				
Lily	Moderate: slope, large stones.	Moderate: slope, large stones.	Severe: large stones, slope.	Slight.
Portia	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight.
18*:				
Estate	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.
Lily	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Severe: slope.
Portia	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
19--- Leadvale	Moderate: wetness.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Moderate: wetness.
20*:				
Lily	Moderate: slope, large stones.	Moderate: slope, large stones.	Severe: large stones, slope.	Slight.
Udorthents.				
Rock outcrop.				
21*:				
Lily	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Severe: slope.
Udorthents.				
Rock outcrop.				
22--- Linker	Slight	Slight	Moderate: slope, small stones.	Slight.
23--- Linker	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight.
24*:				
Linker	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight.
Mountainburg	Severe: depth to rock.	Severe: depth to rock.	Severe: small stones.	Moderate: large stones.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails
25*:				
Linker	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight.
Mountainburg	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, small stones.	Moderate: large stones.
26*:				
Moko	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: large stones, slope, small stones.	Severe: large stones, slope.
Rock outcrop.				
27--- Mountainburg	Severe: depth to rock.	Severe: depth to rock.	Severe: small stones.	Slight.
28--- Mountainburg	Severe: depth to rock.	Severe: depth to rock.	Severe: large stones, small stones.	Moderate: large stones.
29--- Mountainburg	Severe: depth to rock.	Severe: depth to rock.	Severe: large stones, slope.	Moderate: large stones.
30--- Mountainburg	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: large stones, slope.	Severe: slope.
31--- Nella	Slight	Slight	Severe: slope.	Slight.
32--- Nella	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
33--- Nella	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: large stones.
34--- Nella	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
35*:				
Nella	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: large stones.
Enders	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, small stones.	Moderate: large stones.
36*:				
Nella	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Enders	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: slope, small stones.	Severe: slope.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails
37*:				
Nella	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: large stones.
Steprock	Moderate: slope, large stones.	Moderate: slope, large stones.	Severe: large stones, slope, small stones.	Moderate: large stones.
38*, 39*:				
Nella	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Steprock	Severe: slope.	Severe: slope.	Severe: large stones, slope, small stones.	Severe: slope.
Mountainburg	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: large stones, slope.	Severe: slope.
40--- Nixa	Severe: small stones, percs slowly.	Severe: small stones, percs slowly.	Severe: small stones, percs slowly.	Severe: erodes easily, small stones.
41--- Nixa	Severe: small stones, percs slowly.	Severe: small stones, percs slowly.	Severe: slope, small stones, percs slowly.	Severe: erodes easily, small stones.
42--- Noark	Severe: small stones.	Severe: small stones.	Severe: small stones.	Severe: small stones.
43--- Noark	Severe: small stones.	Severe: small stones.	Severe: slope, small stones.	Severe: small stones.
44--- Noark	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.
45--- Peridge	Slight	Slight	Moderate: slope.	Slight.
46--- Portia	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight.
47--- Portia	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight.
48--- Razort	Severe: flooding.	Slight	Moderate: small stones.	Slight.
49*. Riverwash				

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails
50---------- Spadra	Severe: flooding.	Slight----------	Moderate: small stones, flooding.	Slight.
51---------- Spadra	Slight----------	Slight----------	Moderate: slope, small stones.	Slight.
52---------- Steprock	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight.
53---------- Wideman	Severe: flooding.	Moderate: flooding.	Severe: flooding, too sandy.	Flooding.

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

TABLE 9.--WILDLIFE HABITAT

(See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated)

Map symbol and soil name	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
1---------- Arkana	Fair	Good	Fair	Good	---	Poor	Very poor.	Fair	Good	Very poor.
2*:										
Arkana----------	Poor	Fair	Fair	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.
Moko----------	Very poor.	Poor	Poor	---	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
3*:										
Arkana----------	Very poor.	Fair	Fair	Good	---	Very poor.	Very poor.	Poor	Good	Very poor.
Moko----------	Very poor.	Poor	Poor	---	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
4---------- Britwater	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
5---------- Ceda	Poor	Fair	Fair	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.
6*:										
Ceda----------	Poor	Fair	Fair	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.
Kenn----------	Poor	Fair	Fair	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.
7---------- Clarksville	Very poor.	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
8*:										
Eden----------	Fair	Good	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Newnata----------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
9*:										
Eden----------	Very poor.	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Newnata----------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
10*:										
Eden----------	Very poor.	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Newnata----------	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Rock outcrop.										

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT--Continued

Map symbol and soil name	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
11, 12---------- Enders	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
13---------- Enders	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
14---------- Enders	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
15*:										
Enders----------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Leesburg----------	Poor	Poor	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
16*:										
Enders----------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Leesburg----------	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
17*:										
Estate----------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Lily----------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Portia----------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
18*:										
Estate----------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Lily----------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Portia----------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
19---------- Leadvale	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
20*:										
Lily----------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Udorthents.										
Rock outcrop.										
21*:										
Lily----------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Udorthents.										

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT--Continued

Map symbol and soil name	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
21*: Rock outcrop.										
22, 23---------- Linker	Fair	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
24*: Linker----------	Fair	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
Mountainburg------	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Poor	Very poor.
25*: Linker----------	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
Mountainburg------	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Poor	Very poor.
26*: Moko----------	Very poor.	Poor	Poor	---	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Rock outcrop.										
27---------- Mountainburg	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Very poor.	Poor	Very poor.	Very poor.
28, 29, 30--------- Mountainburg	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Poor	Very poor.
31---------- Nella	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
32---------- Nella	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
33---------- Nella	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
34---------- Nella	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
35*: Nella----------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Enders----------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
36*: Nella----------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Enders----------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT--Continued

Map symbol and soil name	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
37*:										
Nella	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Steprock	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
38*:										
Nella	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Steprock	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Mountainburg	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Poor	Very poor.
39*:										
Nella	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Steprock	Very poor.	Very poor.	Poor	Poor	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.
Mountainburg	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Poor	Very poor.
40--- Nixa	Poor	Fair	Fair	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.
41--- Nixa	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
42, 43--- Noark	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
44--- Noark	Very poor.	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
45--- Peridge	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
46--- Portia	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
47--- Portia	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
48--- Razort	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
49*. Riverwash										
50, 51--- Spadra	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
52--- Steprock	Poor	Fair	Fair	Poor	Poor	Poor	Very poor.	Fair	Poor	Very poor.

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT--Continued

Map symbol and soil name	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
53---------- Wideman	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.

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

TABLE 10.--BUILDING SITE DEVELOPMENT

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

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
1---- Arkana	Severe: depth to rock.	Severe: shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
2*:					
Arkana----	Severe: depth to rock.	Severe: shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.
Moko----	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, large stones.
3*:					
Arkana----	Severe: depth to rock, slope.	Severe: shrink-swell, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.
Moko----	Severe: depth to rock, large stones, slope.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.
4---- Britwater	Slight----	Slight----	Slight----	Moderate: slope.	Slight.
5---- Ceda	Moderate: flooding, large stones.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
6*:					
Ceda----	Moderate: flooding, large stones.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
Kenn----	Moderate: flooding, large stones.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
7---- Clarksville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
8*:					
Eden----	Moderate: depth to rock, too clayey, slope.	Moderate: shrink-swell, slope, large stones.	Moderate: depth to rock, slope, shrink-swell.	Severe: slope.	Severe: low strength.
Newnata----	Moderate: depth to rock, too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: slope, shrink-swell.	Severe: low strength, shrink-swell.

See footnote at end of table.

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
9*:					
Eden	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.
Newnata	Severe: slope.	Severe: slope, shrink-swell.	Severe: slope, shrink-swell.	Severe: slope, shrink-swell.	Severe: low strength, slope, shrink-swell.
10*:					
Eden	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.
Newnata	Severe: slope.	Severe: slope, shrink-swell.	Severe: slope, shrink-swell.	Severe: slope, shrink-swell.	Severe: low strength, slope, shrink-swell.
Rock outcrop.					
11 Enders	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
12, 13 Enders	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.
14 Enders	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.
15*:					
Enders	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.
Leesburg	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
16*:					
Enders	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.
Leesburg	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
17*:					
Estate	Moderate: depth to rock, too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: depth to rock, slope, shrink-swell.	Severe: slope.	Severe: low strength.

See footnote at end of table.

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
17*:					
Lily	Severe: depth to rock.	Moderate: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock, slope.
Portia	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
18*:					
Estate	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.
Lily	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.
Portia	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
19 Leadvale	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness, slope.	Moderate: low strength, wetness.
20*:					
Lily	Severe: depth to rock.	Moderate: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock, slope, frost action.
Udorthents	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.
Rock outcrop.					
21*:					
Lily	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.
Udorthents	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.
Rock outcrop.					
22, 23 Linker	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: slope, depth to rock.	Moderate: depth to rock.
24*:					
Linker	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: slope, depth to rock.	Moderate: depth to rock.
Mountainburg	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
25*:					
Linker	Severe: depth to rock.	Moderate: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock, slope.

See footnote at end of table.

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
25*: Mountainburg	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.
26*: Moko	Severe: depth to rock, large stones, slope.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.
Rock outcrop.					
27, 28--- Mountainburg	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
29--- Mountainburg	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.
30--- Mountainburg	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.
31--- Nella	Moderate: slope.	Moderate: slope.	Moderate: slope.	Moderate: slope.	Moderate: slope.
32--- Nella	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
33--- Nella	Moderate: large stones, slope.	Moderate: slope, large stones.	Moderate: slope, large stones.	Severe: slope.	Moderate: slope, large stones.
34--- Nella	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
35*: Nella	Moderate: large stones, slope.	Moderate: slope, large stones.	Moderate: slope, large stones.	Severe: slope.	Moderate: slope, large stones.
Enders	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.
36*: Nella	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Enders	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.
37*: Nella	Moderate: large stones, slope.	Moderate: slope, large stones.	Moderate: slope, large stones.	Severe: slope.	Moderate: slope, large stones.

See footnote at end of table.

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
37*: Steprock	Moderate: depth to rock, slope, large stones.	Moderate: slope, large stones.	Moderate: depth to rock, slope, large stones.	Severe: slope.	Moderate: slope, large stones.
38*, 39*: Nella	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Steprock	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Mountainburg	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.
40--- Nixa	Slight	Slight	Slight	Moderate: slope.	Slight.
41--- Nixa	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
42--- Noark	Moderate: too clayey.	Slight	Slight	Moderate: slope.	Slight.
43--- Noark	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
44--- Noark	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
45--- Peridge	Moderate: too clayey.	Slight	Slight	Moderate: slope.	Severe: low strength.
46--- Portia	Slight	Slight	Slight	Moderate: slope.	Slight.
47--- Portia	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
48--- Razort	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
49*. Riverwash					
50--- Spadra	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
51--- Spadra	Slight	Slight	Slight	Slight	Slight.
52--- Steprock	Moderate: depth to rock.	Slight	Moderate: depth to rock.	Moderate: slope.	Slight.
53--- Wideman	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.

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

TABLE 11.--SANITARY FACILITIES

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

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1---------- Arkana	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.
2*:					
Arkana----------	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.
Moko----------	Severe: depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock.	Poor: area reclaim, thin layer.
3*:					
Arkana----------	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: area reclaim, too clayey, hard to pack.
Moko----------	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope.	Poor: area reclaim, slope, thin layer.
4---------- Britwater	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight----------	Poor: small stones.
5---------- Ceda	Severe: flooding, poor filter.	Severe: seepage, flooding.	Severe: flooding, seepage.	Severe: flooding, seepage.	Poor: large stones, seepage.
6*:					
Ceda----------	Severe: flooding, poor filter.	Severe: seepage, flooding.	Severe: flooding, seepage.	Severe: flooding, seepage.	Poor: large stones, seepage.
Kenn----------	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Poor: small stones.
7---------- Clarksville	Severe: slope.	Severe: seepage, slope.	Severe: slope.	Severe: seepage, slope.	Poor: small stones, slope.
8*:					
Eden----------	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: depth to rock, too clayey, hard to pack.

See footnote at end of table.

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
8*:					
Newnata	Severe: percs slowly.	Severe: slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock, slope.	Poor: too clayey, hard to pack.
9*:					
Eden	Severe: depth to rock, slope, percs slowly.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: depth to rock, too clayey, slope.
Newnata	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
10*:					
Eden	Severe: depth to rock, slope, percs slowly.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: depth to rock, too clayey, slope.
Newnata	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
Rock outcrop.					
11 Enders	Severe: percs slowly.	Moderate: depth to rock, slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock.	Poor: too clayey, hard to pack.
12, 13 Enders	Severe: percs slowly.	Severe: slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock, slope.	Poor: too clayey, hard to pack.
14 Enders	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
15*:					
Enders	Severe: percs slowly.	Severe: slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock, slope.	Poor: too clayey, hard to pack.
Leesburg	Moderate: percs slowly, slope.	Severe: slope.	Moderate: too clayey, slope.	Moderate: slope.	Fair: small stones.
16*:					
Enders	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
Leesburg	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.

See footnote at end of table.

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
17*:					
Estate	Severe: percs slowly.	Severe: slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock, slope.	Poor: too clayey, hard to pack.
Lily	Severe: depth to rock.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Poor: area reclaim, small stones.
Portia	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
18*:					
Estate	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
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: area reclaim, small stones, slope.
Portia	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
19 Leadvale	Severe: wetness, percs slowly.	Severe: wetness.	Severe: depth to rock.	Moderate: depth to rock, wetness.	Fair: area reclaim, too clayey.
20*:					
Lily	Severe: depth to rock.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Poor: area reclaim, small stones.
Udorthents	Severe: depth to rock, poor filter.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Poor: area reclaim.
Rock outcrop.					
21*:					
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: area reclaim, small stones, slope.
Udorthents	Severe: depth to rock, slope, poor filter.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: area reclaim, slope.
Rock outcrop.					
22, 23 Linker	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, thin layer.

See footnote at end of table.

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
24*:					
Linker	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, thin layer.
Mountainburg	Severe: depth to rock.	Severe: seepage, depth to rock.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Poor: depth to rock, small stones, thin layer.
25*:					
Linker	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, thin layer.
Mountainburg	Severe: depth to rock.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Poor: depth to rock, small stones, thin layer.
26*:					
Moko	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope.	Poor: area reclaim, slope, thin layer.
Rock outcrop.					
27--- Mountainburg	Severe: depth to rock.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Severe: seepage, depth to rock.	Poor: area reclaim, seepage, small stones.
28--- Mountainburg	Severe: depth to rock.	Severe: seepage, depth to rock.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Poor: depth to rock, small stones, thin layer.
29--- Mountainburg	Severe: depth to rock.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Poor: depth to rock, small stones, thin layer.
30--- Mountainburg	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: depth to rock, small stones, slope.
31--- Nella	Moderate: percs slowly, slope.	Severe: slope.	Moderate: too clayey.	Moderate: slope.	Poor: small stones, slope.
32--- Nella	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: small stones, slope.
33--- Nella	Moderate: percs slowly, slope, large stones.	Severe: slope.	Moderate: slope, too clayey, large stones.	Moderate: slope.	Poor: small stones.
34--- Nella	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: small stones, slope.

See footnote at end of table.

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
35*:					
Nella	Moderate: percs slowly, slope, large stones.	Severe: slope.	Moderate: slope, too clayey, large stones.	Moderate: slope.	Poor: small stones.
Enders	Severe: percs slowly.	Severe: slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock, slope.	Poor: too clayey, hard to pack.
36*:					
Nella	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: small stones, slope.
Enders	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
37*:					
Nella	Moderate: percs slowly, slope, large stones.	Severe: slope.	Moderate: slope, too clayey, large stones.	Moderate: slope.	Poor: small stones.
Steprock	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock, small stones.
38*, 39*:					
Nella	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: small stones, slope.
Steprock	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope, small stones.
Mountainburg	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: depth to rock, small stones, slope.
40 Nixa	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Poor: small stones.
41 Nixa	Severe: percs slowly.	Severe: slope.	Moderate: too clayey, slope.	Moderate: slope.	Poor: small stones.
42 Noark	Moderate: percs slowly.	Moderate: seepage, slope.	Severe: too clayey.	Slight	Poor: too clayey, small stones.
43 Noark	Moderate: percs slowly, slope.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, small stones.

See footnote at end of table.

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
44---------- Noark	Severe: slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, small stones, slope.
45---------- Peridge	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight----------	Fair: too clayey, thin layer.
46---------- Portia	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight----------	Fair: too clayey.
47---------- Portia	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
48---------- Razort	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding, seepage.	Severe: flooding.	Fair: too clayey.
49*. Riverwash					
50---------- Spadra	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Good.
51---------- Spadra	Moderate: percs slowly.	Moderate: seepage, slope.	Slight----------	Slight----------	Good.
52---------- Steprock	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, small stones, thin layer.
53---------- Wideman	Severe: flooding.	Severe: flooding, seepage.	Severe: seepage, flooding, too sandy.	Severe: flooding, seepage.	Poor: seepage, too sandy.

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

TABLE 12.--CONSTRUCTION MATERIALS

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
1 Arkana	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
2*: Arkana	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Moko	Poor: area reclaim, large stones, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, large stones, thin layer.
3*: Arkana	Poor: area reclaim, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Moko	Poor: area reclaim, large stones, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, large stones, slope.
4 Britwater	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
5 Ceda	Fair: large stones.	Improbable: small stones.	Probable	Poor: small stones, area reclaim.
6*: Ceda	Fair: large stones.	Improbable: small stones.	Probable	Poor: small stones, area reclaim.
Kenn	Fair: shrink-swell.	Improbable: small stones.	Probable	Poor: small stones, area reclaim.
7 Clarksville	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
8*: Eden	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones.
Newnata	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Moderate: large stones, slope.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
9*:				
Eden	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones.
Newnata	Poor: low strength, slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Severe: slope.
10*:				
Eden	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones.
Newnata	Poor: low strength, slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Severe: slope.
Rock outcrop.				
11, 12 Enders	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
13 Enders	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones.
14 Enders	Poor: low strength, slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, slope.
15*:				
Enders	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones.
Leesburg	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
16*:				
Enders	Poor: low strength, slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, slope.
Leesburg	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
17*:				
Estate	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Lily	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
17*:				
Portia	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
18*:				
Estate	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Lily	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Portia	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
19--- Leadvale	Fair: area reclaim, low strength, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Good.
20*:				
Lily	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Udorthents.				
Rock outcrop.				
21*:				
Lily	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Udorthents.				
Rock outcrop.				
22, 23--- Linker	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
24*, 25*:				
Linker	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Mountainburg	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones.
26*:				
Moko	Poor: area reclaim, large stones, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, large stones, slope.
Rock outcrop.				
27--- Mountainburg	Poor: thin layer, area reclaim.	Improbable: thin layer.	Improbable: thin layer.	Poor: small stones, area reclaim.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
28, 29---------- Mountainburg	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones.
30---------- Mountainburg	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
31---------- Nella	Good----------	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
32---------- Nella	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
33---------- Nella	Fair: large stones.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
34---------- Nella	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
35*: Nella----------	Fair: large stones.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
Enders----------	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones.
36*: Nella----------	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Enders----------	Poor: low strength, slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, slope.
37*: Nella----------	Fair: large stones.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
Steprock----------	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
38*, 39*: Nella----------	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
38*, 39*:				
Steprock	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Mountainburg	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
40, 41 Nixa	Slight	Improbable: small stones.	Probable	Poor: small stones, area reclaim.
42, 43 Noark	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
44 Noark	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
45 Peridge	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.
46 Portia	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Good.
47 Portia	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
48 Razort	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.
49*. Riverwash				
50, 51 Spadra	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
52 Steprock	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
53 Wideman	Good	Improbable: thin layer.	Improbable: too sandy.	Fair: too sandy.

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

TABLE 13.--WATER MANAGEMENT

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

Map symbol and soil name	Limitations for--		Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Irrigation	Terraces and diversions	Grassed waterways
1---------- Arkana	Moderate: depth to rock.	Severe: hard to pack.	Droughty, percs slowly, depth to rock.	Large stones, depth to rock.	Large stones, depth to rock.
2*:					
Arkana----------	Moderate: depth to rock.	Severe: hard to pack.	Droughty, percs slowly, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
Moko----------	Severe: depth to rock.	Severe: large stones.	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
3*:					
Arkana----------	Severe: slope.	Severe: hard to pack.	Droughty, percs slowly, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
Moko----------	Severe: depth to rock, slope.	Severe: large stones.	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
4---------- Britwater	Moderate: seepage.	Slight----------	Slope----------	Favorable--------	Favorable.
5---------- Ceda	Severe: seepage.	Severe: seepage.	Flooding, droughty, large stones.	Large stones-----	Droughty, large stones.
6*:					
Ceda----------	Severe: seepage.	Severe: seepage.	Flooding, droughty, large stones.	Large stones-----	Droughty, large stones.
Kenn----------	Moderate: seepage.	Moderate: piping, large stones.	Droughty, flooding.	Large stones-----	Large stones, droughty.
7---------- Clarksville	Severe: seepage, slope.	Moderate: large stones.	Droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
8*:					
Eden----------	Moderate: depth to rock.	Severe: hard to pack, large stones.	Large stones, droughty.	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
Newnata----------	Moderate: depth to rock.	Moderate: thin layer, hard to pack.	Percs slowly, slope, erodes easily.	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for--		Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Irrigation	Terraces and diversions	Grassed waterways
9*:					
Eden	Severe: slope.	Severe: hard to pack, large stones.	Large stones, droughty.	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
Newnata	Severe: slope.	Moderate: thin layer, hard to pack.	Percs slowly, slope, erodes easily.	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
10*:					
Eden	Severe: slope.	Severe: hard to pack, large stones.	Large stones, droughty.	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
Newnata	Severe: slope.	Moderate: thin layer, hard to pack.	Percs slowly, slope, erodes easily.	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
Rock outcrop.					
11 Enders	Moderate: depth to rock.	Severe: hard to pack.	Percs slowly, slope.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
12 Enders	Moderate: depth to rock.	Severe: hard to pack.	Percs slowly, slope.	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
13 Enders	Moderate: depth to rock.	Moderate: thin layer, hard to pack.	Percs slowly, slope.	Slope, percs slowly.	Slope, percs slowly.
14 Enders	Severe: slope.	Moderate: thin layer, hard to pack.	Percs slowly, slope.	Slope, percs slowly.	Slope, percs slowly.
15*:					
Enders	Moderate: depth to rock.	Moderate: thin layer, hard to pack.	Percs slowly, slope.	Slope, percs slowly.	Slope, percs slowly.
Leesburg	Moderate: seepage.	Moderate: piping, large stones.	Slope	Large stones, slope.	Slope.
16*:					
Enders	Severe: slope.	Moderate: thin layer, hard to pack.	Percs slowly, slope.	Slope, percs slowly.	Slope, percs slowly.
Leesburg	Severe: slope.	Moderate: piping, large stones.	Slope	Large stones, slope.	Slope.
17*:					
Estate	Moderate: depth to rock.	Moderate: thin layer, hard to pack, large stones.	Percs slowly, slope.	Slope, large stones, percs slowly.	Large stones, slope, percs slowly.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for--		Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Irrigation	Terraces and diversions	Grassed waterways
17*:					
Lily	Severe: seepage.	Severe: piping.	Depth to rock, slope.	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
Portia	Moderate: seepage.	Moderate: piping.	Slope	Slope	Slope.
18*:					
Estate	Severe: slope.	Moderate: thin layer, hard to pack, large stones.	Percs slowly, slope.	Slope, large stones, percs slowly.	Large stones, slope, percs slowly.
Lily	Severe: seepage, slope.	Severe: piping.	Depth to rock, slope.	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
Portia	Severe: slope.	Moderate: piping.	Slope	Slope	Slope.
19--- Leadvale	Moderate: seepage, depth to rock.	Severe: piping.	Wetness, percs slowly, rooting depth.	Erodes easily, wetness.	Erodes easily, rooting depth.
20*					
Lily	Severe: seepage.	Severe: piping.	Depth to rock, slope.	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
Udorthents.					
Rock outcrop.					
21*					
Lily	Severe: seepage, slope.	Severe: piping.	Depth to rock, slope.	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
Udorthents.					
Rock outcrop.					
22, 23--- Linker	Moderate: seepage, depth to rock.	Severe: piping.	Depth to rock, slope.	Depth to rock----	Depth to rock.
24*:					
Linker	Moderate: seepage, depth to rock.	Severe: piping.	Depth to rock, slope.	Depth to rock----	Depth to rock.
Mountainburg	Severe: depth to rock.	Severe: large stones.	Slope, large stones, depth to rock.	Large stones, depth to rock.	Large stones, droughty, depth to rock.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for--		Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Irrigation	Terraces and diversions	Grassed waterways
25*:					
Linker	Moderate: seepage, depth to rock.	Severe: piping.	Depth to rock, slope.	Slope, depth to rock.	Slope, depth to rock.
Mountainburg	Severe: depth to rock.	Severe: large stones.	Slope, large stones, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
26*:					
Moko	Severe: depth to rock, slope.	Severe: large stones.	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Rock outcrop.					
27--- Mountainburg	Severe: depth to rock, seepage.	Severe: thin layer, seepage.	Droughty, depth to rock, slope.	Large stones, depth to rock.	Large stones, droughty, depth to rock.
28--- Mountainburg	Severe: depth to rock.	Severe: large stones.	Slope, large stones, depth to rock.	Large stones, depth to rock.	Large stones, droughty, depth to rock.
29--- Mountainburg	Severe: depth to rock.	Severe: large stones.	Slope, large stones, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
30--- Mountainburg	Severe: depth to rock, slope.	Severe: large stones.	Slope, large stones, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
31--- Nella	Moderate: seepage.	Severe: piping.	Droughty, slope.	Large stones-----	Large stones, droughty.
32--- Nella	Moderate: seepage.	Severe: piping.	Droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
33--- Nella	Moderate: seepage.	Severe: piping.	Large stones, droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
34--- Nella	Severe: slope.	Severe: piping.	Large stones, droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
35*:					
Nella	Moderate: seepage.	Severe: piping.	Large stones, droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
Enders	Moderate: depth to rock.	Moderate: thin layer, hard to pack.	Percs slowly, slope.	Slope, percs slowly.	Slope, percs slowly.
36*:					
Nella	Severe: slope.	Severe: piping.	Large stones, droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
Enders	Severe: slope.	Moderate: thin layer, hard to pack.	Percs slowly, slope.	Slope, percs slowly.	Slope, percs slowly.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for--		Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Irrigation	Terraces and diversions	Grassed waterways
37*:					
Nella	Moderate: seepage.	Severe: piping.	Large stones, droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
Steprock	Moderate: seepage, depth to rock.	Severe: piping.	Slope, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
38*, 39*:					
Nella	Severe: slope.	Severe: piping.	Large stones, droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
Steprock	Severe: slope.	Severe: piping.	Slope, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Mountainburg	Severe: depth to rock, slope.	Severe: large stones.	Slope, large stones, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
40--- Nixa	Slight	Moderate: seepage, piping.	Droughty, percs slowly, erodes easily.	Large stones, erodes easily, rooting depth.	Erodes easily, droughty, rooting depth.
41--- Nixa	Slight	Moderate: seepage, piping.	Droughty, percs slowly, erodes easily.	Slope, erodes easily, rooting depth.	Slope, erodes easily, droughty.
42--- Noark	Moderate: seepage.	Slight	Droughty, slope.	Favorable	Droughty.
43--- Noark	Moderate: seepage.	Slight	Droughty, slope.	Slope	Slope, droughty.
44--- Noark	Severe: slope.	Slight	Droughty, slope.	Slope	Slope, droughty.
45--- Peridge	Moderate: seepage.	Moderate: piping.	Slope, erodes easily.	Erodes easily	Erodes easily.
46--- Portia	Moderate: seepage.	Moderate: piping.	Slope	Favorable	Favorable.
47--- Portia	Moderate: seepage.	Moderate: piping.	Slope	Slope	Slope.
48--- Razort	Moderate: seepage.	Severe: piping.	Erodes easily, flooding.	Erodes easily	Erodes easily.
49*. Riverwash					
50--- Spadra	Moderate: seepage.	Severe: piping.	Erodes easily, flooding.	Erodes easily	Erodes easily.
51--- Spadra	Moderate: seepage.	Severe: piping.	Slope, erodes easily.	Erodes easily	Erodes easily.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for--		Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Irrigation	Terraces and diversions	Grassed waterways
52---------- Steprock	Moderate: seepage, depth to rock.	Severe: piping.	Slope, depth to rock, droughty.	Depth to rock, large stones.	Depth to rock, droughty.
53---------- Wideman	Severe: seepage.	Severe: piping, seepage.	Flooding, fast intake, droughty.	Too sandy--------	Droughty.

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

TABLE 14.--ENGINEERING INDEX PROPERTIES

(The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated. Some soils may have Unified classifications and USDA textures in addition to those shown. In general, the dominant classifications and textures are shown)

Map symbol and soil name	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
1---------- Arkana	0-7	Very cherty silt loam.	SM, SC, SM-SC, GM	A-4, A-2, A-1, A-6	20-30	60-90	50-80	45-70	15-40	<25	NP-15
	7-13	Cherty silty clay loam, very cherty clay.	GC, SC, CL, CH	A-2, A-7	15-30	60-90	45-80	40-70	25-55	40-65	20-35
	13-33	Clay, cherty clay	CH	A-7	0-10	70-100	70-100	65-95	60-85	51-80	31-50
	33-35	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
2*, 3*:											
Arkana----------	0-7	Very cherty silt loam.	SM, SC, SM-SC, GM	A-4, A-2, A-1, A-6	20-30	60-90	50-80	45-70	15-40	<25	NP-15
	7-13	Cherty silty clay loam, very cherty clay.	GC, SC, CL, CH	A-2, A-7	15-30	60-90	45-80	40-70	25-55	40-65	20-35
	13-33	Clay, cherty clay	CH	A-7	0-10	70-100	70-100	65-95	60-85	51-80	31-50
	33-35	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Moko----------	0-4	Very stony silt loam.	ML, CL, CL-ML, SM-SC	A-4, A-6	35-75	65-90	50-72	45-70	40-60	16-38	3-15
	4-13	Very stony silty clay loam, very stony loam, very stony silt loam.	ML, CL, CL-ML, SM-SC	A-4, A-6	35-75	65-90	50-72	45-70	40-60	16-38	3-15
	13-15	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
4---------- Britwater	0-7	Gravelly silt loam.	ML, CL, CL-ML	A-4	0	55-85	55-75	55-75	50-75	<30	NP-10
	7-15	Gravelly silty clay loam, gravelly clay loam, silty clay loam.	CL, GC, SC	A-2, A-6, A-4	0	60-95	55-95	45-80	30-65	25-40	8-18
	15-72	Very gravelly silty clay loam, gravelly silty clay loam.	GC, SC	A-2, A-6, A-4	0	50-80	35-75	30-65	15-40	25-40	8-18
5---------- Ceda	0-10	Cobbly loam------	SM, GM, ML, GM-GC	A-1, A-2, A-4	5-25	35-75	35-75	35-65	20-65	22-29	2-7
	10-72	Cobbly loam, gravelly fine sandy loam, very gravelly clay loam.	GM, GP-GM, GM-GC, GC	A-1, A-2, A-4, A-6	5-30	15-50	15-50	10-50	5-45	<40	NP-18
6*:											
Ceda----------	0-10	Cobbly loam------	SM, GM, ML, GM-GC	A-1, A-2, A-4	5-25	35-75	35-75	35-65	20-65	22-29	2-7
	10-72	Cobbly loam, gravelly fine sandy loam, very gravelly clay loam.	GM, GP-GM, GM-GC, GC	A-1, A-2, A-4, A-6	5-30	15-50	15-50	10-50	5-45	<40	NP-18

See footnote at end of table.

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	
6*:											
Kenn	0-7	Fine sandy loam	ML, SM, CL-ML, SM-SC	A-2, A-4	0	75-90	75-90	65-90	25-55	<26	NP-7
	7-13	Fine sandy loam, loam, gravelly fine sandy loam.	ML, CL, SM, SC	A-2, A-4, A-6	0	50-75	50-75	45-75	25-65	24-35	3-13
	13-25	Clay loam, gravelly sandy clay loam, gravelly clay loam.	CL, SC	A-2, A-4, A-6	0-15	50-90	50-90	35-90	15-80	25-40	8-18
	25-43	Very gravelly sandy clay loam, extremely gravelly clay loam, cobbly sandy clay loam.	GC, GP-GC	A-2, A-4, A-6	0-55	25-50	25-50	20-50	10-45	25-40	8-18
	43-60	Extremely cobbly loam, extremely gravelly loam, extremely gravelly fine sandy loam.	GC, GM, GP-GC, GP-GM	A-1, A-2, A-4	15-65	15-50	15-50	10-50	5-45	<31	NP-10
7											
Clarksville	0-14	Very cherty silt loam.	GC, SC, SM-SC, GP-GC	A-2, A-2, A-1	5-30	30-70	10-60	5-50	5-35	20-40	5-15
	14-69	Extremely cherty silt loam, extremely cherty silty clay loam.	GC, SC, SP-SC, GP-GC	A-2, A-6	5-20	30-70	10-60	10-50	5-45	30-40	15-25
	69-75	Extremely cherty silty clay loam, extremely cherty silt clay.	GC, SC, GP-GC, SP-SC	A-7, A-2, A-6	5-20	30-70	10-60	10-50	10-45	35-75	20-55
8*, 9*:											
Eden	0-5	Flaggy silty clay loam.	CL, CH	A-7, A-6	25-40	75-95	70-95	70-95	65-95	35-65	12-35
	5-22	Flaggy silty clay, flaggy clay, silty clay.	CH, CL	A-7	10-45	75-100	55-100	50-100	50-95	45-75	20-45
	22-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Newnata	0-3	Stony silt loam	CL, CL-ML, SC, SM-SC	A-2, A-4, A-6	10-35	80-95	70-80	65-75	30-60	<30	5-15
	3-7	Gravelly silty clay loam, silty clay loam, flaggy silty clay loam.	CL, ML	A-4, A-6, A-7	0-15	90-100	75-95	70-90	60-80	30-45	5-25
	7-44	Flaggy silty clay loam, silty clay, clay.	CL, CH	A-7	0-10	95-100	85-95	75-95	70-90	41-60	20-35
	44-46	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

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	
10*:											
Eden	0-5	Flaggy silty clay loam.	CL, CH	A-7, A-6	25-40	75-95	70-95	70-95	65-95	35-65	12-35
	5-22	Flaggy silty clay, flaggy clay, silty clay.	CH, CL	A-7	10-45	75-100	55-100	50-100	50-95	45-75	20-45
	22-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Newnata	0-3	Stony silt loam	CL, CL-ML, SC, SM-SC	A-2, A-4, A-6	10-35	80-95	70-80	65-75	30-60	>30	5-15
	3-7	Gravelly silty clay loam, silty clay loam, flaggy silty clay loam.	CL, ML	A-4, A-6, A-7	0-15	90-100	75-95	70-90	60-80	30-45	5-25
	7-44	Flaggy silty clay loam, silty clay, clay.	CL, CH	A-7	0-10	95-100	85-95	75-95	70-90	41-60	20-35
	44-46	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
11, 12 Enders	0-5	Gravelly loam----	ML, SM, SM-SC, CL-ML	A-2, A-4	0-15	50-95	50-75	30-70	30-60	20-35	2-10
	5-9	Gravelly loam, loam.	ML, SM, SM-SC	A-2, A-4	0-15	50-95	50-75	30-70	30-60	20-35	2-10
	9-27	Silty clay, clay	CH	A-7	0	95-100	85-100	85-100	70-95	65-80	36-45
	27-49	Silty clay, shaly silty clay, clay.	CH	A-7	0	55-100	50-100	30-100	25-95	65-80	36-45
	49-57	Weathered bedrock, unweathered bedrock.	---	---	---	---	---	---	---	---	---
13, 14 Enders	0-5	Stony loam-------	SM, ML, SM-SC, CL-ML	A-2, A-4	15-50	80-90	70-80	65-75	30-60	20-35	2-10
	5-9	Gravelly loam, loam.	ML, SM, SM-SC	A-2, A-4	0-15	50-95	50-75	30-70	30-60	20-35	2-10
	9-27	Silty clay, clay	CH	A-7	0	85-100	75-100	75-100	70-90	50-65	30-40
	27-49	Silty clay, shaly silty clay, shaly clay.	CH, GC	A-7, A-2 A-2-7	0	55-100	50-100	30-100	25-90	50-65	30-40
	49-57	Weathered bedrock, unweathered bedrock.	---	---	---	---	---	---	---	---	---
15*, 16*:											
Enders	0-5	Stony loam-------	SM, ML, SM-SC, CL-ML	A-2, A-4	15-50	80-90	70-80	65-75	30-60	20-35	2-10
	5-9	Gravelly loam, loam.	ML, SM, SM-SC	A-2, A-4	0-15	50-95	50-75	30-70	30-60	20-35	2-10
	9-27	Silty clay, clay.	CH	A-7	0	85-100	75-100	75-100	70-90	50-65	30-40

See footnote at end of table.

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	
15*, 16*: Enders	27-49	Silty clay, shaly silty clay, shaly clay.	CH, GC	A-7, A-2	0	55-100	50-100	30-100	25-90	50-65	30-40
	49-57	Weathered bedrock, unweathered bedrock.	---	---	---	---	---	---	---	---	---
Leesburg	0-10	Stony loam	SM, SM-SC, ML, CL-ML	A-2, A-4	10-25	85-95	80-90	45-70	25-55	<25	NP-7
	10-33	Gravelly clay loam, clay loam, gravelly sandy clay loam.	SC, CL	A-4, A-6	0-20	75-90	70-85	55-75	40-65	26-40	8-20
	33-72	Gravelly clay loam, gravelly sandy clay loam, gravelly clay.	SC, CL	A-6, A-7	0-15	75-90	70-85	55-75	40-70	35-50	12-25
17*, 18*: Estate	0-4	Stony fine sandy loam.	SM	A-2, A-4	10-30	75-100	60-100	55-80	20-50	<20	NP-3
	4-16	Gravelly sandy loam, sandy loam, sandy clay loam.	ML, CL-ML, SM, SM-SC	A-2, A-4	0-20	80-100	70-100	40-80	30-60	<25	NP-5
	16-58	Clay, sandy clay, cobbly clay loam.	CH, CL	A-6, A-7	0-15	80-100	80-100	70-90	55-80	35-55	15-30
	58-62	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Lily	0-4	Stony sandy loam.	SM, ML	A-2, A-4	5-20	90-95	85-90	55-90	25-75	<35	NP-7
	4-9	Fine sandy loam, gravelly clay loam, loam.	SM, SC, ML, CL	A-4, A-6	0-20	90-100	70-100	60-85	40-80	<35	3-15
	9-21	Sandy clay loam, loam, gravelly loam.	SM, GC, ML, CL	A-2, A-4, A-6	0-20	65-100	60-100	50-85	20-75	<35	NP-15
	21-36	Loamy sand, loam, sandy clay loam.	SC, GC ML, CL	A-2, A-4, A-6	0-5	90-100	70-100	60-85	20-75	<35	NP-15
	36-38	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Portia	0-4	Sandy loam	SM, ML	A-4	0	100	85-100	70-85	35-60	---	NP
	4-15	Loam, fine sandy loam.	ML, SM CL-ML, SC-SM	A-4	0	100	85-100	75-95	35-60	<25	NP-7
	15-28	Loam, sandy clay loam.	CL	A-4, A-6	0	100	85-100	80-95	65-85	25-40	8-20
	28-72	Sandy clay, clay loam, sandy clay loam.	CL, CH, SC	A-4, A-6, A-7	0	100	85-100	80-95	36-75	25-55	8-30
19--- Leadvale	0-5	Silt loam	ML, CL-ML, CL	A-4	0	100	95-100	85-95	65-85	18-32	2-10
	5-25	Silt loam, silty clay loam, loam.	CL-ML, CL, ML	A-4, A-6	0	100	95-100	90-98	75-90	22-36	3-14
	25-47	Silt loam, silty clay loam.	CL-ML, CL, ML	A-4, A-6, A-7	0	100	95-100	80-98	70-90	23-42	3-18

See footnote at end of table.

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	
19----------											
Leadvale	47-52	Silty clay loam, silty clay, clay.	CL, MH, ML, CH	A-6, A-7	0-5	90-100	90-100	85-95	70-90	32-58	12-26
	52-54	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
20*, 21*:											
Lily----------	0-4	Very stony sandy loam.	SM, ML	A-2, A-4	5-20	90-95	85-90	55-90	25-75	<35	NP-7
	4-9	Clay loam, sandy clay loam, loam.	SM, SC, ML, CL	A-4, A-6	5-20	90-95	85-90	60-85	40-80	<35	3-15
	9-21	Sandy clay loam, loam, gravelly loam.	SM, GC, ML, CL	A-2, A-4, A-6	5-20	65-95	60-90	50-85	20-75	<35	NP-15
	21-36	Loamy sand, loam, sandy clay loam.	SC, GC, ML, CL	A-2, A-4, A-6	0-5	90-100	70-100	70-100	60-85	20-75	NP-15
	36-38	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Udorthents.											
Rock outcrop.											
22----------	0-10	Loam----------	SM, ML	A-4	0	85-100	80-100	70-100	40-70	<30	NP-7
Linker	10-28	Clay loam, sandy clay loam, loam.	CL, SC, SM, ML	A-4, A-6	0-10	70-100	60-100	50-100	40-80	<40	NP-18
	28-37	Gravelly sandy clay loam, clay loam, sandy clay loam.	CL, SC, GC, ML	A-4, A-6	0-10	70-100	60-100	35-100	30-80	<40	NP-18
	37-39	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
23----------	0-10	Gravelly loam----	ML, GM, SM	A-2, A-4	0-5	60-100	60-100	55-100	25-70	<30	NP-7
Linker	10-28	Clay loam, sandy clay loam, loam.	CL, SC, SM, ML	A-4, A-6	0-10	70-100	60-100	50-100	40-80	<40	NP-18
	28-37	Gravelly sandy clay loam, clay loam, sandy clay loam.	CL, SC, GC, ML	A-4, A-6	0-10	70-100	60-100	35-100	30-80	<40	NP-18
	37-39	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
24*, 25*:											
Linker----------	0-10	Gravelly loam----	ML, GM, SM	A-2, A-4	0-5	60-100	60-100	55-100	25-70	<30	NP-7
	10-28	Clay loam, sandy clay loam, loam.	CL, SC, SM, ML	A-4, A-6	0-10	70-100	60-100	50-100	40-80	<40	NP-18
	28-37	Gravelly sandy clay loam, clay loam, sandy clay loam.	CL, SC, GC, ML	A-4, A-6	0-10	70-100	60-100	35-100	30-80	<40	NP-18
	37-39	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Mountainburg----	0-9	Stony fine sandy loam.	SM	A-2	15-35	70-90	65-90	40-60	25-35	<20	NP
	9-19	Very gravelly sandy clay loam, very stony loam, very cobbly sandy clay loam.	GM, GC, GM-GC	A-1, A-2	5-50	40-60	25-55	25-50	20-30	<30	NP-10
	19-21	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
26*:											
Moko	0-4	Very stony silt loam.	ML, CL, CL-ML, SM-SC	A-4, A-6	35-75	65-90	50-72	45-70	40-60	16-38	3-15
	4-13	Very stony silty clay loam, very stony loam, very stony silt loam.	ML, CL, CL-ML, SM-SC	A-4, A-6	35-75	65-90	50-72	45-70	40-60	16-38	3-15
	13-15	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
27---------- Mountainburg	0-9	Gravelly fine sandy loam.	GM, SM	A-1, A-2	0-15	60-80	50-70	20-40	15-30	---	NP
	9-19	Very gravelly sandy clay loam, very cobbly loam, very gravelly loam.	GM, GC, GP-GM, GM-GC	A-1, A-2	15-30	40-60	30-50	25-50	10-25	<30	NP-10
	19-21	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
28, 29, 30------- Mountainburg	0-9	Very stony fine sandy loam.	SM	A-2	35-50	70-90	65-90	40-60	25-35	<20	NP
	9-19	Very gravelly sandy clay loam, very stony loam, very cobbly sandy clay loam.	GM, GC, GM-GC	A-1, A-2	5-50	40-60	25-55	25-50	20-30	<30	NP-10
	19-21	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
31, 32---------- Nella	0-3	Gravelly loam----	ML, CL, GM, SM	A-4, A-2	0-10	65-90	60-80	55-65	30-55	<30	NP-8
	3-7	Cobbly loam, gravelly sandy loam, fine sandy loam.	ML, CL, GM, SM	A-4, A-2	0-10	65-90	60-80	55-65	30-55	<30	NP-8
	7-16	Cobbly loam, gravelly loam, loam.	CL, SC, CL-ML, SM-SC	A-4, A-6, A-2	0-30	75-95	60-90	45-70	30-60	25-40	6-20
	16-72	Cobbly clay loam, gravelly sandy clay loam, cobbly sandy clay loam.	SC, SM, CL, GC	A-4, A-6, A-7	0-25	85-95	75-90	65-80	40-65	30-55	8-27
33---------- Nella	0-3	Stony loam-------	ML, CL, SM, SC	A-4	10-30	90-100	85-90	65-75	36-55	<30	NP-8
	3-7	Cobbly loam, gravelly sandy loam, fine sandy loam.	ML, CL, GM, SM	A-4, A-2	0-10	65-90	60-80	55-65	30-55	<30	NP-8
	7-16	Stony loam, loam, cobbly loam.	CL, SC, CL-ML, SM-SC	A-4, A-6, A-2	0-30	75-95	60-90	45-70	30-60	25-40	6-20
	16-72	Stony clay loam, gravelly sandy clay loam, cobbly sandy, clay loam.	SC, SM, CL, GC	A-4, A-6, A-7	0-25	85-95	75-90	65-80	40-65	30-55	8-27

See footnote at end of table.

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	
34---------- Nella	0-3	Stony loam-------	ML, CL, SM, SC	A-4	10-30	90-100	85-90	65-75	36-55	<30	NP-8
	3-7	Cobbly loam, gravelly sandy loam, fine sandy loam.	ML, CL, GM, SM	A-4, A-2	0-10	65-90	60-80	55-65	30-55	<30	NP-8
	7-16	Stony loam, loam, cobbly loam.	CL, SC, CL-ML, SM-SC	A-4, A-6, A-2	0-30	75-95	60-90	45-70	30-60	25-40	6-20
	16-72	Stony clay loam, gravelly sandy clay loam, cobbly sandy clay loam.	SC, SM, CL, GC	A-4, A-6, A-7	0-25	85-95	75-90	65-80	40-65	30-55	8-27
35*, 36*: Nella----------	0-3	Stony loam-------	ML, CL, SM, SC	A-4	10-30	90-100	85-90	65-75	36-55	<30	NP-8
	3-7	Cobbly loam, gravelly sandy loam, fine sandy loam.	ML, CL, GM, SM	A-4, A-2	0-10	65-90	60-80	55-65	30-55	<30	NP-8
	7-16	Stony loam, loam, cobbly loam.	CL, SC, CL-ML, SM-SC	A-4, A-6, A-2	0-30	75-95	60-90	45-70	30-60	25-40	6-20
	16-72	Stony clay loam, gravelly sandy clay loam, cobbly sandy clay loam.	SC, SM, CL, GC	A-4, A-6, A-7	0-25	85-95	75-90	65-80	40-65	30-55	8-27
Enders----------	0-5	Stony loam-------	SM, ML, SM-SC, CL-ML	A-2, A-4	15-50	80-90	70-80	65-75	30-60	20-35	2-10
	5-9	Gravelly loam, loam.	ML, SM, SM-SC	A-2, A-4	0-15	50-95	50-75	30-70	30-60	20-35	2-10
	9-27	Silty clay, clay	CH	A-7	0	85-100	75-100	75-100	70-90	50-65	30-40
	27-49	Silty clay, shaly silty clay, shaly clay.	CH, GC	A-7,	0	55-100	50-100	30-100	25-90	50-65	30-40
	49-57	Weathered bedrock, unweathered bedrock.	---	---	---	---	---	---	---	---	---
37*: Nella----------	0-3	Stony loam-------	ML, CL, SM, SC	A-4	10-30	90-100	85-90	65-75	36-55	<30	NP-8
	3-7	Cobbly loam, gravelly sandy loam, fine sandy loam.	ML, CL, GM, SM	A-4, A-2	0-10	65-90	60-80	55-65	30-55	<30	NP-8
	7-16	Stony loam, loam, cobbly loam.	CL, SC, CL-ML, SM-SC	A-4, A-6, A-2	0-30	75-95	60-90	45-70	30-60	25-40	6-20
	16-72	Stony clay loam, gravelly sandy clay loam, cobbly sandy clay loam.	SC, SM, CL, GC	A-4, A-6, A-7	0-25	85-95	75-90	65-80	40-65	30-55	8-27

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
37*:											
Steprock--------	0-3	Very stony loam	SM, SM-SC, ML, CL-ML	A-2, A-4	25-45	70-90	60-85	55-85	30-65	<20	NP-5
	3-32	Very gravelly sandy clay loam, very gravelly loam, very gravelly sandy loam.	SM, GM, ML, CL-ML	A-2, A-4	5-25	45-80	40-70	40-65	30-65	<25	NP-7
	32-38	Weathered bedrock	---	---	---	---	---	---	---	---	---
38*, 39*:											
Nella-----------	0-3	Very stony loam	SM, SM-SC, SC, CL-ML	A-4, A-2	15-45	85-95	80-90	55-75	30-55	<30	NP-8
	3-7	Cobbly loam, gravelly sandy loam, fine sandy loam.	ML, CL, GM, SM	A-4, A-2	0-10	65-90	60-80	55-65	30-55	<30	NP-8
	7-16	Stony loam, loam, cobbly loam.	CL, SC, CL-ML, SM-SC	A-4, A-6, A-2	0-30	75-95	60-90	45-70	30-60	25-40	6-20
	16-72	Stony clay loam, gravelly sandy clay loam, cobbly sandy clay loam.	SC, SM, CL, GC	A-4, A-6, A-7	0-25	85-95	75-90	65-80	40-65	30-55	8-27
Steprock--------	0-3	Very stony loam	SM, SM-SC, ML, CL-ML	A-2, A-4	15-45	70-90	45-85	40-80	30-65	<20	NP-5
	3-15	Very gravelly loam, very gravelly fine sandy loam.	GM, SM, ML, SM-SC	A-2, A-4	0-15	45-80	40-70	35-65	30-65	<20	NP-5
	15-32	Very gravelly sandy clay loam, very gravelly loam, very gravelly clay loam.	SM, GM, ML, CL-ML	A-2, A-4	5-35	45-80	30-70	30-65	30-65	<25	NP-7
	32-38	Weathered bedrock	---	---	---	---	---	---	---	---	---
Mountainburg----	0-9	Very stony loam	SM	A-2	35-50	70-90	65-90	40-60	25-35	<20	NP
	9-19	Very gravelly sandy clay loam, very stony loam, very cobbly sandy clay loam.	GM, GC, GM-GC	A-1, A-2	15-50	40-60	25-55	25-50	20-30	<30	NP-10
	19-21	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
40, 41---------- Nixa	0-11	Very cherty silt loam.	GM, SM, GC, SC	A-1, A-2, A-4	0-10	40-70	30-60	25-55	20-50	<25	NP-8
	11-19	Very cherty silt loam, very cherty silty clay loam, extremely cherty silt loam.	GC, GM, SC, SM	A-1, A-2, A-4	0-10	30-70	20-60	20-55	20-50	<30	NP-8
	19-41	Very cherty silt loam, very cherty silty clay loam, extremely cherty silt loam.	GC, GM, SC, SM	A-1, A-2, A-4	0-10	30-70	20-50	20-50	20-50	<30	NP-8

See footnote at end of table.

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	
40, 41----------											
Nixa	41-72	Very cherty silty clay, very cherty silty clay loam, extremely cherty clay.	GM, GC, GP-GM, GM-GC	A-1, A-2	10-30	15-45	5-40	5-35	5-30	<30	NP-8
42, 43, 44-------	0-14	Very cherty silt loam.	GM	A-2, A-1, A-4	0	20-50	20-50	20-50	15-45	<20	NP-3
Noark	14-30	Very cherty clay, very cherty silty clay, extremely cherty clay.	GC	A-2	5-10	20-50	20-50	20-50	15-35	41-60	20-35
	30-72	Very cherty clay, very cherty silty clay, extremely cherty clay.	GC, GP-GC	A-2	5-10	10-40	10-40	10-40	5-35	41-60	20-35
45----------	0-9	Silt loam--------	ML, CL-ML	A-4	0	95-100	90-100	85-90	80-85	<20	NP-5
Peridge	9-44	Silty clay loam, silt loam.	CL	A-6	0	95-100	90-100	85-95	80-95	30-40	11-20
	44-48	Gravelly silty clay loam, silty clay loam.	CL, SC, GC	A-6	0	55-100	55-100	45-90	40-85	30-40	11-20
	48-72	Silty clay, clay, gravelly silty clay loam.	CL, SC, GC	A-7, A-6	0	55-100	55-100	45-90	40-85	35-50	15-25
46, 47----------	0-4	Sandy loam-------	SM, ML	A-4	0	100	85-100	70-85	35-60	---	NP
Portia	4-15	Loam, fine sandy loam.	ML, SM, CL-ML, SC-SM	A-4	0	100	85-100	75-95	35-60	<25	NP-7
	15-28	Loam, sandy clay loam.	CL	A-4, A-6	0	100	85-100	80-95	65-85	25-40	8-20
	28-72	Sandy clay, clay loam, sandy clay loam.	CL, CH, SC	A-4, A-6, A-7	0	100	85-100	80-95	36-75	25-55	8-30
48----------	0-5	Loam----------	ML, CL-ML	A-4	0	80-100	80-100	65-90	65-90	<25	NP-7
Razort	5-12	Silt loam, loam.	CL, CL-ML	A-4, A-6	0	80-100	80-100	65-90	65-90	25-40	7-15
	12-43	Silt loam, loam, gravelly clay loam.	CL, CL-ML	A-4, A-6	0	60-100	60-100	55-85	50-80	25-40	7-15
	43-65	Gravelly silt loam, gravelly fine sandy loam.	GM, SM, ML, CL-ML	A-2, A-4, A-1	0	60-90	60-90	55-85	20-60	<20	NP-7
49*. Riverwash											
50, 51----------	0-7	Loam----------	ML, SM	A-2, A-4	0	85-100	80-100	65-100	30-75	<20	NP-3
Spadra	7-40	Loam, sandy clay loam.	CL, CL-ML, ML	A-4, A-6	0	90-100	90-100	80-95	55-75	25-40	NP-15
	40-72	Fine sandy loam, sandy loam, gravelly fine sandy loam.	ML, CL, SM, SC	A-4, A-2, A-1	0	70-100	70-100	40-85	20-65	<30	NP-10

See footnote at end of table.

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	
52---------- Steprock	0-3	Gravelly loam----	SM, ML, SM-SC, CL-ML	A-2, A-4	0-10	70-90	45-75	40-70	30-65	<20	NP-5
	3-15	Very gravelly loam, very gravelly fine sandy loam.	GM, SM, ML, SM-SC	A-2, A-4	0-15	45-80	40-70	35-65	30-65	<20	NP-5
	15-32	Very gravelly sandy clay loam, very gravelly loam, very gravelly clay loam.	GM, SM, ML, CL-ML	A-4	5-35	45-80	40-70	40-65	35-65	<24	NP-7
	32-38	Weathered bedrock	---	---	---	---	---	---	---	---	---
53---------- Wideman	0-7	Loamy fine sand	SM, SP-SM	A-2	0	100	85-100	50-75	10-30	---	NP
	7-32	Sandy loam, loamy fine sand, fine sand.	SP-SM, SM	A-2, A-3	0	100	100	60-100	10-35	---	NP
	32-34	Fine sandy loam, fine sand, silt loam.	SM, ML, CL-ML, SM-SC	A-2, A-4	0	100	100	65-100	30-75	<25	NP-5
	34-58	Loamy sand, loamy fine sand, fine sand.	SM, SP-SM	A-2	0	90-100	85-100	50-75	10-35	---	NP
	58-72	Fine sandy loam, sandy loam, loamy fine sand.	SM, ML	A-2, A-4	0	90-100	90-100	65-90	25-55	<20	NP-3

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

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

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

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	G/cc	In/hr	In/in	pH				Pct
1----------	0-7	15-27	1.25-1.50	0.6-2.0	0.08-0.12	5.6-7.8	Low----------	0.24	2	2-4
Arkana	7-13	50-85	1.20-1.45	0.06-0.2	0.06-0.10	5.1-8.4	Moderate-----	0.24		
	13-33	60-85	1.15-1.45	<0.06	0.12-0.18	5.1-8.4	High---------	0.32		
	33-35	---	---	---	---	---	----------	----		
2*, 3*:										
Arkana----------	0-7	15-27	1.25-1.50	0.6-2.0	0.08-0.12	5.6-7.8	Low----------	0.24	2	2-4
	7-13	50-85	1.20-1.45	0.06-0.2	0.06-0.10	5.1-8.4	Moderate-----	0.24		
	13-33	60-85	1.15-1.45	<0.06	0.12-0.18	5.1-8.4	High---------	0.32		
	33-35	---	---	---	---	---	----------	----		
Moko----------	0-4	18-27	1.25-1.60	0.6-2.0	0.09-0.14	6.6-7.8	Low----------	0.24	1	2-4
	4-13	18-35	1.25-1.60	0.6-2.0	0.09-0.14	6.6-7.8	Low----------	0.32		
	13-15	---	---	---	---	---	----------	----		
4----------	0-7	15-25	1.40-1.60	0.6-2.0	0.12-0.20	5.1-6.0	Low----------	0.32	3	.5-1
Britwater	7-15	27-34	1.40-1.60	0.6-2.0	0.12-0.15	5.1-6.0	Low----------	0.28		
	15-72	27-34	1.50-1.70	0.6-2.0	0.09-0.11	5.1-6.0	Low----------	0.28		
5----------	0-10	10-18	1.30-1.55	6.0-20	0.07-0.17	5.6-6.5	Low----------	0.28	5	.5-1
Ceda	10-72	15-32	1.40-1.70	6.0-20	0.02-0.16	5.6-6.5	Low----------	0.28		
6*:										
Ceda----------	0-10	10-18	1.30-1.55	6.0-20	0.07-0.17	5.6-6.5	Low----------	0.28	5	.5-1
	10-72	15-32	1.40-1.70	6.0-20	0.02-0.16	5.6-6.5	Low----------	0.28		
Kenn----------	0-13	10-20	1.30-1.60	0.6-2.0	0.10-0.18	5.1-6.5	Low----------	0.24	5	.5-2
	13-25	20-30	1.45-1.70	0.6-2.0	0.06-0.18	4.5-5.5	Moderate-----	0.28		
	25-43	20-30	1.45-1.70	0.6-2.0	0.02-0.10	4.5-5.5	Moderate-----	0.28		
	43-60	10-25	1.40-1.70	0.6-2.0	0.02-0.05	4.5-5.5	Low----------	0.32		
7----------	0-14	14-20	1.30-1.60	2.0-6.0	0.07-0.12	3.6-6.0	Low----------	0.15	2	1-2
Clarksville	14-69	25-35	1.40-1.65	2.0-6.0	0.06-0.10	3.6-5.5	Low----------	0.20		
	69-75	35-60	1.40-1.80	0.6-2.0	0.05-0.08	3.6-5.5	Low----------	0.10		
8*, 9*:										
Eden----------	0-5	27-40	1.45-1.65	0.06-0.6	0.11-0.17	4.5-8.4	Moderate-----	0.17	3	.5-3
	5-22	40-60	1.45-1.65	0.06-0.2	0.08-0.13	5.1-8.4	Moderate-----	0.28		
	22-60	---	---	---	---	---	----------	----		
Newnata---------	0-3	15-27	1.25-1.60	0.6-2.0	0.10-0.18	4.5-7.3	Low----------	0.28	3	1-5
	3-7	27-40	1.25-1.55	0.2-0.6	0.12-0.22	5.1-7.8	Moderate-----	0.37		
	7-44	35-55	1.15-1.50	0.06-0.2	0.12-0.18	5.1-7.8	High---------	0.32		
	44-46	---	---	---	---	---	----------	----		
10*:										
Eden----------	0-5	27-40	1.45-1.65	0.06-0.6	0.11-0.17	4.5-8.4	Moderate-----	0.17	3	.5-3
	5-22	40-60	1.45-1.65	0.06-0.2	0.08-0.13	5.1-8.4	Moderate-----	0.28		
	22-60	---	---	---	---	---	----------	----		
Newnata---------	0-3	15-27	1.25-1.60	0.6-2.0	0.10-0.18	4.5-7.3	Low----------	0.28	3	1-5
	3-7	27-40	1.25-1.55	0.2-0.6	0.12-0.22	5.1-7.8	Moderate-----	0.37		
	7-44	35-55	1.15-1.50	0.06-0.2	0.12-0.18	5.1-7.8	High---------	0.32		
	44-46	---	---	---	---	---	----------	----		
Rock outcrop.										

See footnote at end of table.

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

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	G/cc	In/hr	In/in	pH				Pct
11, 12----------	0-5	10-25	1.25-1.60	0.6-2.0	0.07-0.15	3.6-5.5	Low----------	0.32	3	.5-2
Enders	5-9	15-27	1.25-1.60	0.6-2.0	0.15-0.22	3.6-5.5	Low----------	0.32		
	9-27	40-60	1.15-1.45	<0.06	0.12-0.18	3.6-5.5	High---------	0.37		
	27-49	40-60	1.20-1.45	<0.06	0.08-0.10	3.6-5.5	Moderate-----	0.28		
	49-57	---	---	---	---	---	----------	----		
13, 14----------	0-5	10-25	1.25-1.60	0.6-2.0	0.07-0.15	3.6-5.5	Low----------	0.32	3	.5-2
Enders	5-9	15-27	1.25-1.45	0.6-2.0	0.15-0.20	3.6-5.5	Low----------	0.28		
	9-27	40-60	1.25-1.45	<0.06	0.12-0.18	3.6-5.5	High---------	0.37		
	27-49	40-60	1.25-1.45	<0.06	0.11-0.13	3.6-5.5	Moderate-----	0.28		
	49-57	---	---	---	---	---	----------	----		
15*, 16*:										
Enders----------	0-5	10-25	1.25-1.60	0.6-2.0	0.07-0.15	3.6-5.5	Low----------	0.32	3	.5-2
	5-9	15-27	1.25-1.45	0.6-2.0	0.15-0.20	3.6-5.5	Low----------	0.28		
	9-27	40-60	1.25-1.45	<0.06	0.12-0.18	3.6-5.5	High---------	0.37		
	27-49	40-60	1.25-1.45	<0.06	0.11-0.13	3.6-5.5	Moderate-----	0.28		
	49-57	---	---	---	---	---	----------	----		
Leesburg--------	0-10	7-18	1.30-1.50	2.0-6.0	0.08-0.16	4.5-5.5	Low----------	0.15	5	1-3
	10-33	20-40	1.35-1.60	0.6-2.0	0.12-0.18	4.5-5.5	Low----------	0.32		
	33-72	27-50	1.25-1.60	0.6-2.0	0.12-0.18	4.5-5.5	Moderate-----	0.32		
17*, 18*:										
Estate----------	0-4	5-20	1.40-1.60	0.6-6.0	0.07-0.15	5.1-7.3	Low----------	0.15	3	.5-2
	4-16	15-35	1.30-1.50	0.6-2.0	0.10-0.18	5.1-7.3	Low----------	0.32		
	16-58	35-55	1.20-1.40	0.06-0.2	0.12-0.18	5.6-7.3	Moderate-----	0.28		
	58-62	---	---	---	---	---	----------	----		
Lily----------	0-4	5-25	1.20-1.40	0.6-6.0	0.09-0.16	3.6-5.5	Low----------	0.24	3	.5-2
	4-9	15-27	1.25-1.55	2.0-6.0	0.12-0.18	3.6-5.5	Low----------	0.24		
	9-21	18-35	1.25-1.55	2.0-6.0	0.08-0.17	3.6-5.5	Low----------	0.17		
	21-36	8-35	1.20-1.40	2.0-6.0	0.06-0.17	3.6-5.5	Low----------	0.17		
	36-38	---	---	---	---	---	----------	----		
Portia----------	0-4	7-20	1.30-1.60	0.6-2.0	0.11-0.15	5.1-6.5	Low----------	0.24	3	1-3
	4-15	15-25	1.30-1.60	0.6-2.0	0.15-0.24	4.5-6.0	Low----------	0.32		
	15-28	20-35	1.30-1.60	0.2-2.0	0.10-0.17	4.5-6.0	Low----------	0.32		
	28-72	27-40	1.20-1.60	0.2-2.0	0.12-0.20	5.1-6.0	Moderate-----	0.28		
19----------	0-5	12-22	1.30-1.40	0.6-2.0	0.17-0.22	4.5-5.5	Low----------	0.43	3	.5-2
Leadvale	5-25	20-32	1.30-1.50	0.6-2.0	0.17-0.20	4.5-5.5	Low----------	0.43		
	25-47	20-35	1.55-1.70	0.06-0.6	0.06-0.11	4.5-5.5	Low----------	0.43		
	47-52	30-45	1.40-1.60	0.06-0.6	0.06-0.11	4.5-5.5	Low----------	0.24		
	52-54	---	---	---	---	---	----------	----		
20*, 21*:										
Lily----------	0-4	5-25	1.20-1.40	0.6-6.0	0.09-0.16	3.6-5.5	Low----------	0.24	3	.5-2
	4-9	18-27	1.25-1.55	2.0-6.0	0.12-0.18	3.6-5.5	Low----------	0.24		
	9-21	18-35	1.25-1.55	2.0-6.0	0.08-0.17	3.6-5.5	Low----------	0.17		
	21-36	8-35	1.20-1.40	2.0-6.0	0.06-0.17	3.6-5.5	Low----------	0.17		
	36-38	---	---	---	---	---	----------	----		
Udorthents.										
Rock outcrop.										
22----------	0-10	7-20	1.30-1.60	0.6-2.0	0.11-0.20	3.6-5.5	Low----------	0.28	3	.5-3
Linker	10-28	18-35	1.30-1.60	0.6-2.0	0.11-0.20	3.6-5.5	Low----------	0.32		
	28-37	18-35	1.30-1.60	0.6-2.0	0.08-0.20	3.6-5.5	Low----------	0.28		
	37-39	---	---	---	---	---	----------	----		

See footnote at end of table.

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

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	G/cc	In/hr	In/in	pH				Pct
23----------	0-10	7-20	1.30-1.60	0.6-2.0	0.11-0.17	3.6-5.5	Low----------	0.24	3	.5-3
Linker	10-28	18-35	1.30-1.60	0.6-2.0	0.11-0.20	3.6-5.5	Low----------	0.32		
	28-37	18-35	1.30-1.60	0.6-2.0	0.08-0.20	3.6-5.5	Low----------	0.28		
	37-39	---	---	---	---	---	----------	----		
24*, 25*:										
Linker----------	0-10	7-20	1.30-1.60	0.6-2.0	0.11-0.17	3.6-5.5	Low----------	0.24	3	.5-3
	10-28	18-35	1.30-1.60	0.6-2.0	0.11-0.20	3.6-5.5	Low----------	0.32		
	28-37	18-35	1.30-1.60	0.6-2.0	0.08-0.20	3.6-5.5	Low----------	0.28		
	37-39	---	---	---	---	---	----------	----		
Mountainburg----	0-9	5-15	1.30-1.60	2.0-6.0	0.05-0.10	4.5-6.0	Low----------	0.17	1	1-3
	9-19	10-30	1.30-1.55	2.0-6.0	0.05-0.10	4.5-5.5	Low----------	0.24		
	19-21	---	---	---	---	---	----------	----		
26*:										
Moko----------	0-4	18-27	1.25-1.60	0.6-2.0	0.09-0.14	6.6-7.8	Low----------	0.24	1	2-4
	4-13	18-35	1.25-1.60	0.6-2.0	0.09-0.14	6.6-7.8	Low----------	0.32		
	13-15	---	---	---	---	---	----------	----		
Rock outcrop.										
27----------	0-9	3-10	1.40-1.60	2.0-6.0	0.05-0.10	4.5-6.0	Low----------	0.20	1	1-3
Mountainburg	9-19	15-25	1.50-1.70	2.0-6.0	0.05-0.10	4.5-5.5	Low----------	0.17		
	19-21	---	---	---	---	---	----------	----		
28, 29, 30-------	0-9	5-15	1.30-1.60	2.0-6.0	0.05-0.10	4.5-6.0	Low----------	0.15	1	1-3
Mountainburg	9-19	10-30	1.30-1.55	2.0-6.0	0.05-0.10	4.5-5.5	Low----------	0.24		
	19-21	---	---	---	---	---	----------	----		
31, 32----------	0-7	12-25	1.30-1.45	2.0-6.0	0.08-0.15	4.5-5.5	Low----------	0.15	5	.5-3
Nella	7-16	15-27	1.35-1.55	0.6-2.0	0.08-0.15	4.5-5.5	Low----------	0.15		
	16-72	27-40	1.30-1.45	0.6-2.0	0.07-0.14	4.5-5.5	Low----------	0.15		
33----------	0-7	12-25	1.30-1.45	2.0-6.0	0.08-0.15	4.5-5.5	Low----------	0.15	5	.5-3
Nella	7-16	15-27	1.35-1.55	0.6-2.0	0.07-0.14	4.5-5.5	Low----------	0.15		
	16-72	27-40	1.35-1.55	0.6-2.0	0.08-0.15	4.5-5.5	Low----------	0.15		
34----------	0-7	12-25	1.30-1.45	2.0-6.0	0.08-0.15	4.5-5.5	Low----------	0.15	5	.5-3
Nella	8-16	15-27	1.35-1.55	0.6-2.0	0.07-0.14	4.5-5.5	Low----------	0.15		
	16-72	27-40	1.35-1.55	0.6-2.0	0.08-0.15	4.5-5.5	Low----------	0.15		
35*, 36*:										
Nella----------	0-7	12-25	1.30-1.45	2.0-6.0	0.08-0.15	4.5-5.5	Low----------	0.15	5	.5-3
	7-16	15-27	1.35-1.55	0.6-2.0	0.07-0.14	4.5-5.5	Low----------	0.15		
	16-72	27-40	1.35-1.55	0.6-2.0	0.08-0.15	4.5-5.5	Low----------	0.15		
Enders----------	0-5	10-25	1.25-1.60	0.6-2.0	0.07-0.15	3.6-5.5	Low----------	0.32	3	.5-2
	5-9	15-27	1.25-1.45	0.6-2.0	0.15-0.20	3.6-5.5	Low----------	0.28		
	9-27	40-60	1.25-1.45	<0.06	0.12-0.18	3.6-5.5	High----------	0.24		
	27-49	40-60	1.25-1.45	<0.06	0.11-0.13	3.6-5.5	Moderate-----	0.24		
	49-57	---	---	---	---	---	----------	----		
37*:										
Nella----------	0-7	12-25	1.30-1.45	2.0-6.0	0.08-0.15	4.5-5.5	Low----------	0.15	5	.5-3
	7-16	15-27	1.35-1.55	0.6-2.0	0.07-0.14	4.5-5.5	Low----------	0.15		
	16-72	27-40	1.35-1.55	0.6-2.0	0.08-0.15	4.5-5.5	Low----------	0.15		
Steprock--------	0-3	8-18	1.30-1.60	2.0-6.0	0.04-0.08	4.5-5.5	Low----------	0.17	3	.5-2
	3-32	10-35	1.30-1.60	0.6-2.0	0.06-0.10	4.5-5.5	Low----------	0.17		
	32-38	---	---	---	---	---	----------	----		

See footnote at end of table.

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

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	G/cc	In/hr	In/in	pH				Pct
38*, 39*:										
Nella	0-7	12-25	1.30-1.45	2.0-6.0	0.06-0.14	4.5-5.5	Low	0.15	5	.5-3
	7-16	15-27	1.35-1.55	0.6-2.0	0.07-0.14	4.5-5.5	Low	0.15		
	16-72	27-40	1.35-1.55	0.6-2.0	0.08-0.15	4.5-5.5	Low	0.15		
Steprock	0-3	8-18	1.30-1.60	2.0-6.0	0.04-0.08	4.5-5.5	Low	0.17	3	.5-2
	3-32	10-35	1.30-1.60	0.6-2.0	0.06-0.10	4.5-5.5	Low	0.17		
	32-38	---	---	---	---	---	---	---		
Mountainburg	0-9	5-15	1.30-1.60	2.0-6.0	0.05-0.10	4.5-6.0	Low	0.15	1	1-3
	9-19	10-30	1.30-1.55	2.0-6.0	0.05-0.10	4.5-5.5	Low	0.24		
	19-21	---	---	---	---	---	---	---		
40, 41	0-11	5-25	1.30-1.60	0.6-2.0	0.08-0.10	4.5-5.5	Low	0.32	2	1-3
Nixa	11-19	20-35	1.30-1.60	0.2-0.6	0.08-0.10	4.5-5.5	Low	0.43		
	19-41	20-35	1.40-1.80	<0.06	0.05-0.08	4.5-5.5	Low	0.43		
	41-72	30-50	1.30-1.45	<0.06	0.03-0.06	4.5-5.5	Low	0.37		
42, 43, 44	0-14	10-25	1.30-1.50	0.6-2.0	0.10-0.14	4.5-6.5	Low	0.28	3	1-3
Noark	14-43	45-75	1.20-1.50	0.6-2.0	0.09-0.13	3.6-5.5	Low	0.24		
	43-72	45-75	1.15-1.45	0.6-2.0	0.06-0.09	3.6-5.5	Low	0.24		
45	0-9	10-20	1.25-1.45	0.6-2.0	0.16-0.24	4.5-6.0	Low	0.37	5	1-3
Peridge	9-44	20-34	1.25-1.45	0.6-2.0	0.18-0.22	4.5-6.0	Low	0.32		
	44-48	30-40	1.25-1.40	0.6-2.0	0.13-0.22	4.5-6.0	Low	0.28		
	48-72	35-60	1.15-1.35	0.6-2.0	0.09-0.18	4.5-6.0	Moderate	0.24		
46, 47	0-4	7-20	1.30-1.60	0.6-2.0	0.11-0.15	5.1-6.5	Low	0.24	3	1-3
Portia	4-15	15-25	1.30-1.60	0.6-2.0	0.15-0.24	4.5-6.0	Low	0.32		
	15-28	20-35	1.30-1.60	0.2-2.0	0.10-0.17	4.5-6.0	Low	0.32		
	28-72	27-40	1.20-1.60	0.2-2.0	0.12-0.20	5.1-6.0	Moderate	0.28		
48	0-12	10-25	1.25-1.60	0.6-2.0	0.10-0.22	6.1-7.3	Low	0.37	5	2-4
Razort	12-43	18-30	1.25-1.60	0.6-2.0	0.13-0.22	5.6-7.3	Low	0.37		
	43-65	10-25	1.25-1.50	2.0-6.0	0.08-0.12	5.6-7.3	Low	0.32		
49*.										
Riverwash										
50, 51	0-7	10-26	1.30-1.60	0.6-2.0	0.11-0.24	4.5-6.0	Low	0.37	5	1-4
Spadra	7-40	18-32	1.30-1.60	0.6-2.0	0.12-0.20	4.5-6.0	Low	0.37		
	40-72	10-20	1.30-1.60	0.6-2.0	0.10-0.15	4.5-6.0	Low	0.24		
52	0-10	8-18	1.30-1.60	2.0-6.0	0.08-0.15	4.5-5.5	Low	0.20	3	.5-2
Steprock	10-32	10-35	1.30-1.60	0.6-2.0	0.06-0.10	4.5-5.5	Low	0.17		
	32-38	---	---	---	---	---	---	---		
53	0-7	2-12	1.40-1.60	>6.0	0.05-0.11	3.6-6.0	Low	0.17	5	.5-1
Wideman	7-32	2-15	1.40-1.60	>6.0	0.06-0.14	5.1-7.3	Low	0.17		
	32-34	5-18	1.30-1.50	2.0-6.0	0.06-0.20	5.1-7.3	Low	0.20		
	34-58	2-12	1.40-1.60	>6.0	0.05-0.11	5.1-7.3	Low	0.17		
	58-72	5-18	1.30-1.50	2.0-6.0	0.10-0.15	5.1-7.3	Low	0.17		

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

TABLE 16.--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	Hydrologic group	Flooding			High water table		
		Frequency	Duration	Months	Depth	Kind	Months
					Ft		
1---------- Arkana	C	None----------	---	---	>6.0	---	---
2*, 3*:							
Arkana----------	C	None----------	---	---	>6.0	---	---
Moko----------	D	None----------	---	---	>6.0	---	---
4---------- Britwater	B	None----------	---	---	>6.0	---	---
5---------- Ceda	B	Frequent--------	Very brief----	Dec-Apr	>6.0	---	---
6*:							
Ceda----------	B	Frequent--------	Very brief----	Dec-Apr	>6.0	---	---
Kenn----------	B	Frequent--------	Very brief----	Dec-Apr	>6.0	---	---
7---------- Clarksville	B	None----------	---	---	>6.0	---	---
8*, 9*:							
Eden----------	C	None----------	---	---	>6.0	---	---
Newnata----------	C	None----------	---	---	>6.0	---	---
10*:							
Eden----------	C	None----------	---	---	>6.0	---	---
Newnata----------	C	None----------	---	---	>6.0	---	---
Rock outcrop.							
11, 12, 13, 14---------- Enders	C	None----------	---	---	>6.0	---	---
15*, 16*:							
Enders----------	C	None----------	---	---	>6.0	---	---
Leesburg----------	B	None----------	---	---	>6.0	---	---
17*, 18*:							
Estate----------	C	None----------	---	---	>6.0	---	---
Lily----------	B	None----------	---	---	>6.0	---	---
Portia----------	C	None----------	---	---	>6.0	---	---
19---------- Leadvale	C	None----------	---	---	2.0-3.0	Perched	Jan-Apr
20*, 21*:							
Lily----------	B	None----------	---	---	>6.0	---	---
Udorthents.							

See footnote at end of table.

TABLE 16.--WATER FEATURES--Continued

Map symbol and soil name	Hydrologic group	Flooding			High water table		
		Frequency	Duration	Months	Depth	Kind	Months
					Ft		
20*, 21*: Rock outcrop.							
22, 23---------- Linker	B	None----------	---	---	>6.0	---	---
24*, 25*: Linker----------	B	None----------	---	---	>6.0	---	---
Mountainburg----------	D	None----------	---	---	>6.0	---	---
26*: Moko----------	D	None----------	---	---	>6.0	---	---
Rock outcrop.							
27, 28, 29, 30---------- Mountainburg	D	None----------	---	---	>6.0	---	---
31, 32, 33, 34---------- Nella	B	None----------	---	---	>6.0	---	---
35*, 36*: Nella----------	B	None----------	---	---	>6.0	---	---
Enders----------	C	None----------	---	---	>6.0	---	---
37*: Nella----------	B	None----------	---	---	>6.0	---	---
Steprock----------	B	None----------	---	---	>6.0	---	---
38*, 39*: Nella----------	B	None----------	---	---	>6.0	---	---
Steprock----------	B	None----------	---	---	>6.0	---	---
Mountainburg----------	D	None----------	---	---	>6.0	---	---
40, 41---------- Nixa	C	None----------	---	---	>6.0	---	---
42, 43, 44---------- Noark	B	None----------	---	---	>6.0	---	---
45---------- Peridge	B	None----------	---	---	>6.0	---	---
46, 47---------- Portia	C	None----------	---	---	>6.0	---	---
48---------- Razort	B	Occasional------	Very brief to brief.	Dec-Apr	>6.0	---	---
49*. Riverwash							
50---------- Spadra	B	Occasional------	Very brief to brief.	Dec-Apr	>6.0	---	---

See footnote at end of table.

TABLE 16.--WATER FEATURES--Continued

Map symbol and soil name	Hydrologic group	Flooding			High water table		
		Frequency	Duration	Months	Depth	Kind	Months
					Ft		
51---------- Spadra	B	None----------	---	---	>6.0	---	---
52---------- Steprock	B	None----------	---	---	>6.0	---	---
53---------- Wideman	A	Frequent--------	Very brief----	Dec-May	>6.0	---	---

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

TABLE 17.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Arkana	Very-fine, mixed, mesic Mollic Hapludalfs
Britwater	Fine-loamy, mixed, mesic Typic Paleudalfs
Ceda	Loamy-skeletal, siliceous, nonacid, thermic Typic Udifluvents
Clarksville	Loamy-skeletal, siliceous, mesic Typic Paleudults
Eden	Fine, mixed, mesic Typic Hapludalfs
Enders	Clayey, mixed, thermic Typic Hapludults
Estate	Fine, mixed, mesic Typic Hapludalfs
Kenn	Fine-loamy, siliceous, thermic Ultic Hapludalfs
Leadvale	Fine-silty, siliceous, thermic Typic Fragiudults
Leesburg	Fine-loamy, siliceous, thermic Typic Paleudults
Lily	Fine-loamy, siliceous, mesic Typic Hapludults
Linker	Fine-loamy, siliceous, thermic Typic Hapludults
Moko	Loamy-skeletal, mixed, mesic Lithic Hapludolls
Mountainburg	Loamy-skeletal, siliceous, thermic Lithic Hapludults
Nella	Fine-loamy, siliceous, thermic Typic Paleudults
Newnata	Fine, mixed, mesic Typic Hapludalfs
Nixa	Loamy-skeletal, siliceous, mesic Glossic Fragiudults
Noark	Clayey-skeletal, mixed, mesic Typic Paleudults
Peridge	Fine-silty, mixed, mesic Typic Paleudalfs
Portia	Fine-loamy, siliceous, mesic Typic Paleudalfs
*Razort	Fine-loamy, mixed, mesic Mollic Hapludalfs
Spadra	Fine-loamy, siliceous, thermic Typic Hapludults
Steprock	Loamy-skeletal, siliceous, thermic Typic Hapludults
Wideman	Sandy, siliceous, mesic Typic Udifluvents

* 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.

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