United States Department of Agriculture

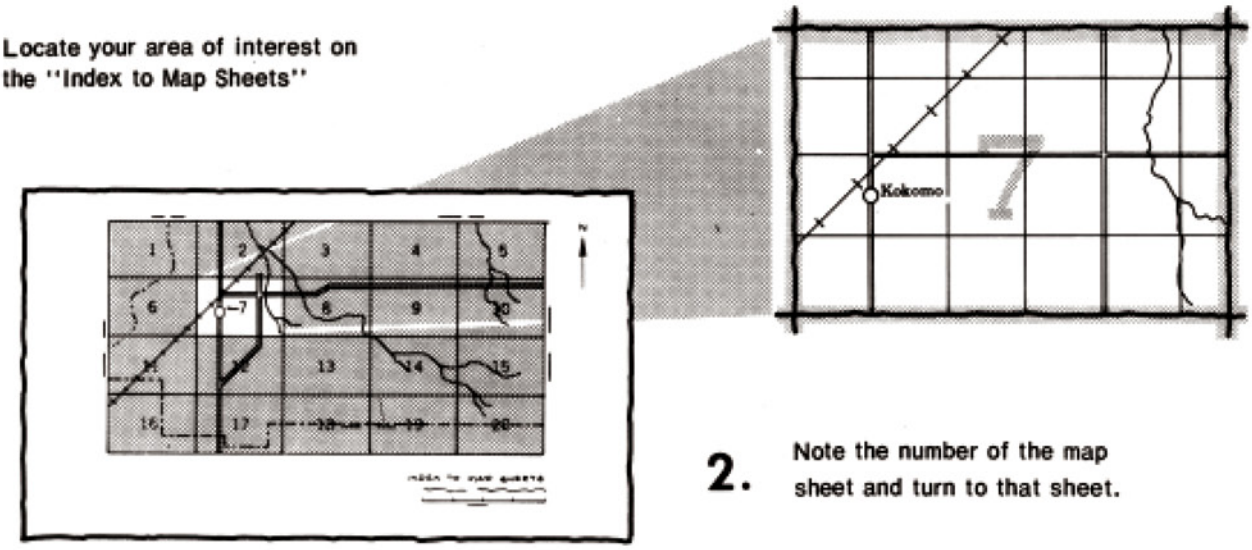
Soil Conservation Service

In cooperation with Arkansas Agricultural Experiment Station

Soil Survey of Carroll County Arkansas

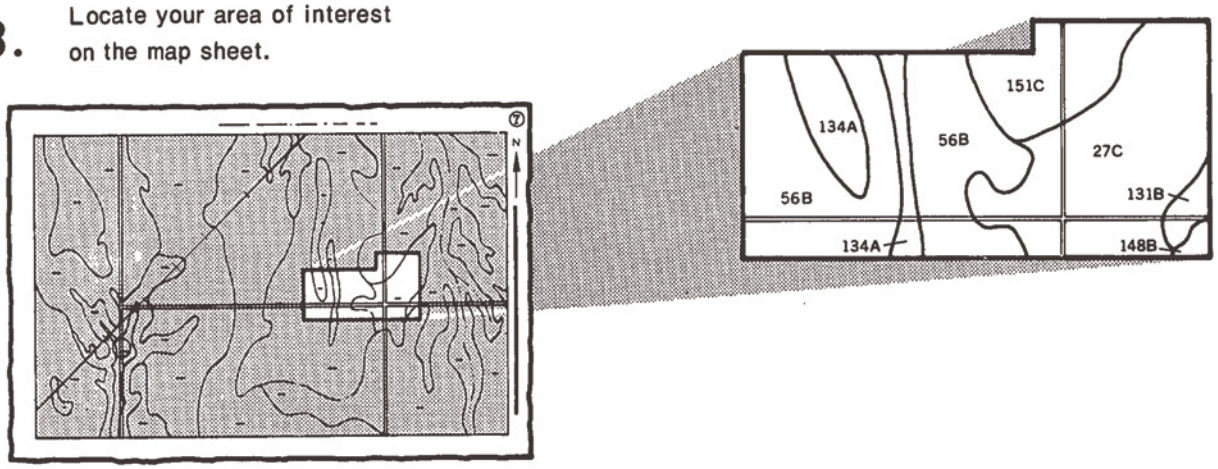
HOW TO USE

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

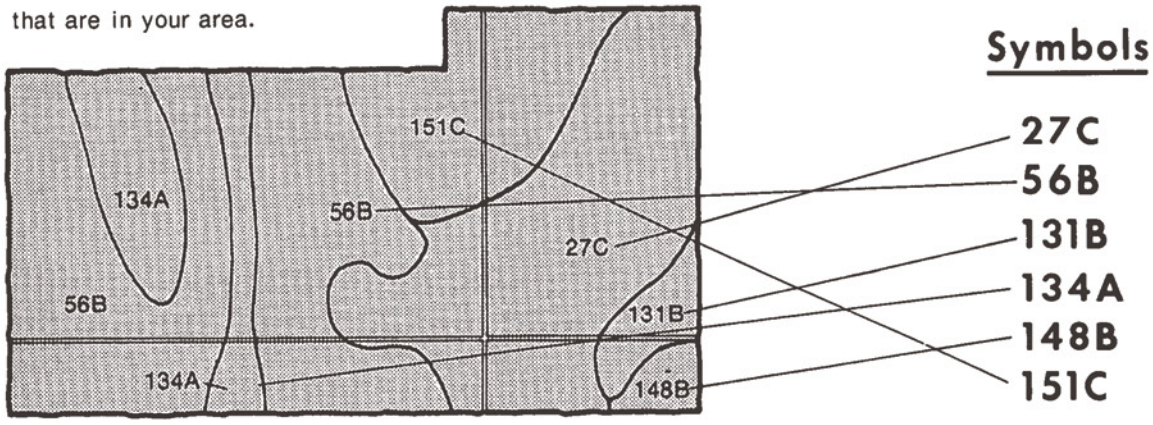


2. Note the number of the map sheet and turn to that sheet.

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

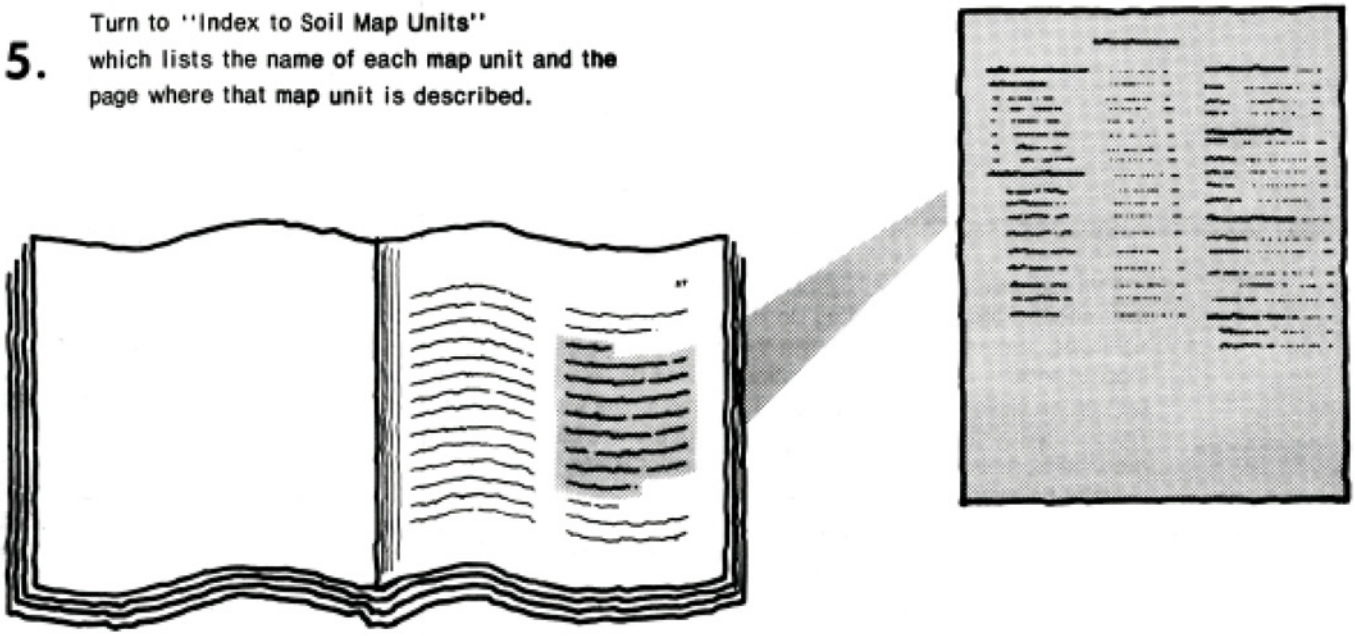


4. List the map unit symbols that are in your area.

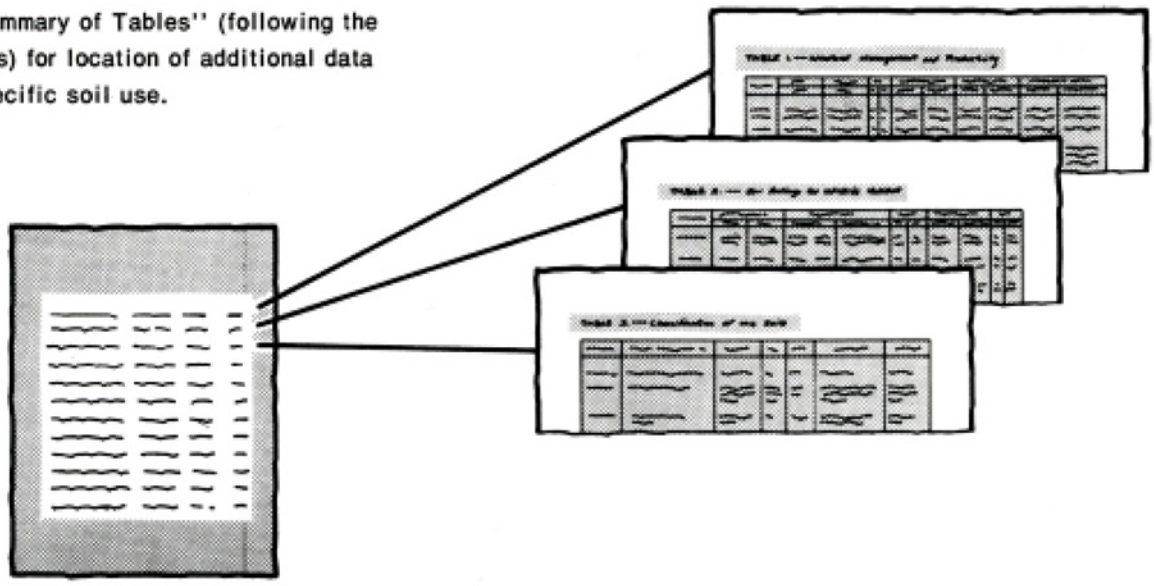


THIS SOIL SURVEY

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; to 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 1981. Soil names and descriptions were approved in 1981. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1981. This survey was made cooperatively by the Soil Conservation Service and the Arkansas Agricultural Experiment Station. It is part of the technical assistance furnished to the Carroll County Conservation District.

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

Cover: A pasture of bermudagrass in an area of Cane loam, 3 to 8 percent slopes. Raising cattle is an important part of the economy in Carroll County.

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Soil Series

Issued June 1984

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Summary of Tables

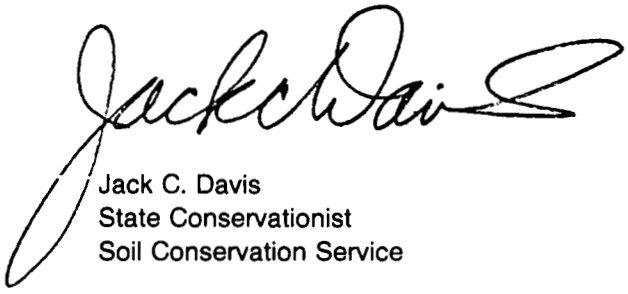
Foreword

This soil survey contains information that can be used in land-planning programs in Carroll 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.

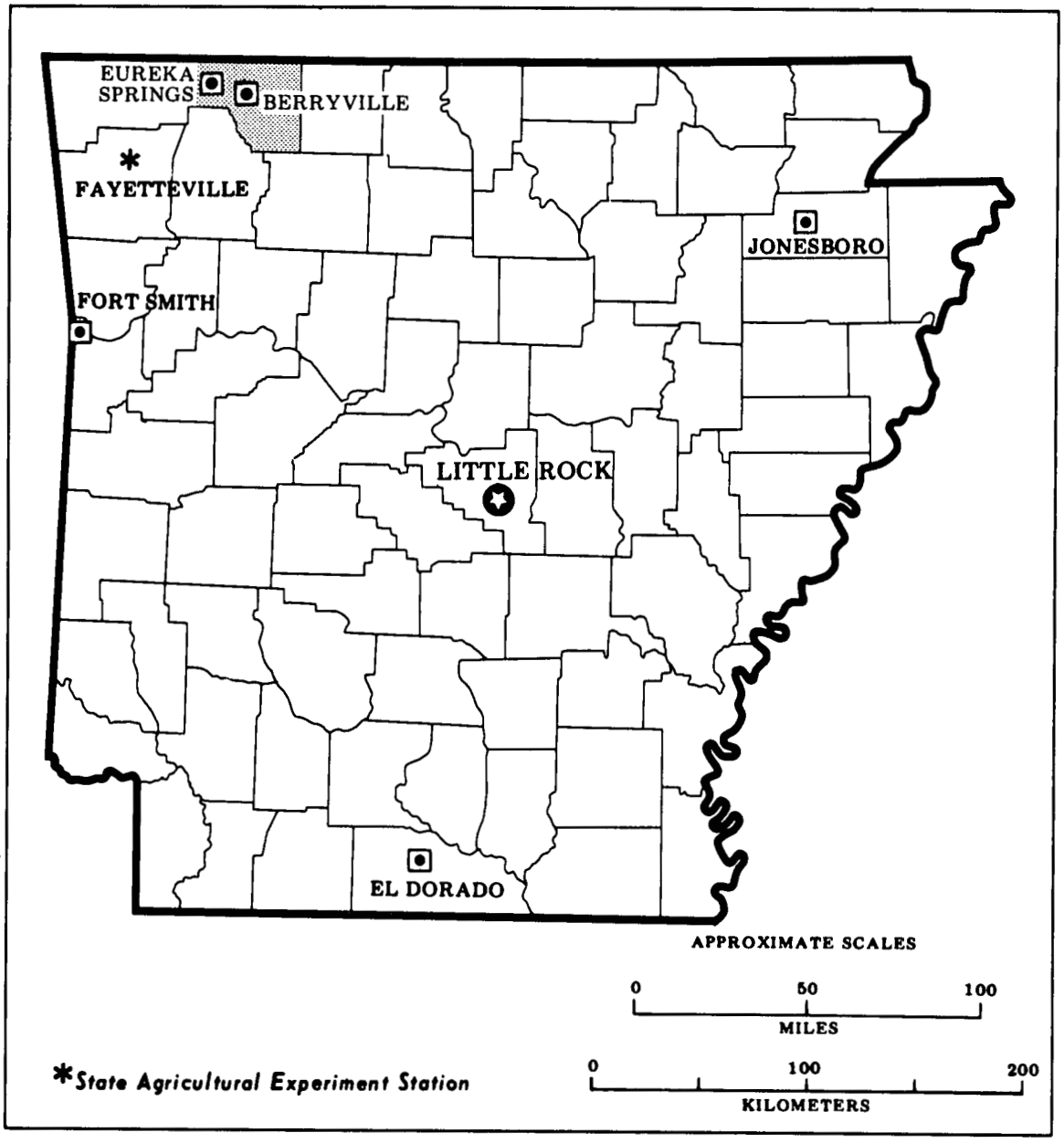
This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use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



Jack C. Davis
State Conservationist
Soil Conservation Service



Location of Carroll County in Arkansas.

Soil Survey of Carroll County, Arkansas

By David H. Fowlkes, M. Dean Harper, and Richard T. McCright,
Soil Conservation Service

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

CARROLL COUNTY is in the northwestern part of Arkansas. It is roughly rectangular and extends about 13 to 26 miles from north to south and 32 miles from east to west. It is bordered by Missouri on the north, by Benton County on the west, by Madison and Newton Counties on the south, and by Boone County on the east. The total area is 405,760 acres, or 634 square miles, which includes 8,010 acres of large bodies of water.

In 1980, the population of Carroll County was 16,203. There are two county seats; one is Berryville, and the other is Eureka Springs. Berryville, the largest town in the county, had a population of 2,966 in 1980, and Eureka Springs had a population of 1,989.

The economy is based mainly on poultry and cattle production, tourism, small industry, and business.

Carroll County attracts a large number of tourists. There are numerous points of interest along U.S. Highway 62.

General Nature of the County

This section provides general information about Carroll County. It discusses farming, physiography and drainage, and climate.

Farming

Early settlers in Carroll County cleared and farmed the flood plains and the gently sloping uplands where the soil was deep and contained few, if any, pebbles or stones. As roads were built and markets were developed, the settlers produced cotton, fruit, grain, livestock, and timber to be sold commercially.

From the 1930's through the 1950's, some farms were abandoned. On many other farms, use of the land changed from cultivated crops to pasture and meadow. Most of the nearly level to moderately steep soils were in tame pasture or meadow, and the steep soils were mostly in forest.

The trees in the county, chiefly low-grade hardwoods, are mainly on the steep, stony, or shallow soils. Eastern redcedar grows on shallow soils that overlie limestone in the central and western parts of the county. Most of the timber sold in the county is trucked to Harrison to be milled. The hardwoods are used to make furniture, crossties, fenceposts, and other wood products. The redcedar is used for posts, lumber, furniture, and novelties.

Recently, farming has become more diversified and generally less intensive. Most farm income comes from poultry, cattle, and hogs. According to the U.S. Census of Agriculture, the number and principal kinds of livestock and poultry in 1974 and 1978 were as follows:

	1974	1978
Cattle and calves	59,132	55,258
Beef cows	26,257	22,981
Milk cows	5,392	4,637
Hogs and pigs	5,393	6,939
Chickens, broilers	1,757,497	1,365,731
Chickens more than 3 months old	327,174	401,142
Turkeys	0	551,415

The poultry industry produces turkeys (fig. 1), broilers, and laying hens. It supports numerous feed mills, a broiler processing plant in Berryville, and one in Green Forest.

Figure 1.—The poultry industry adds substantially to the economy in Carroll County. This turkey farm is in an area of Arkana-Eldon complex, 3 to 8 percent slopes.

The cattle industry consists mainly of cow-calf operations. Most calves are sold as weaners, and some are sold as stockers in their second year.

Beef cattle are grazed on cool- and warm-season pasture plants, which are supplemented with minerals and protein. The cattle are fed grain and hay for only short periods late in the winter. Most are high grade cattle and are sold to midwestern feedlots.

There are several dairy herds in Carroll County that produce grade A milk. The dairy industry supports a processing plant in Berryville.

A few farms have orchards that produce fruits to be sold at roadside stands and commercial markets.

The soils on most steep mountainsides and hillsides support poorly managed stands of hardwood trees. Most of the soils are too steep, too stony, or too shallow to be

suitable for intensive use as meadow or tame pasture. As the population of the county increases, however, these areas are being cleared for use as tame pasture.

Many small farms are owned by people who have off-the-farm jobs or are retired. Many retired people who move into Carroll County want to farm a small acreage; hence, much of the population is in rural areas or small towns. Most of the farms are small enough that the family can do most of the work.

In 1978, according to the U.S. Census of Agriculture, 55.8 percent of the land area in Carroll County was in farms. Between 1974 and 1978, the size of the average farm decreased slightly from 225 acres to 220 acres. Many large farms have been divided into small tracts that are sold to retirees and to people employed away from the farm. The land area in farms increased slightly from 223,360 acres in 1974 to 223,367 acres in 1978.

Physiography and Drainage

Carroll County is within three physiographic areas of the Ozark Highland. More than half of the county is on the Springfield Plateau; the rest is on the Salem Plateau and in the Boston Mountains.

The southeastern part of the county is in the Boston Mountains, where the elevation of the stream valleys is about 1,200 to 1,400 feet above sea level. The valleys range from little wider than the stream itself to nearly half a mile wide.

The soils on the mountainsides are gravelly and stony and are strongly dissected. The lower two-thirds of the mountainside is convex and has a slope of about 8 to 40 percent. The upper third is a series of steep escarpments and less sloping benches. The slope is 12 to 40 percent. The mountaintops are mainly gently sloping. They are long and winding and range from 500 feet to 2 miles in width. Most are at an elevation of about 1,700 to 2,000 feet, and a few are at 2,200 feet. Some have a prominent bedrock escarpment around the rim.

The Springfield Plateau is adjacent to the Boston Mountains but is lower in elevation. Much of it is strongly dissected by streams. The dissected areas are characterized by gently sloping to moderately sloping, long and narrow, winding ridges and rolling to steep side slopes that have a slope of 12 to 50 percent. The side slopes form V-shaped valleys. The elevation is about 1,000 to 1,599 feet above sea level. There is a broad, nearly level to gently sloping upland area at Oak Grove that has a slope of 1 to 8 percent in most places.

The Salem Plateau is adjacent to the Springfield Plateau but is at a lower elevation, about 900 to 1,200 feet. This area includes outcrops of limestone and gently sloping to steep, stony soils on mountainsides.

There are several small streams in the county and a few large ones. The natural drainage system consists of many streams that form a dendritic pattern in the upper part of several watersheds. Springs, which are common in some areas, contribute substantially to stream flow during summer and fall.

The stream valleys are entrenched and are commonly less than one-half mile wide. Most flood plains in the county are 100 to 1,000 feet wide.

The southwestern part of the county drains into Beaver Reservoir, which was formed by the White River. In Carroll County, Beaver Reservoir has a surface area of about 3,592 acres. The southern part of the county is drained in a northwesterly direction by Osage Creek, Piney Creek, and Dry Fork Creek, which flow into the Kings River. The Kings River flows, in a generally northern direction, into Table Rock Lake. The northeastern part of the county is drained in a generally northern direction mainly by Long Creek, Yocum Creek, and Dry Creek, which flow into Table Rock Lake.

Table Rock Lake is another major reservoir that was formed by the White River. Table Rock Lake juts into Carroll County in two separate areas that have a combined surface area of about 1,528 acres. In the northwestern part of the county, near the town of Beaver, the surface area of the lake is 898 acres. In the northeastern part of the county, the surface area is 630 acres.

The main soils on the Springfield Plateau are the Clarksville, Noark, Nixa, and Captina soils. The main soils on the Salem Plateau are the Arkana, Eldon, and Moko soils. The main soils in the Boston Mountains are the Enders, Mountainburg, Leesburg, and Linker soils. The main soils in the stream valleys and on terraces are the Razort, Elsah, Portia, and Britwater soils.

The supply of ground water is not adequate for large-scale irrigation. A few of the larger streams can supply enough water for small-scale sprinkler irrigation. Drilled wells and springs supply most of the domestic water. Water lines have been built from an intake structure on Beaver Reservoir to Eureka Springs. There are plans to extend the lines to Berryville and Green Forest. At present, the water supply for Berryville comes from the Kings River and from a spring. Green Forest gets its water from springs. Farm ponds and creeks supply most of the water for livestock.

Climate

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

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

Table 1 gives data on temperature and precipitation for the survey area as recorded at Eureka Springs in the period 1951 to 1973. Table 2 shows probable dates of

the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 40 degrees F, and the average daily minimum temperature is 29 degrees. The lowest temperature on record, which occurred at Eureka Springs on January 11, 1962, is -11 degrees. In summer the average temperature is 77 degrees, and the average daily maximum temperature is 88 degrees. The highest recorded temperature, which occurred on July 14, 1954, is 111 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (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 43 inches. Of this, 26 inches, or 65 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 20 inches. The heaviest 1-day rainfall during the period of record was 4.1 inches at Eureka Springs on July 1, 1964. Thunderstorms occur on about 60 days each year, and most occur in summer.

The average seasonal snowfall is 14 inches. The greatest snow depth at any one time during the period of record was 12 inches. On an average of 3 days, at least 1 inch of snow is on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 80 percent. Humidity is higher at night, and the average at dawn is about 55 percent. The sun shines 70 percent of the time possible in summer and 50 percent in winter. The prevailing wind is from the south-southeast. Average windspeed is highest, 9 miles per hour, in spring.

How This Survey Was Made

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

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 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 and hay crops, woodland,* and *urban uses*. Cultivated crops are those grown extensively in the survey area. Pasture and hay crops are those grown for livestock forage production. Woodland refers to areas of native or introduced trees. Urban uses include residential, commercial, and industrial developments.

Areas dominated by loamy, very cherty, stony, and very stony soils; on the tops and sides of mountains and on stream terraces, plateaus, and flood plains

The soils in this group make up about 15 percent of Carroll County. Map units 1 and 3 consist of loamy and very cherty soils in the Ozark Highland. The soils in map unit 1 are in the northeastern part of the county, and the soils in map unit 3 are along most of the major drainageways in the county. Map unit 2 consists of stony, loamy, and very stony soils in the Boston Mountains. These soils are mainly in the eastern and southern parts of the county.

1. Captina-Nixa

Deep, nearly level to gently sloping, moderately well drained, loamy and very cherty soils that formed in loamy and cherty material over limestone and residuum of cherty limestone

These soils are in the northeastern part of the county. They are on broad ridgetops on the Springfield Plateau.

This map unit makes up about 4 percent of the county. About 67 percent of the unit is Captina soils, 20 percent is Nixa soils, and 13 percent is soils of minor extent.

Captina soils are on nearly level to gently sloping uplands. Their surface layer is dark brown silt loam. The upper part of the subsoil is yellowish brown silt loam, and the lower part is a compact and brittle, brown, gray, and red mottled, yellowish brown, silty clay loam fragipan.

Nixa soils are on gently sloping ridgetops of uplands. The surface layer is very dark grayish brown very cherty silt loam. The upper part of the subsoil is yellowish brown very cherty silt loam. The middle part is a compact and brittle, pale brown mottled, strong brown, very cherty silt loam fragipan, and the lower part is red and light gray very cherty silty clay.

The soils of minor extent are the very cherty Noark and Clarksville soils on gently sloping ridgetops or on steep hillsides.

The soils in this map unit are used for pasture or hay. Most of the acreage was originally in mixed hardwood forest.

Captina soils are moderately suited to well suited to cultivated crops. Nixa soils are moderately suited because the chert content is high, and because erosion is a severe hazard. The soils are moderately suited to woodland and moderately suited to well suited to pasture and hay.

The soils are moderately suited to most urban uses because of low strength, wetness, slope, and the slow and very slow permeability. These limitations generally can be overcome on these soils.

2. Linker-Cane-Mountainburg

Deep to shallow, gently sloping to moderately steep, well drained and moderately well drained, stony, loamy, and very stony soils that were derived from sandstone

These soils are in the east-central and southeastern parts of the county. Two of the areas are on top of the Boston Mountains. The other area is at a lower elevation between the Boston Mountains and the Springfield Plateau.

This map unit makes up about 5 percent of the county. About 40 percent of the unit is Linker soils, 30 percent is

Cane soils, and 19 percent is Mountainburg soils. About 11 percent is soils of minor extent.

Linker soils are moderately deep and well drained. Their surface layer is dark brown loam. The upper part of the subsoil is yellowish red loam, the middle part is yellowish red clay loam, and the lower part is mottled red, pale brown, and strong brown clay loam. It is underlain by acid sandstone.

Cane soils are deep and are moderately well drained. Their surface layer is dark brown loam. The upper part of the subsoil is reddish brown silt loam, and the middle part is yellowish red clay loam. The lower part is a compact and brittle, mottled, yellowish red, dark red, brown, and yellowish brown clay loam fragipan.

Mountainburg soils are shallow and well drained. Their surface layer is very dark grayish brown very stony fine sandy loam, and the subsurface layer is yellowish brown stony fine sandy loam. The subsoil is strong brown very stony sandy clay loam. It is underlain by acid sandstone.

The soils of minor extent are the Enders, Leesburg, and Nella soils at slightly higher elevations.

The soils in this map unit are used mainly for pasture and hay. Some of the less sloping, gravel-free areas have been cultivated for 40 to 80 years. Most of the original vegetation was mixed, low-grade, hardwood forest.

Linker soils are moderately suited or are not suited to cultivated crops, and Cane soils are moderately suited because erosion is a severe hazard, and slope is a moderate limitation. Mountainburg soils are not suited to cultivated crops. The main limitations are surface stones and droughtiness, and erosion is a very severe hazard.

The soils are moderately suited to poorly suited to pasture, hay, and woodland. The Linker and Cane soils are moderately suited to most urban uses. Depth to bedrock is a moderate limitation on the Linker soils, and wetness is a moderate limitation on the Cane soils. Mountainburg soils are poorly suited to most urban uses. Depth to rock, shallowness, and stoniness are severe limitations that are difficult to overcome.

3. Razort-Portia-Britwater

Deep, level to moderately sloping, well drained, loamy and gravelly soils that formed in loamy alluvium, residuum of sandstone, and old alluvium from limestone

These soils are scattered throughout the county. They are primarily along flood plains, on foot slopes, and on stream terraces of the larger streams.

This map unit makes up about 6 percent of the county. About 29 percent of the unit is Razort soils, 23 percent is Portia soils, and 19 percent is Britwater soils. About 29 percent is soils of minor extent.

Razort soils are on flood plains. Their surface layer is dark brown loam. The upper part of the subsoil is dark brown loam, the middle part is dark yellowish brown clay loam, and the lower part is dark brown very gravelly loam.

Portia soils are on uplands, foot slopes, and stream terraces. Their surface layer is brown loam. The upper part of the subsoil is dark brown silt loam, the middle part is yellowish red sandy clay loam and red clay loam, and the lower part is red gravelly clay loam.

Britwater soils are on stream terraces. Their surface layer is dark yellowish brown gravelly silt loam. The upper part of the subsoil is yellowish red silty clay loam, and the middle part is red gravelly silty clay loam. The lower part is mottled, yellowish red gravelly and very gravelly silty clay loam.

The soils of minor extent are the gently sloping Peridge soils, the level and nearly level, frequently flooded, sandy Wideman soils, and the cherty Elsah soils.

The soils in this map unit are used mainly for pasture and hay, and they are well suited to these uses. The Razort soils are well suited to cultivated crops. Portia and Britwater soils are moderately suited to cultivated crops because erosion is a severe hazard. The soils are well suited to woodland.

Razort soils are poorly suited to most urban uses because flooding is a severe hazard. Major flood control practices are needed. Portia and Britwater soils are well suited to moderately well suited to most urban uses. Slope and the moderately slow permeability of the Portia soils and the moderate permeability, low strength, and slope of the Britwater soils are moderate limitations and can be overcome.

Areas dominated by very cherty, cherty, and very stony soils; on hillsides, ridges, and mountainsides

The soils in this group make up about 76 percent of Carroll County. They are scattered throughout the county and are on the Springfield and Salem Plateaus in the Ozark Highland.

4. Arkana-Eldon

Moderately deep and deep, gently sloping and moderately sloping, well drained, very cherty and cherty soils that formed in residuum of limestone

These soils are in the north-central part of Carroll County. They are on gently sloping to moderately sloping ridges and hillsides on the Salem Plateau.

This map unit makes up about 8 percent of the county. About 45 percent of the unit is Arkana soils, 35 percent is Eldon soils, and 20 percent is soils of minor extent.

Arkana soils are moderately deep. Their surface layer is very dark gray very cherty silt loam, and their subsurface layer is very dark grayish brown very cherty silt loam. The upper part of the subsoil is yellowish red clay, and the lower part is strong brown mottled clay. It is underlain by hard dolomitic bedrock.

Eldon soils are deep. Their surface layer is dark brown cherty silt loam. The upper part of the subsoil is yellowish brown cherty silty clay loam, and the next part

is strong brown cherty silty clay. The layer below that is brown mottled very cherty silty clay. The lower part of the subsoil is reddish yellow, mottled very cherty clay.

The soils of minor extent are the shallow and stony Moko soils on steep hillsides and the Britwater, Razort, and Elsah soils on terraces and flood plains. Also included are areas of limestone outcrops.

The soils in this map unit have mostly been cleared and are used for pasture. The soils are moderately suited to this use.

In the gently sloping areas of this unit, the soils are poorly suited to cultivated crops, and in the moderately sloping areas, they are not suited because erosion is a severe hazard. They are poorly suited to use as woodland.

The Arkana soils are poorly suited to most urban uses because the low strength, shrink-swell potential, and very slow permeability are severe limitations that are difficult or impractical to overcome. Eldon soils are moderately suited to most urban uses. The shrink-swell potential, moderate permeability, and slope are moderate limitations that generally can be overcome by proper engineering design and construction techniques.

5. Arkana-Moko

Moderately deep and shallow, moderately sloping to very steep, well drained, very cherty and very stony soils that formed in residuum of limestone or dolomite

These soils are mostly in the northern and central parts of the county. They are on mountainsides and ridgetops on the Salem Plateau.

This map unit makes up about 15 percent of the county. About 55 percent of the unit is Arkana soils, 30 percent is Moko soils, and 15 percent is soils of minor extent.

Arkana and Moko soils in most places are intermingled on the same landscape. Arkana soils are moderately deep, and Moko soils are shallow.

Arkana soils have a very dark gray very cherty silt loam surface layer and a very dark grayish brown very cherty silt loam subsurface layer. The upper part of the subsoil is yellowish red clay, and the lower part is strong brown, mottled clay. It is underlain by hard dolomitic bedrock.

Moko soils have a very dark gray very stony silt loam surface layer and a very dark gray very stony silty clay loam subsurface layer. The subsurface layer is underlain by hard dolomitic bedrock.

The soils of minor extent are the very cherty Clarksville, Nixa, and Noark soils on hillsides and ridgetops at higher elevations. Also included are intermingled rock outcrops and areas of Eldon soils.

The soils in this map unit are used mainly as woodland that is in redcedar and low-grade hardwood trees. Some moderately sloping and moderately steep areas are used for pasture. The original vegetation was mainly an open stand of hardwood trees and prairie grasses in the open areas.

These soils are not suited to cultivated crops and are poorly suited to pasture. Depth to rock, stoniness, and slope are the main limitations. The soils are poorly suited to woodland uses.

These soils are poorly suited to urban uses. Depth to rock, slope, and the shrink-swell potential are severe limitations that are difficult or impractical to overcome.

6. Clarksville-Nixa

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

These soils are mainly in the western and southern parts of the county. They are on hillsides and ridgetops on highly dissected parts of the Springfield Plateau.

This map unit makes up about 42 percent of the county. About 33 percent of the unit is Clarksville soils, 19 percent is Nixa soils, and 48 percent is soils of minor extent.

Clarksville soils are steep to very steep and are on hillsides. They have a dark brown very cherty silt loam surface layer and a light yellowish brown, brown, and strong brown very cherty silt loam subsoil.

Nixa soils are gently sloping to moderately sloping and are on ridgetops. They have a very dark grayish brown, very cherty silt loam surface layer. The upper part of the subsoil is yellowish brown very cherty silt loam. The middle part is a compact and brittle, pale brown mottled, strong brown, very cherty silt loam fragipan. The lower part is mottled, red and light gray very cherty clay.

The soils of minor extent are the Noark soils on hillsides and ridgetops, the Arkana and Moko soils at slightly lower elevations, and the Razort, Elsah, and Britwater soils along flood plains and on stream terraces.

In most of the gently sloping and moderately sloping areas the soils in this map unit are used as pasture. In most of the steep and very steep areas they are used as woodland that consists of mixed hardwoods and some shortleaf pine. Most of the original vegetation was this type of woodland.

The Clarksville soils are not suited to cultivated crops or to pasture. Nixa soils are moderately suited to poorly suited to cultivated crops and are moderately suited to pasture. Slope and the high content of chert are the main limitations. The soils are moderately suited to woodland.

Clarksville soils are poorly suited to most urban uses because of the steep to very steep slopes. This limitation is difficult or impractical to overcome. Nixa soils are moderately suited to most urban uses. Very slow permeability is a severe limitation for septic tank absorption fields that is difficult to overcome.

Figure 2.—Typical landscape of Noark very cherty silt loam, 8 to 20 percent slopes.

7. Noark

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

These soils are in the northeastern part of the county. They are on ridgetops and hillsides on the Springfield Plateau (fig. 2).

This map unit makes up about 11 percent of the county. About 90 percent of the unit is Noark soils, and 10 percent is soils of minor extent.

Noark soils are well drained and are moderately permeable. Their surface layer is dark grayish brown very cherty silt loam, and their subsurface layer is yellowish brown very cherty silt loam. The upper part of the subsoil is yellowish red very cherty silty clay loam, the middle part is red very cherty silty clay, and the lower part is dark red very cherty clay.

The soils of minor extent are the Clarksville soils on ridgetops and hillsides, the Nixa and Captina soils on ridgetops, and the Arkana and Moko soils at lower elevations.

The soils in this map unit are used mainly for pasture, hay, and urban development. Some areas are used as woodland and wildlife habitat. Most of the original vegetation was hardwood trees.

These soils are moderately suited to not suited to cultivated crops, pasture, and hay. Slope and the high content of chert are limitations, and erosion is a hazard. The soils are moderately suited to woodland.

Noark soils are moderately suited to urban uses. Slope is the main limitation. This limitation can be overcome on the gently sloping, moderately sloping, and moderately steep slopes.

Areas dominated by stony and very stony soils; on mountains, hills, and ridges

The soils in this group make up about 9 percent of the county. The soils in map unit 8 are in the Boston Mountains, which are in the southeastern part of the county. The soils in map unit 9 are in the Ozark Highland in the southwestern part of the county.

8. Enders-Mountainburg-Leesburg

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

These soils are in the southeastern part of the county. They are on mountainsides in the Boston Mountains.

This map unit makes up about 8 percent of the county. About 40 percent of the unit is Enders soils, 30 percent is Mountainburg soils, 20 percent is Leesburg soils, and 10 percent is soils of minor extent.

Enders soils are deep and have a dark brown stony loam surface layer. The subsurface layer is yellowish brown stony loam. The upper part of the subsoil is yellowish red silty clay and clay. The lower part is red and gray clay. The underlying material is gray, weathered soft shale.

Mountainburg soils are shallow and have a very dark grayish brown very stony fine sandy loam surface layer. The subsurface layer is yellowish brown very stony fine sandy loam. The subsoil is strong brown very stony sandy clay loam. It is underlain by acid sandstone.

Leesburg soils are deep and have a brown stony loam surface layer. The upper part of the subsoil is yellowish brown gravelly loam and gravelly clay loam, and the middle part is strong brown very gravelly clay loam. The lower part of the subsoil is mottled strong brown, yellowish red, and brown very gravelly clay loam.

The soils of minor extent are Linker soils on ridgetops and Nella soils on side slopes. Also included are some prominent sandstone bluffs and other rock outcrops.

The soils in this map unit are used mainly as woodland, which consists of low-grade hardwood trees. They are also used as wildlife habitat. Some of the less sloping soils are in pasture. The original vegetation on Enders and Mountainburg soils was an open stand of hardwood trees and prairie plants in the open areas. The original vegetation on Leesburg soils was a dense stand of mixed hardwood trees. Most of the commercially valuable trees have been cut, and stands of undesirable species and young trees remain.

In most areas the soils in this map unit are not suited to cultivated crops. They are moderately suited to not suited to pasture, and they are well suited to poorly suited to use as woodland. Stones, slope, and the clayey subsoil are the main limitations. Mountainburg soils, in addition, are shallow to bedrock.

In most areas, the soils are poorly suited to urban uses. Surface stones, shallowness, steep slopes, and the high shrink-swell potential are severe limitations and are difficult or impractical to overcome.

9. Ramsey-Lily

Shallow and moderately deep, steep, somewhat excessively drained and well drained, very stony and stony soils that formed in residuum of sandstone

These soils are in the southwestern part of the county. They are on steep hillsides of the St. Peter Sandstone Formation and the Everton Formation along the Kings River and Piney Creek.

This map unit makes up about 1 percent of the county. About 50 percent of the unit is Ramsey soils, 40 percent is Lily soils, and 10 percent is soils of minor extent.

Ramsey and Lily soils in most places are intermingled on the same landscape. Ramsey soils are somewhat excessively drained, and Lily soils are well drained.

Ramsey soils are shallow. Their surface layer is dark brown very stony loam, and their subsurface layer is brown very stony loam. The subsoil is light yellowish brown stony loam. It extends to a depth of about 15 inches. It is underlain by hard, level-bedded sandstone bedrock.

Lily soils are moderately deep. Their surface layer is dark brown stony loam, and their subsurface layer is yellowish brown stony loam. The upper part of the subsoil is yellowish red stony sandy clay loam, and the lower part is mottled yellowish red, dark red, and light brownish gray stony sandy clay loam. It is underlain, at a depth of about 40 inches, by hard, level-bedded sandstone bedrock.

The soils of minor extent are the very cherty Arkana soils, the stony Moko soils on steep hillsides, and the very cherty Clarksville soils also on steep hillsides but at higher elevations. Also included are vertical bedrock bluffs and bouldery areas.

The soils in this map unit are used mainly as woodland and as habitat for wildlife. The trees are mainly low-grade hardwoods.

The soils are not suited to cultivated crops or to improved pasture. Slope, surface stones, and rock outcrops are the main limitations. Ramsey soils are poorly suited to use as woodland, and Lily soils are moderately suited.

The soils are not suited to most urban uses mainly because of shallowness, in places, and steep slopes. The limitations are difficult or impractical to overcome.

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, 3 to 8 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 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

Soil Descriptions

1—Arkana-Eldon complex, 3 to 8 percent slopes. This complex consists of Arkana and Eldon soils in areas that are so intermingled that they could not be mapped separately at the scale used in mapping. The individual areas of each soil are about 1/2 acre to 5 acres in size, and the mapped areas of this complex are about 5 to 1,000 acres or more in size. Arkana soils make up about 45 percent of each mapped area, Eldon soils make up 35 percent, and included areas make up 20 percent. The soils are on gently sloping ridges and hillsides. The slopes are convex in most areas and are smooth except in areas where there is Rock outcrop.

Typically, the surface layer of the Arkana soils is very dark gray very cherty silt loam about 5 inches thick. The subsurface layer is very dark grayish brown very cherty silt loam about 4 inches thick. The upper part of the subsoil is yellowish red clay about 15 inches thick, and the lower part is strong brown, mottled clay about 14 inches thick. Hard, level-bedded dolomitic bedrock is at a depth of 38 inches.

The natural fertility of Arkana soils is moderate, and the content of organic matter is moderate. The surface layer is medium acid to mildly alkaline, and the subsoil is strongly acid to moderately alkaline. Permeability is very slow, and the available water capacity is low. The root zone is moderately deep; roots can penetrate to the clayey subsoil, which restricts further penetration.

Typically, the surface layer of the Eldon soils is dark brown cherty silt loam about 8 inches thick. The upper part of the subsoil is yellowish brown cherty silty clay

loam about 5 inches thick. Below that, there is strong brown cherty silty clay about 8 inches thick; brown, mottled very cherty silty clay about 21 inches thick; and reddish yellow, mottled very cherty clay about 30 or more inches thick.

The natural fertility of Eldon soils is low, and the content of organic matter is low. The surface layer is strongly acid to neutral, and the subsoil is very strongly acid to mildly alkaline. Permeability is moderate, and the available water capacity is medium. Tilth is good, but the chert fragments in the surface layer limit the use of some equipment. The root zone is deep; and roots can penetrate to the clayey subsoil, which restricts further penetration.

Included with this soil in mapping are areas of Moko soils and Rock outcrop (limestone), soils that have a lighter colored surface layer, and soils that are deeper than Arkana soils but are not so deep as Eldon soils.

The soils in this complex are poorly suited to cultivated crops. Runoff is medium to rapid, and erosion is a very severe hazard if cultivated crops are grown. Clean-tilled crops that leave large amounts of residue on the surface can be grown occasionally if a close-growing cover is kept on the soil most of the time and minimum tillage, contour cultivation, and terraces are used.

The soils are moderately suited to pasture and hay and are used mainly for pasture and hay. Adapted pasture plants include tall fescue, bermudagrass, lespedeza, and white clover.

Arkana soils are poorly suited to use as woodland, and Eldon soils are moderately suited. Adapted species include eastern redcedar and shortleaf pine. On Arkana soils, the use of equipment is moderately limited, seedling mortality is moderate, and erosion is a slight hazard.

Arkana soils are poorly suited to most urban uses. Low strength and the shrink-swell potential are severe limitations for roads and streets. The shrink-swell potential is a severe limitation for dwellings and small commercial buildings. These limitations generally can be overcome by proper engineering design and construction techniques. The very slow permeability and moderate depth to bedrock are severe limitations for septic tank absorption fields. These limitations are difficult or impractical to overcome.

Eldon soils are moderately suited to most urban uses. The shrink-swell potential is a moderate limitation for dwellings, local roads and streets, and small commercial buildings. This limitation generally can be overcome by proper engineering design and construction techniques. The moderate permeability is a moderate limitation for septic tank absorption fields. This limitation can be partly overcome by increasing the size of the absorption field.

The soils are in capability subclass IVe. Arkana soils are in woodland suitability group 5c8, and Eldon soils are in group 4o7.

2—Arkana-Eldon complex, 8 to 12 percent slopes. This complex consists of Arkana and Eldon soils in areas that are so intermingled that they could not be mapped separately at the scale used in mapping. The individual areas of each soil are about 1/2 acre to 5 acres in size, and the mapped areas of this complex are about 5 to 200 acres in size. Arkana soils make up about 35 percent of each mapped area, Eldon soils make up 35 percent, and included areas make up 30 percent. The soils are on moderately sloping ridges and hillsides. The slopes are convex in most places and are smooth except in areas where there is Rock outcrop.

Typically, the surface layer of the Arkana soils is very dark gray very cherty silt loam about 5 inches thick. The subsurface layer is very dark grayish brown very cherty silt loam about 4 inches thick. The upper part of the subsoil is yellowish red clay about 15 inches thick, and the lower part is strong brown, mottled clay about 14 inches thick. Hard, level-bedded dolomitic bedrock is at a depth of 38 inches.

The natural fertility of Arkana soils is moderate, and the content of organic matter is moderate. The surface layer is medium acid to mildly alkaline, and the subsoil is strongly acid to moderately alkaline. Permeability is very slow, and the available water capacity is low. The root zone is moderately deep; roots can penetrate to the clayey subsoil, which restricts further penetration.

Typically, the surface layer of the Eldon soils is dark brown cherty silt loam about 8 inches thick. The upper part of the subsoil is yellowish brown cherty silty clay about 5 inches thick. Below that, there is strong brown cherty silty clay about 8 inches thick; brown, mottled cherty silty clay about 21 inches thick; and reddish yellow, mottled very cherty clay about 30 or more inches thick.

The natural fertility of Eldon soils is low, and the content of organic matter is low. The surface layer is strongly acid to neutral, and the subsoil is very strongly acid to mildly alkaline. Permeability is moderate, and the available water capacity is medium. Tilth is good, but the chert fragments in the surface layer limit the use of some equipment. The root zone is deep; roots can penetrate to the clayey subsoil, which restricts further penetration.

Included with these soils in mapping are areas of Moko soils and Rock outcrop (limestone), soils that have a lighter colored surface layer, and soils that are deeper than Arkana soils but are not so deep as Eldon soils.

The soils are not suited to cultivated crops and are moderately suited to pasture and hay. The soils are used mainly for pasture and hay. Runoff is rapid, and erosion is a very severe hazard if cultivated crops are grown. Adapted pasture plants include tall fescue, lespedeza, and white clover.

Arkana soils are poorly suited to woodland, and Eldon soils are moderately suited. Adapted species include eastern redcedar and shortleaf pine. On Arkana soils,

the use of equipment is moderately limited, seedling mortality is moderate, and erosion is a slight hazard.

Arkana soils are poorly suited to most urban uses. Low strength and the shrink-swell potential are severe limitations for local roads and streets. The shrink-swell potential is a severe limitation for dwellings. The shrink-swell potential and the slope are severe limitations for small commercial buildings. These limitations generally can be overcome by proper engineering design and construction techniques. The very slow permeability and moderate depth to bedrock are severe limitations for septic tank absorption fields. These limitations are difficult or impractical to overcome.

Eldon soils are moderately suited to most urban uses. The shrink-swell potential and slope are moderate limitations for dwellings and local roads and streets. Slope is a severe limitation for small commercial buildings. These limitations generally can be overcome by proper engineering design and construction techniques. The moderate permeability and the slope are moderate limitations for septic tank absorption fields. This limitation can be partly overcome by increasing the size of the absorption field.

The soils are in capability subclass VIe. Arkana soils are in woodland suitability group 5c8, and Eldon soils are in group 4o7.

3—Arkana-Moko complex, 8 to 20 percent slopes. This complex consists of Arkana and Moko soils in areas that are so intermingled that they could not be mapped separately at the scale used in mapping. The individual areas of each soil are about 3 to 5 acres in size, and the mapped areas of this complex are about 20 to a few hundred acres in size. Arkana soils make up about 55 percent of each mapped area, Moko soils make up 35 percent, and included areas make up 10 percent. The soils are on moderately sloping to moderately steep hillsides. The slopes are uneven and convex. In most places they have a stepped appearance because of outcrops of horizontally bedded limestone.

Typically, the surface layer of the Arkana soils is very dark gray very cherty silt loam about 5 inches thick. The subsurface layer is very dark grayish brown very cherty silt loam about 4 inches thick. The upper part of the subsoil is yellowish red clay about 15 inches thick, and the lower part is strong brown, mottled clay about 14 inches thick. Hard, level-bedded dolomitic bedrock is at a depth of about 38 inches.

The natural fertility of Arkana soils is moderate, and the content of organic matter is moderate. The surface layer is medium acid to mildly alkaline, and the subsoil is strongly acid to moderately alkaline. Permeability is very slow, and the available water capacity is low. The root zone is moderately deep; roots can penetrate to the clayey subsoil, which restricts further penetration.

Typically, the surface layer of Moko soils is very dark gray very stony silt loam about 3 inches thick. The subsurface layer is very dark gray very stony silty clay loam about 8 inches thick. Hard, level-bedded dolomitic bedrock is at a depth of about 11 inches.

The natural fertility of Moko soils is moderate, and the content of organic matter is moderate. The soils are neutral or mildly alkaline throughout. Permeability is moderate, and the available water capacity is very low.

Included with these soils in mapping are areas of Clarksville soils, Eldon soils, and Rock outcrop.

The soils are not suited to cultivated crops. Arkana soils are moderately suited to pasture. Adapted pasture plants include tall fescue, bermudagrass, lespedeza, and white clover. Moko soils are not suited to pasture. The native vegetation should not be disturbed because erosion is a very severe hazard.

The soils are used mainly as woodland (fig. 3), which consists of low-grade hardwoods and redcedars. In some places the soils are used as pasture.

Arkana soils are poorly suited to use as woodland. Adapted species include eastern redcedar and shortleaf pine. The use of equipment is moderately limited, seedling mortality is moderate, and erosion is a slight hazard.

Moko soils also are poorly suited to use as woodland. The main adapted species is eastern redcedar. The use of equipment is severely limited, seedling mortality is severe, and erosion is a severe hazard.

Arkana soils are poorly suited to most urban uses. Low strength and the high shrink-swell potential are severe limitations for local roads and streets. The high shrink-swell potential is a severe limitation for dwellings. The shrink-swell potential and the slope are severe limitations for small commercial buildings. The very slow permeability and moderate depth to rock are severe limitations for septic tank absorption fields. These limitations are difficult or impractical to overcome.

Moko soils also are poorly suited to most urban uses. Large stones and shallowness to rock are severe limitations for dwellings, small commercial buildings, local roads and streets, and septic tank absorption fields. Slope is another severe limitation for small commercial buildings. These limitations are difficult or impractical to overcome.

The soils are in capability subclass VIIs. Arkana soils are in woodland suitability group 5c8, and Moko soils are in group 5x3.

4—Arkana-Moko complex, 20 to 40 percent slopes. This complex consists of Arkana and Moko soils in areas that are so intermingled that they could not be mapped separately at the scale used in mapping. The individual areas of each soil are about 3 to 5 acres in size, and the mapped areas of this complex are about 20 to a few hundred acres in size. Arkana soils make up about 55 percent of each mapped area, Moko soils make up 35 percent, and included areas make up 10 percent. The soils are on steep hillsides. The slopes are uneven and

Figure 3.—This spring-fed stream is in an area of Arkana-Moko complex, 8 to 20 percent slopes. It provides water for livestock and wildlife.

convex. In most places they have a stepped appearance because of outcrops of horizontally bedded limestone.

Typically, the surface layer of the Arkana soils is very dark gray very cherty silt loam about 5 inches thick. The subsurface layer is very dark grayish brown very cherty silt loam about 4 inches thick. The upper part of the subsoil is yellowish red clay about 15 inches thick, and the lower part is strong brown, mottled clay about 14 inches thick. Hard, level-bedded dolomitic bedrock is at a depth of about 38 inches.

The natural fertility of Arkana soils is moderate, and the content of organic matter is moderate. The surface layer is medium acid to mildly alkaline, and the subsoil is strongly acid to moderately alkaline. Permeability is very slow, and the available water capacity is low. The root zone is moderately deep; roots can penetrate to the clayey subsoil, which restricts further penetration.

Typically, the surface layer of the Moko soils is very dark gray very stony silt loam about 3 inches thick. The subsurface layer is very dark gray very stony silty clay

loam about 8 inches thick. Hard, level-bedded dolomitic bedrock is at a depth of about 11 inches.

The natural fertility of Moko soils is moderate, and the content of organic matter is moderate. The soils are neutral or mildly alkaline throughout. Permeability is moderate, and the available water capacity is very low.

Included with these soils in mapping are areas of Eldon and Clarksville soils, soils that have a slope of more than 40 percent, and Rock outcrop.

The soils are not suited to cultivated crops or to pasture. The native vegetation should not be disturbed because erosion is a very severe hazard.

The soils are used mainly as woodland, which consists mostly of hardwoods and redcedars. The wooded areas provide habitat for wildlife.

Arkana soils are poorly suited to use as woodland. Adapted species include eastern redcedar and shortleaf pine. The use of equipment is severely limited, seedling mortality is severe, and erosion is a moderate hazard.

Moko soils are poorly suited to use as woodland. The main adapted species is eastern redcedar. The use of equipment is severely limited, seedling mortality is severe, and erosion is a severe hazard.

Arkana soils are poorly suited to most urban uses. Steepness of slope, low strength, and the high shrink-swell potential are severe limitations for local roads and streets. Steepness of slope and the high shrink-swell potential are severe limitations for dwellings and small commercial buildings. The very slow permeability, moderate depth to rock, and steepness of slope are severe limitations for septic tank absorption fields. These limitations are difficult or impractical to overcome.

Moko soils also are poorly suited to most urban uses. The large stones, shallowness to rock, and steepness of 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 are in capability subclass VIIs. Arkana soils are in woodland suitability group 5c9, and Moko soils are in group 5x3.

5—Britwater gravelly silt loam, 3 to 8 percent slopes. This is a deep, well drained, gently sloping soil on stream terraces and uplands. The slopes are smooth and convex. Individual areas range from about 5 to 30 acres in size.

Typically, the surface layer is dark yellowish brown gravelly silt loam about 6 inches thick. The upper part of the subsoil is yellowish red silty clay loam about 5 inches thick. Below that, there is yellowish red gravelly silty clay loam about 9 inches thick; red, mottled gravelly silty clay loam about 20 inches thick; yellowish red, mottled gravelly silty clay loam about 15 inches thick; and yellowish red, mottled very gravelly silty clay loam 25 or more inches thick.

The natural fertility of this soil is moderate, and the content of organic matter is moderate. The soil is medium acid or strongly acid throughout. Permeability is moderate, and the available water capacity is medium. Tilth is good; the soil can be worked within a wide range of moisture content. Gravel is a slight hindrance to tilling. The root zone is deep. It is easily penetrated by roots.

Included with this soil in mapping are small areas of Peridge and Razort soils and narrow rock escarpments.

This soil is moderately suited to cultivated crops. Adapted crops include corn, soybeans, and small grains. Erosion is a severe hazard if cultivated crops are grown. Clean-tilled crops that leave large amounts of residue on the surface can be grown year after year in the less sloping areas if terraces and contour cultivation are used.

This soil is used mainly for pasture and hay, and it is well suited to this use (fig. 4). Adapted pasture plants include bermudagrass, tall fescue, white clover, lespedeza, and alfalfa.

This soil is well suited to use as woodland. Adapted species include shortleaf pine, loblolly pine, red oak, and eastern redcedar.

This soil is well suited to moderately suited to most urban uses. Slope is a moderate limitation for small commercial buildings. This limitation can be overcome by proper engineering design and construction techniques. The moderate permeability is a moderate limitation for septic tank absorption fields. This limitation can be overcome by increasing the size of the absorption field.

This soil is in capability subclass IIIe and in woodland suitability group 3o7.

6—Britwater gravelly silt loam, 8 to 12 percent slopes. This is a deep, well drained, moderately sloping soil on stream terraces and uplands. The slopes are smooth and convex. Individual areas range from about 5 to 20 acres in size.

Typically, the surface layer is dark yellowish brown gravelly silt loam about 6 inches thick. The upper part of the subsoil is yellowish red silty clay loam about 5 inches thick. Below that, there is yellowish red gravelly silty clay loam about 9 inches thick; red, mottled gravelly silty clay loam about 20 inches thick; yellowish red, mottled gravelly silty clay loam about 15 inches thick; and yellowish red, mottled very gravelly silty clay about 25 or more inches thick.

The natural fertility of this soil is moderate, and the content of organic matter is moderate. The soil is medium acid or strongly acid throughout. Permeability is moderate, and the available water capacity is medium. Tilth is good; the soil can be worked within a wide range of moisture content. Gravel is a slight hindrance to tilling. The root zone is deep. It is easily penetrated by roots.

Included with this soil in mapping are areas of Noark soils, small areas of soils similar to Britwater soils except that they are less than 5 feet deep to bedrock, a few

Figure 4.—Fescue pasture in an area of Britwater gravelly silt loam, 3 to 8 percent slopes. Commercially valuable trees on Noark very cherty silt loam, 8 to 20 percent slopes, are in the background.

shallow gullies, areas where the surface layer and subsoil have been mixed by plowing, and narrow escarpments.

This soil is poorly suited to cultivated crops. Adapted crops include small grains. Slope and the medium speed of runoff are limitations, and erosion is a very severe hazard. Crops can be grown occasionally if a close-growing cover is kept on the soil most of the time and terraces and contour cultivation are used. Conservation practices are more important in the more sloping areas.

This soil is used mainly for pasture and hay, and it is well suited to this use. Adapted pasture plants include bermudagrass, tall fescue, lespedeza, white clover, and bahiagrass.

This soil is well suited to use as woodland. Adapted species include shortleaf pine, loblolly pine, red oak, and eastern redcedar.

This soil is moderately suited to most urban uses. Slope is a moderate limitation for dwellings and local roads and streets and a severe limitation for small commercial buildings. This limitation can be overcome by proper engineering design and construction techniques. Slope and the moderate permeability are moderate limitations for septic tank absorption fields. These limitations can be overcome by proper design.

This soil is in capability subclass IVe and in woodland suitability group 3o7.

7—Cane loam, 3 to 8 percent slopes. This is a deep, moderately well drained, gently sloping soil on plateaus and stream terraces. The slopes are smooth and convex. Individual areas range from about 10 to 75 acres in size.

Typically, the surface layer is dark brown loam about 6 inches thick. The upper part of the subsoil is reddish

brown silt loam about 7 inches thick and yellowish red clay loam about 11 inches thick. Below that, there is a mottled, compact and brittle, clay loam fragipan 48 or more inches thick. It is red in the upper 39 inches and yellowish red below that.

The natural fertility of this soil is low, and the content of organic matter is low. Except in areas where the soil has been limed, the surface layer is medium acid or strongly acid, and the subsoil is medium acid to very strongly acid. Permeability is moderate above the fragipan and is slow in the fragipan. The available water capacity is medium. The soil has good tilth; it can be worked within a wide range of moisture content. Roots and water easily penetrate to the fragipan, which restricts further penetration except along prism faces. There is a perched water table at a depth of 24 to 36 inches late in winter and early in spring.

Included with this soil in mapping are soils similar to Cane soils except that they are less than 60 inches deep to bedrock or are more than 90 inches. Also included are soils that have a slope of 8 to 12 percent and soils that have a gravelly surface layer.

This soil is moderately suited to cultivated crops. Erosion is a severe hazard, however, if cultivated crops are grown. Adapted crops include corn, soybeans, small grains, and truck crops. Clean-tilled crops that leave large amounts of residue on the surface can be grown year after year in the less sloping areas if contour cultivation and terraces are used.

This soil is well suited to hay and pasture and is used mainly for hay and pasture. Adapted pasture plants include tall fescue, white clover, lespedeza, and bermudagrass.

This soil is well suited to woodland. Shortleaf pine, loblolly pine, and sweetgum are adapted species.

This soil is moderately suited to most urban uses. Wetness is a moderate limitation for dwellings and local roads and streets. Wetness and slope are moderate limitations for small commercial buildings. These limitations can be overcome by proper engineering design and construction techniques and by drainage if needed. The slow permeability in the fragipan and wetness are severe limitations for septic tank absorption fields. These limitations generally can be overcome by increasing the size of the absorption field or by modifying it.

This soil is in capability subclass IIIe and in woodland suitability group 3o7.

8—Captina silt loam, 1 to 3 percent slopes. This is a deep, moderately well drained, nearly level soil on broad uplands and stream terraces. The slopes are smooth and convex. Individual areas range from about 6 to 500 acres in size.

Typically, the surface layer is dark brown silt loam about 8 inches thick. The upper part of the subsoil is yellowish brown silt loam about 7 inches thick. Below that, there is yellowish brown silty clay loam about 11 inches thick; a yellowish brown, compact and brittle, mottled silty clay loam fragipan about 26 inches thick; and mottled strong brown, light brownish gray, and dark red very cherty silty clay loam about 20 inches thick.

The natural fertility of this soil is low, and the content of organic matter is low. Except in areas where the soil has been limed, the surface layer is strongly acid to slightly acid, and the subsoil is extremely acid to strongly acid. Permeability is slow, and the available water capacity is medium. Tilth is good; the soils can be worked within a wide range of moisture content. The fragipan restricts root penetration and slows the movement of water through the soil. There is a perched water table at a depth of 24 to 36 inches late in winter and early in spring.

Included with this soil in mapping are small areas of Nixa, Peridge, and Noark soils and a few small areas of eroded soils.

This soil is well suited to cultivated crops. Adapted crops include corn, soybeans, small grains, and truck crops. Erosion is a moderate hazard if cultivated crops are grown. Clean-tilled crops that leave large amounts of residue on the surface can be grown year after year if contour cultivation and terraces on long slopes are used.

In most areas, the soil has been cleared and is used for hay and pasture (fig. 5). It is well suited to this use.

This soil is moderately suited to use as woodland. Shortleaf pine, red oak, and eastern redcedar are adapted species.

This soil is moderately suited to poorly suited to most urban uses. Wetness is a moderate limitation for dwellings and small commercial buildings. Low strength is a severe limitation for local roads and streets. These limitations can be overcome by proper engineering design and drainage. Slow permeability and wetness are severe limitations for septic tank absorption fields. These limitations can be overcome by increasing the size of the absorption field or by modifying the field and by installing adequate drainage.

This soil is in capability subclass IIe and in woodland suitability group 4o7.

9—Captina silt loam, 3 to 8 percent slopes. This is a deep, moderately well drained, gently sloping soil on broad upland ridges and stream terraces. Individual areas range from about 5 to 500 acres in size.

Typically, the surface layer is dark brown silt loam about 8 inches thick. The upper part of the subsoil is yellowish brown silt loam about 7 inches thick. Below that, there is yellowish brown silty clay loam about 11 inches thick; a yellowish brown, compact and brittle, mottled, silty clay loam fragipan about 26 inches thick; and mottled strong brown, light brownish gray, and dark red very cherty silty clay loam about 20 inches thick.

The natural fertility of this soil is low, and the content of organic matter is low. Except in areas where the soil

Figure 5.—Fescue pasture in an area of Captina silt loam, 1 to 3 percent slopes.

has been limed, the surface layer is strongly acid to slightly acid, and the subsoil is extremely acid to strongly acid. Permeability is slow, and the available water capacity is medium. Tilth is good; the soil can be worked within a wide range of moisture content. The fragipan restricts root penetration and slows the movement of water through the soil. There is a perched water table at a depth of 24 to 36 inches late in winter and early in spring.

Included with this soil in mapping are small areas of Nixa and Noark soils and a few small areas of eroded soils.

This soil is moderately suited to cultivated crops. Erosion is a severe hazard if cultivated crops are grown. Clean-tilled crops that leave large amounts of residue on the surface can be grown year after year in the less sloping areas if contour cultivation and terraces are used.

In most areas, the soil has been cleared and is used for hay and pasture. The soil is well suited to this use.

This soil is moderately suited to use as woodland. Adapted species include shortleaf pine, red oak, and eastern redcedar.

This soil is moderately suited to most urban uses. Low strength is a severe limitation for local roads and streets. Wetness and slope are moderate limitations for small commercial buildings. Wetness is a moderate limitation for dwellings. These limitations can be overcome by proper engineering design and drainage. Slow permeability and wetness are severe limitations for septic tank absorption fields. These limitations can be overcome by increasing the size of the absorption field or by modifying the field and by installing adequate drainage.

This soil is in capability subclass IIIe and in woodland suitability group 4o7.

10—Clarksville very cherty silt loam, 20 to 50 percent slopes. This is a deep, very cherty, somewhat excessively drained, steep to very steep soil on hillsides (fig. 6). Individual areas range from about 20 to several thousand acres in size.

Typically, the surface layer is dark brown very cherty silt loam about 4 inches thick. The subsurface layer is pale brown very cherty silt loam about 10 inches thick. The upper part of the subsoil is light yellowish brown

Figure 6.—Typical landscape of Clarksville very cherty silt loam, 20 to 50 percent slopes. The light spots are exposed chert.

very cherty silt loam about 13 inches thick. Below that, there is brown very cherty silt loam about 17 inches thick; strong brown very cherty silt loam about 13 inches thick; and mottled red and reddish yellow very cherty silty clay 15 or more inches thick.

The natural fertility of this soil is low, and the content of organic matter is low. The surface layer is very strongly acid to medium acid, and the subsoil is strongly acid or very strongly acid. Permeability is moderately rapid. The available water capacity is low because of the high content of chert, and the soil is droughty.

Included with this soil in mapping are Nixa, Noark, Moko, and Arkana soils, very narrow flood plains, small rock outcrops, and small areas where cherty limestone bedrock is at a depth of less than 3 feet.

This soil is not suited to cultivated crops or to pasture. The steep slopes and high content of chert severely limit the use of farm equipment. Erosion is a very severe hazard if the soil is cleared.

This soil is moderately suited to use as woodland, and this is the main use. White oak and shortleaf pine are adapted species. The use of equipment is severely limited, and seedling mortality is severe.

This soil is poorly suited to most urban uses and to use as septic tank absorption fields. The steep slopes are a severe limitation. This limitation is difficult or impractical to overcome.

This soil is in capability subclass VIIs and in woodland suitability group 4f9.

11—Elsah cherty silt loam, frequently flooded. This is a deep, well drained and somewhat excessively drained, nearly level soil on flood plains of small streams. Individual areas of the soil range from about 10

Figure 7.—Tall fescue pasture on Elsah cherty silt loam, frequently flooded.

to 100 acres in size. The slopes range from 0 to 2 percent.

Typically, the surface layer is brown cherty silt loam about 6 inches thick. The underlying material is mostly stratified layers of brown to dark yellowish brown very cherty silt loam to a depth of about 72 inches. Some of the individual layers are only 2 to 11 inches thick, and some are up to 22 inches thick.

The natural fertility of this soil is moderate, and the content of organic matter is moderate. The soil is medium acid to neutral throughout. Permeability is moderate. The available water capacity is medium, but deep-rooted plants can absorb water from seepage. This soil is frequently flooded for brief periods, mainly from December to May.

Included with this soil in mapping are soils similar to Elsah soils except that they have less chert throughout. Also included are Razort soils, stream channels, and soils that are only occasionally flooded.

This soil is not suited to cultivated crops because of frequent flooding. It is moderately suited to pasture and hay, and this is the main use. Adapted pasture plants include tall fescue, bermudagrass, white clover, and sorghum-sudangrass hybrids (fig. 7).

This soil is well suited to use as woodland. Black walnut, sycamore, red oak, white oak, sweetgum, and cottonwood are adapted species. Seedling mortality is moderate.

This soil is poorly suited to most urban uses. Flooding is a severe limitation for dwellings, small commercial buildings, local roads and streets, and septic tank absorption fields. Major flood control measures are needed to overcome this limitation.

This soil is in capability subclass Vw and in woodland suitability group 3f5.

12—Enders gravelly loam, 3 to 8 percent slopes. This is a deep, well drained, gently sloping soil on ridges and hillsides. Individual areas range from about 10 to 30 acres in size.

Typically, the surface layer is brown gravelly loam about 7 inches thick. The upper part of the subsoil is yellowish red silty clay about 7 inches thick, the middle part is yellowish red clay about 11 inches thick, and the bottom part is variegated red and gray clay about 22 inches thick. The underlying material is gray, weathered soft shale about 17 inches thick. Below that, there is gray and dark gray, soft shale bedrock.

The natural fertility of this soil is low, and the content of organic matter is low. The soil is strongly acid to extremely acid throughout. Permeability is very slow, and the available water capacity is medium. The surface layer is thin, and root penetration is restricted by the clayey subsoil.

Included with this soil in mapping are areas of eroded soils, areas of soils similar to Enders soils except that they are less than 36 inches deep to bedrock or more than 60 inches, and areas of Linker, Mountainburg, and Cane soils.

This soil is poorly suited to cultivated crops. Runoff is medium to rapid, and erosion is a very severe hazard if cultivated crops are grown. Adapted crops include small grains, corn, and soybeans. Clean-tilled crops that leave large amounts of residue on the surface can be grown occasionally if a close-growing cover is kept on the soil most of the time and minimum tillage, contour cultivation, and terraces are used.

This soil is moderately suited to hay and pasture and is used mainly for hay and pasture. Adapted pasture plants include bermudagrass, tall fescue, lespedeza, and white clover.

This soil is moderately suited to use as woodland. Adapted species include loblolly pine and shortleaf pine.

This soil is poorly suited to most urban uses. The shrink-swell potential is a severe limitation for dwellings and small commercial buildings. Low strength and the shrink-swell potential are severe limitations for local roads and streets. These limitations generally can be overcome by proper engineering design and construction techniques. The very slow permeability is a severe limitation for septic tank absorption fields. This limitation can be partly overcome by increasing the size of the absorption field.

This soil is in capability subclass IVe and in woodland suitability group 4o1.

13—Enders gravelly loam, 8 to 12 percent slopes. This is a deep, well drained, moderately sloping soil on ridges and hillsides. Individual areas range from about 10 to 30 acres in size.

Typically, the surface layer is brown gravelly loam about 7 inches thick. The upper part of the subsoil is yellowish red silty clay about 7 inches thick. The middle part is yellowish red clay about 11 inches thick, and the lower part is variegated red and gray clay about 22 inches thick. The underlying material is gray, weathered soft shale about 17 inches thick. Below that, there is gray and dark gray, soft shale bedrock.

The natural fertility of this soil is low, and the content of organic matter is low. The soil is strongly acid to extremely acid throughout. Permeability is very slow, and the available water capacity is medium. The surface layer is thin, and root penetration is restricted by the clayey subsoil.

Included with this soil in mapping are areas of eroded soils, stony soils, soils similar to Enders soils except that bedrock is at a depth of less than 36 inches or more than 60 inches, and Linker, Mountainburg, and Nella soils.

This soil is not suited to cultivated crops. Runoff is rapid, and erosion is a very severe hazard if cultivated crops are grown.

This soil is moderately suited to hay and pasture and is used mainly for hay and pasture. Adapted pasture plants include bermudagrass, tall fescue, lespedeza, and white clover.

This soil is moderately suited to use as woodland. Adapted species include loblolly pine and shortleaf pine.

This soil is poorly suited to most urban uses. The shrink-swell potential is a severe limitation for dwellings and small commercial buildings. Slope is another severe limitation for small commercial buildings. Low strength and the shrink-swell potential are severe limitations for local roads and streets. These limitations generally can be overcome by proper engineering design and construction techniques. The very slow permeability is a severe limitation for septic tank absorption fields. This limitation can be partly overcome by increasing the size of the absorption field.

This soil is in capability subclass VIe and in woodland suitability group 4o1.

14—Enders-Leesburg complex, 8 to 20 percent slopes. This complex consists of Enders and Leesburg soils in areas that are so intermingled that they could not be mapped separately at the scale used in mapping. The individual areas of each soil are about 1/2 acre to 4 acres in size, and the mapped areas of this complex are about 20 to several hundred acres in size. Enders soils make up about 50 percent of each mapped area, Leesburg soils make up 30 percent, and included areas make up 20 percent. The Enders soils are on mountainsides, hillsides, and ridges, and the Leesburg soils are on side slopes. Areas of this complex are broad and are on the middle and lower parts of slopes.

Typically, the surface layer of the Enders soils is dark brown stony loam about 2 inches thick. The subsurface layer is yellowish brown stony loam about 6 inches thick. The upper part of the subsoil is yellowish red silty clay about 6 inches thick, the middle part is yellowish red clay about 11 inches thick, and the lower part is variegated red and gray clay about 22 inches thick. The underlying material is gray, weathered soft shale about 17 inches thick. Below that, there is gray and dark gray, soft shale bedrock.

The natural fertility of Enders soils is low, and the content of organic matter is low. The soils are strongly acid to extremely acid throughout. Permeability is very slow, and the available water capacity is medium. Root penetration is restricted by the clayey subsoil.

Typically, the surface layer of the Leesburg soils is brown stony loam about 7 inches thick. The upper part of the subsoil is yellowish brown gravelly loam about 7 inches thick; the next part is yellowish brown gravelly clay loam about 17 inches thick; the next part is strong brown very gravelly clay loam about 16 inches thick; and the lower part is mottled strong brown, yellowish red, and brown very gravelly clay loam about 25 inches thick.

The natural fertility of Leesburg soils is low, and the content of organic matter is low. The soils are very strongly acid or strongly acid throughout. Permeability is moderate, and the available water capacity is medium. The root zone is deep. It is easily penetrated by plant roots.

Included with these soils in mapping are Nella soils, a few small areas where shale or sandstone bedrock is near the surface, and a few bouldery areas. Also included are soils that have a dark-colored surface layer.

The soils in this complex are not suited to cultivated crops. In some areas, the soils are in pasture although they are poorly suited to this use. Adapted pasture plants include tall fescue, lespedeza, and white clover. Surface stones limit the use of equipment, and erosion is a very severe hazard if the pasture is overgrazed.

Enders soils are moderately suited to use as woodland, and Leesburg soils are well suited. The main use of these soils is for trees, which are mostly low-grade hardwoods. The adapted species are shortleaf pine and loblolly pine, and on Leesburg soils, white oak and red oak are also adapted. The use of equipment is moderately limited. On Enders soils, erosion is a slight hazard, and seedling mortality is slight.

Enders soils are poorly suited to most urban uses. Low strength and the shrink-swell potential are severe limitations for local roads and streets. Slope and the shrink-swell potential are severe limitations for small commercial buildings, and the shrink-swell potential is a severe limitation for dwellings. These limitations can be overcome by proper engineering design and construction techniques. The very slow permeability is a severe limitation for septic tank absorption fields.

Leesburg soils are moderately suited to most urban uses. Slope is a moderate limitation for dwellings and for local roads and streets, and it is a severe limitation for small commercial buildings. This limitation can be overcome by proper engineering design and construction techniques. Slope is a moderate limitation for septic tank absorption fields. This limitation is difficult and expensive to overcome.

The soils are in capability subclass VIIs. Enders soils are in woodland suitability group 4x2, and Leesburg soils are in group 3x8.

15—Enders-Leesburg complex, 20 to 40 percent slopes. This complex consists of Enders and Leesburg soils in areas that are so intermingled that they could not be mapped separately at the scale used in mapping. The individual areas of each soil are about 1/2 acre to 4 acres in size, and the mapped areas of this complex are about 20 to several hundred acres in size. Enders soils make up about 45 percent of each mapped area, Leesburg soils make up 30 percent, and included areas make up 25 percent. The Enders soils are on mountainsides, hillsides, and ridges, and the Leesburg soils are on side slopes. Areas of this complex are broad and are on the middle and lower parts of slopes.

Typically, the surface layer of the Enders soils is dark brown stony loam about 2 inches thick. The subsurface layer is yellowish brown stony loam about 6 inches thick. The upper part of the subsoil is yellowish red silty clay about 6 inches thick, the middle part is yellowish red clay about 11 inches thick, and the lower part is variegated red and gray clay about 22 inches thick. The underlying material is gray, weathered soft shale about 17 inches thick. Below that, there is gray and dark gray, soft shale bedrock.

The natural fertility of Enders soils is low, and the content of organic matter is low. The soils are strongly acid to extremely acid throughout. Permeability is very slow, and the available water capacity is medium. Root penetration is restricted by the clayey subsoil.

Typically, the surface layer of the Leesburg soils is brown stony loam about 7 inches thick. The upper part of the subsoil is yellowish brown gravelly loam about 7 inches thick; the next part is yellowish brown gravelly clay loam about 17 inches thick; the next part is strong brown very gravelly clay loam about 16 inches thick; and the lower part is mottled strong brown, yellowish red, and brown very gravelly clay loam about 25 inches thick.

The natural fertility of Leesburg soils is low, and the content of organic matter is low. The soil is very strongly acid or strongly acid throughout. Permeability is moderate, and the available water capacity is medium. The root zone is deep. It is easily penetrated by plant roots.

Included with these soils in mapping are Nella soils, a few small areas where shale or sandstone bedrock is near the surface, and bouldery areas. Also included are soils that have a dark-colored surface layer.

The soils in this complex are not suited to cultivated crops or to pasture. Surface stones and the slope severely limit the use of equipment. Erosion is a very severe hazard.

Enders soils are poorly suited to use as woodland, and Leesburg soils are moderately suited. The main use of these soils, nevertheless, is for trees, which are mostly low-grade hardwoods. The adapted species are shortleaf pine and loblolly pine, and on Leesburg soils, white oak and red oak are also adapted. The use of equipment is severely limited, and erosion is a moderate hazard. Seedling mortality is moderate.

Enders soils are poorly suited to most urban uses. The shrink-swell potential and slope are severe limitations for dwellings and small commercial buildings. The slope,

shrink-swell potential, and low strength are severe limitations for local roads and streets. These limitations are difficult and expensive to overcome. The very slow permeability and slope are severe limitations for septic tank absorption fields. These limitations are difficult or impractical to overcome.

Leesburg soils also are 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 or impractical to overcome.

The soils are in capability subclass VIIs. Enders soils are in woodland suitability group 5r3, and Leesburg soils are in group 4r9.

16—Linker loam, 3 to 8 percent slopes. This is a moderately deep, well drained, gently sloping soil on mountaintops and ridgetops. The slopes are smooth and convex. Individual areas range from about 6 to 200 acres in size.

Typically, the surface layer is dark brown loam about 6 inches thick. The upper part of the subsoil is yellowish red loam and clay loam about 14 inches thick, and the lower part is mottled red and pale brown clay loam about 9 inches thick. Below that, there is soft, acid sandstone bedrock about 6 inches thick, and below that, there is hard sandstone.

The natural fertility of this soil is low, and the content of organic matter is low. The soil is strongly acid to extremely acid throughout. Permeability is moderate, and the available water capacity is low. Tilth is good; the soil can be worked within a wide range of moisture content. The root zone is moderately deep. It is easily penetrated by roots.

Included with this soil in mapping are a few small areas of Cane and Mountainburg soils. Cane soils are deep and have a fragipan. Mountainburg soils are less than 20 inches deep to bedrock. Also included are a few small areas of soils that are similar to Linker soils except that they are 41 to 61 inches deep to bedrock and a few areas where the bedrock is soft to a depth of 5 to 8 feet.

This soil is moderately suited to cultivated crops. Erosion is a severe hazard if cultivated crops are grown. Adapted crops include corn, soybeans, and small grains. Clean-tilled crops that leave large amounts of residue on the surface can be grown year after year in the less sloping areas if minimum tillage, contour cultivation, and terraces are used.

This soil is moderately suited to hay and pasture and is used mainly for hay and pasture. Adapted pasture plants include bermudagrass, tall fescue, white clover, and lespedeza.

The soil is moderately suited to use as woodland. Shortleaf pine, loblolly pine, and eastern redcedar are adapted species.

This soil is moderately suited to most urban uses. The moderate depth to bedrock is a moderate limitation for dwellings and for local roads and streets. Slope and the moderate depth to bedrock are moderate limitations for small commercial buildings. These limitations can be overcome by proper engineering design and construction techniques. The moderate depth to bedrock is a severe limitation for septic tank absorption fields. This limitation is difficult or impractical to overcome.

This soil is in capability subclass IIIe and in woodland suitability group 4o1.

17—Linker-Mountainburg complex, 3 to 8 percent slopes. This complex consists of Linker and Mountainburg soils in areas that are so intermingled that they could not be mapped separately at the scale used in mapping. The individual areas of each soil are about 1/2 acre to 4 acres in size, and the mapped areas of this complex are about 20 to a few hundred acres in size. Linker soils make up about 55 percent of each mapped area, Mountainburg soils make up about 35 percent, and included soils make up about 10 percent. The soils are on gently sloping hillsides.

Typically, the surface layer of the Linker soils is brown stony fine sandy loam about 6 inches thick. The upper part of the subsoil is yellowish red loam and clay loam about 14 inches thick, and the lower part is mottled red and pale brown clay loam about 9 inches thick. Below that, there is soft, acid sandstone bedrock about 6 inches thick. Hard sandstone bedrock is at a depth of about 35 inches.

The natural fertility of Linker soils is low, and the content of organic matter is low. The soils are strongly acid to extremely acid throughout. Permeability is moderate, and the available water capacity is low. The stony surface layer limits the use of equipment for tilling. The root zone is moderately deep. It is easily penetrated by roots.

Typically, the surface layer of the Mountainburg soils is very dark grayish brown very stony fine sandy loam about 3 inches thick. The subsurface layer is yellowish brown very stony fine sandy loam about 6 inches thick. The subsoil is strong brown very stony sandy clay loam about 8 inches thick. Below that, there is soft, acid sandstone bedrock about 5 inches thick. Hard sandstone bedrock is at a depth of about 22 inches.

The natural fertility of Mountainburg soils is low, and the content of organic matter is low. The surface layer is medium acid to very strongly acid, and the subsoil is strongly acid or very strongly acid. Permeability is moderately rapid, and the available water capacity is very low because of the shallowness of the soil and the high content of stones. Tilling is not practical because of the stones. The root zone is less than 20 inches deep. It is easily penetrated by roots.

Included with these soils in mapping are small areas where the soil is not stony and small areas of Enders soils.

The soils in this complex are not suited to cultivated crops. They are moderately suited to pasture and are used for pasture. Adapted pasture plants include bermudagrass, tall fescue, lespedeza, and white clover.

Linker soils are moderately suited to use as woodland, and Mountainburg soils are poorly suited. These soils, nevertheless, are used for trees, which are largely low-grade hardwoods. The adapted species are shortleaf pine, loblolly pine, and eastern redcedar. The use of equipment is moderately limited on Linker soils and is severely limited on Mountainburg soils. On Mountainburg soils, erosion is a moderate hazard, and seedling mortality is moderate.

Linker soils are moderately suited to most urban uses. The moderate depth to bedrock is a moderate limitation, but this generally can be overcome by proper engineering design and construction techniques. Depth to bedrock is a severe limitation for septic tank absorption fields. This limitation is difficult or impractical to overcome.

Mountainburg soils are poorly suited to most urban uses. Shallowness to bedrock and large surface stones are severe limitations for most urban uses and for septic tank absorption fields. These limitations are very difficult to overcome.

The soils are in capability subclass VIs. Linker soils are in woodland suitability group 4x2, and Mountainburg soils are in group 5x3.

18—Linker-Mountainburg complex, 8 to 20 percent slopes. This complex consists of Linker and Mountainburg soils in areas that are so intermingled that they could not be mapped separately at the scale used in mapping. The individual areas of each soil are about 1/2 acre to 4 acres in size, and the mapped areas of this complex are about 20 to a few hundred acres in size. Linker soils make up about 55 percent of each mapped area, Mountainburg soils make up 35 percent, and included soils make up about 10 percent. The soils are on moderately sloping to moderately steep uplands. On Linker soils, the slopes range from 8 to 15 percent, and on Mountainburg soils, the slopes range from 8 to 20 percent.

Typically, the surface layer of the Linker soils is brown stony fine sandy loam about 6 inches thick. The upper part of the subsoil is yellowish red loam and clay loam about 14 inches thick, and the lower part is mottled red and pale brown clay loam about 9 inches thick. Acid sandstone bedrock is at a depth of about 29 inches. It is soft in the upper 6 inches and is hard below that.

The natural fertility of Linker soils is low, and the content of organic matter is low. The soil is strongly acid to extremely acid throughout. Permeability is moderate, and the available water capacity is low. The stony surface layer limits the use of equipment for tilling. The root zone is moderately deep. It is easily penetrated by roots.

Typically, the surface layer of the Mountainburg soils is very dark grayish brown very stony fine sandy loam about 3 inches thick. The subsurface layer is yellowish brown very stony fine sandy loam about 6 inches thick. The subsoil is strong brown very stony sandy clay loam about 81 inches thick. Acid sandstone bedrock is at a depth of about 17 inches. It is soft in the upper 5 inches and is hard below that.

The natural fertility of Mountainburg soils is low, and the content of organic matter is low. The surface layer is very strongly acid to medium acid, and the subsoil is very strongly acid or strongly acid. Permeability is moderately rapid, and the available water capacity is very low because of the shallowness of the soil and the high content of stones. Tilling is not practical because of the high content of stones. The root zone is less than 20 inches deep. It is easily penetrated by roots.

Included with these soils in mapping are small areas where the soil is not stony and small areas of Enders soils.

The soils in this complex are not suited to cultivated crops. They are poorly suited to pasture; however, they are used for pasture. Adapted pasture plants include bermudagrass, tall fescue, lespedeza, and white clover.

Linker soils are moderately suited to use as woodland, and Mountainburg soils are poorly suited. These soils, nevertheless, are used for trees, which are largely low-grade hardwoods. The adapted species are shortleaf pine, loblolly pine, and eastern redcedar. On Linker soils, the use of equipment is moderately limited. On Mountainburg soils, the use of equipment is severely limited, erosion is a moderate hazard, and seedling mortality is moderate.

Linker soils are moderately suited to most urban uses. The moderate depth to bedrock and slope are moderate limitations for dwellings and local roads and streets. Slope is a severe limitation for small commercial buildings. These limitations generally can be overcome by proper engineering design and construction techniques. Depth to bedrock is a severe limitation for septic tank absorption fields. This limitation is difficult or impractical to overcome.

Mountainburg soils are poorly suited to most urban uses. Shallowness to bedrock, large surface stones, and slope are severe limitations for most urban uses and for septic tank absorption fields. These limitations are very difficult to overcome.

The soils are in capability subclass VIs. Linker soils are in woodland suitability group 4x2, and Mountainburg soils are in group 5x3.

19—Mayes silt loam, 0 to 2 percent slopes. This is a deep, somewhat poorly drained, level to nearly level soil on broad uplands. Individual areas range from 5 to 200 acres in size.

Typically, the surface layer is very dark gray silt loam about 8 inches thick. The subsurface layer is very dark

grayish brown silt loam about 6 inches thick. The upper part of the subsoil is dark grayish brown, mottled clay about 16 inches thick, and the lower part is grayish brown, mottled clay 30 or more inches thick.

The natural fertility of this soil is moderate, and the content of organic matter is moderate. The surface layer is slightly acid or neutral, and the subsoil is neutral to moderately alkaline. Permeability is very slow, and the available water capacity is high. The root zone is deep. It is easily penetrated by roots to the clayey subsoil, which restricts further penetration. A perched water table is at a depth of 12 to 24 inches late in winter and early in spring.

Included with this soil in mapping are a few small areas of Arkana, Captina, and Eldon soils. Arkana soils are moderately deep and cherty, Captina soils have a fragipan, and Eldon soils are cherty.

This soil is well suited to cultivated crops. Adapted crops include corn and grain sorghum. Surface drainage is necessary. After rain, tilling commonly is delayed for a few days because of excess water.

This soil is well suited to pasture, and this is the main use.

This soil is poorly suited to use as woodland. Water oak, sweetgum, and green ash are adapted species.

This soil is poorly suited to most urban uses. The high shrink-swell potential and low strength are severe limitations for local roads and streets. Wetness and the shrink-swell potential are severe limitations for small commercial buildings and dwellings. The very slow permeability and wetness are severe limitations for septic tank absorption fields. These limitations can be partly overcome by proper engineering design and construction techniques.

This soil is in capability subclass IIw and in woodland suitability group 5w6.

Figure 8.—Prairie plants and eastern redcedar in an area of Moko-Rock outcrop complex, 12 to 50 percent slopes.

20—Moko-Rock outcrop complex, 12 to 50 percent slopes. This complex consists of Moko soil and Rock outcrop in areas that are so intermingled that they could not be mapped separately at the scale used in mapping. The individual areas of soil or Rock outcrop are about 1 acre to 4 acres in size, and the mapped areas of this complex are about 40 to 1,000 acres in size. Moko soil makes up about 60 percent of each mapped area, Rock outcrop makes up 30 percent, and included soils make up 10 percent. Areas of this complex are mainly on hillsides.

Typically, the surface layer of the Moko soil is very dark gray very stony silt loam about 3 inches thick. The subsurface layer is very dark gray very stony silty clay loam about 8 inches thick over hard dolomitic bedrock.

The natural fertility of this soil is moderate, and the content of organic matter is moderate. The soil is neutral or mildly alkaline throughout. Permeability is moderate, and the available water capacity is very low.

Typically, Rock outcrop consists of hard dolomite or limestone.

Included with this complex in mapping are small areas of Arkana soils.

The Moko soil is not suited to cultivated crops, pasture, or hay. Limestone outcrops, shallowness to rock, and the moderately steep to very steep slopes are limitations that are very difficult to overcome. Because erosion is a very severe hazard, the native vegetation should not be disturbed. This soil is mainly in native prairie plants and eastern redcedar (fig. 8).

This soil is poorly suited to the commercial production of trees. It is better suited to use as habitat for wildlife, to production of cedar posts, and to use as recreation areas.

This soil is poorly suited to most urban uses. Shallowness, slope, and large stones are severe limitations. These limitations are difficult or impractical to overcome.

The Moko soil is in capability subclass VIIs and in woodland suitability group 5x3.

21—Mountainburg gravelly fine sandy loam, 8 to 12 percent slopes. This is a shallow, well drained, moderately sloping soil on hilltops, mountaintops, and ridges. Individual areas range from about 5 to 50 acres in size.

Typically, the surface layer is very dark grayish brown gravelly fine sandy loam about 3 inches thick. The subsurface layer is yellowish brown gravelly fine sandy loam about 6 inches thick. The subsoil is strong brown very gravelly sandy clay loam about 8 inches thick. Acid sandstone bedrock is at a depth of 17 inches. It is soft in the upper 5 inches and is hard below that.

The natural fertility of this soil is low, and the content of organic matter is low. The surface layer is medium acid to very strongly acid, and the subsoil is strongly acid or very strongly acid. Permeability is moderately rapid. The available water capacity is very low because of the shallowness of the soil and the high content of gravel. The root zone is less than 20 inches thick. It is easily penetrated by roots.

Included with this soil in mapping are a few small areas of Linker, Cane, and Enders soils in positions on the landscape similar to those of the Mountainburg soil. Also included are a few small areas of soils that have a stony surface layer and a few small areas of Rock outcrop.

This soil is not suited to cultivated crops and is poorly suited to use as pasture. Nevertheless, the soil is used mainly as pasture. Adapted pasture plants include little bluestem, big bluestem, bermudagrass, and tall fescue. This soil is droughty, and erosion is a very severe hazard. Gravel on the surface makes seedbed preparation difficult.

This soil is poorly suited to use as woodland. Shortleaf pine and eastern redcedar are adapted species. Seedling mortality is moderate because of the very low available water capacity.

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

This soil is in capability subclass VIe and in woodland suitability group 5d2.

22—Mountainburg very stony fine sandy loam, 8 to 20 percent slopes. This is a shallow, well drained, moderately sloping to moderately steep soil. It is mainly on the top of hills and mountains. Individual areas range from about 10 to 200 acres in size.

Typically, the surface layer is very dark grayish brown very stony fine sandy loam about 3 inches thick. The subsurface layer is yellowish brown very stony fine sandy loam about 6 inches thick. The subsoil is strong brown very stony sandy clay loam about 8 inches thick. Below that, there is soft, acid sandstone bedrock about 5 inches thick. Hard sandstone bedrock is at a depth of about 22 inches.

The natural fertility of this soil is low, and the content of organic matter is low. The surface layer is medium acid to very strongly acid, and the subsoil is strongly acid or very strongly acid. Permeability is moderately rapid. The available water capacity is very low because of the shallowness of the soil and the high content of stones. The root zone is less than 20 inches thick. It is easily penetrated by roots.

Included with this soil in mapping are a few small areas of Enders and Linker soils in positions on the landscape similar to those of the Mountainburg soil. Also included are areas where there are outcrops of sandstone bedrock.

This soil is not suited to cultivated crops and is poorly suited to pasture and hay. Surface stones and slope limit the use of farm equipment, and the soil is droughty. In many areas, the soil is used as rangeland, or it is idle. On most of the rest of the soil, the vegetation is an open stand of poor quality trees.

This soil is best suited to use as native pasture, habitat for wildlife, and recreation areas.

This soil is poorly suited to use as woodland. Shortleaf pine and eastern redcedar are adapted species. The use of equipment is severely limited, erosion is a moderate hazard, and seedling mortality is moderate.

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

This soil is in capability subclass VIIs and in woodland suitability group 5x3.

23—Mountainburg very stony fine sandy loam, 20 to 40 percent slopes. This is a shallow, well drained, steep soil on hillsides and mountainsides. Individual areas range from about 20 to 200 acres in size.

Typically, the surface layer is very dark grayish brown very stony fine sandy loam about 3 inches thick. The subsurface layer is yellowish brown very stony fine sandy loam about 6 inches thick. The subsoil is strong brown very stony sandy clay loam about 8 inches thick. Below that, there is soft, acid sandstone bedrock about 5 inches thick. Hard sandstone bedrock is at a depth of about 22 inches.

The natural fertility of this soil is low, and the content of organic matter is low. The surface layer is medium acid to very strongly acid, and the subsoil is strongly acid or very strongly acid. Permeability is moderately rapid. The available water capacity is very low because of the shallowness of the soil and the large stones.

Included with this soil in mapping are a few small areas of Enders, Leesburg, and Nella soils in positions on the landscape similar to those of the Mountainburg soil. Also included are areas where there are sandstone ledges.

This soil is not suited to cultivated crops or to pasture and hay. Surface stones, rock ledges, and steep slopes severely limit the use of farm equipment, and the soil is droughty. Erosion is a very severe hazard if the native vegetation is disturbed.

The soil is best suited to native pasture and to use as habitat for wildlife.

This soil is poorly suited to use as woodland. Shortleaf pine and eastern redcedar are adapted species. The use of equipment is severely limited, erosion is a severe hazard, and seedling mortality is moderate.

This soil is poorly suited to most urban uses. Shallowness, large stones, and slope are severe limitations for dwellings, small commercial buildings, local roads and streets, and septic tank absorption fields. These limitations are very difficult and impractical to overcome.

This soil is in capability subclass VIIs and in woodland suitability group 5x3.

24—Nella-Mountainburg complex, 20 to 40 percent slopes. This complex consists of Nella and Mountainburg soils in areas that are so intermingled that they could not be mapped separately at the scale used in mapping. The individual areas of each soil are about 1/2 acre to 5 acres in size and in most places are 50 to 150 feet wide and several hundred feet long. The mapped areas of this complex are about 40 to more than 500 acres in size. They are long and are about 400 to 500 feet wide. Nella soils make up about 50 percent of each mapped area, Mountainburg soils make up 25 percent, and included areas make up 25 percent. The soils are on the upper part of mountainsides.

Typically, the surface layer of the Nella soils is dark grayish brown stony fine sandy loam about 3 inches thick. The subsurface layer is yellowish brown stony fine sandy loam about 7 inches thick. The upper part of the subsoil is yellowish brown stony loam about 7 inches thick, the middle part is yellowish red stony clay loam about 10 inches thick, and the lower part is yellowish red, mottled stony loam about 40 or more inches thick.

The natural fertility of Nella soils is low, and the content of organic matter is low. The soil is very strongly acid or strongly acid throughout. Permeability is moderate, and the available water capacity is medium. The root zone is deep. It is easily penetrated by roots.

Typically, the surface layer of the Mountainburg soils is very dark grayish brown very stony fine sandy loam about 3 inches thick. The subsurface layer is yellowish brown very stony fine sandy loam about 6 inches thick. The subsoil is strong brown very stony sandy clay loam about 8 inches thick. Acid sandstone bedrock is at a depth of about 17 inches. It is soft in the upper 5 inches and is hard below that.

The natural fertility of Mountainburg soils is low, and the content of organic matter is low. The surface layer is very strongly acid to medium acid, and the subsoil is very strongly acid or strongly acid. Permeability is moderately rapid. The available water capacity is very low because of the shallowness of the soil and the content of stones. The root zone is less than 20 inches deep. It is easily penetrated by roots.

Also included in mapping are small areas of Leesburg soils, prominent sandstone bluffs, and soils similar to Nella soils except that they have a dark brown surface layer about 4 to 6 inches thick.

The soils in this complex are not suited to cultivated crops or to pasture. The native vegetation should not be disturbed because erosion is a very severe hazard.

Nella soils are moderately suited to use as woodland, and Mountainburg soils are poorly suited. The main use of these soils, nevertheless, is for trees, which are mostly low-grade hardwoods and redcedars. The use of equipment is severely limited, and erosion is a severe hazard. On Mountainburg soils, seedling mortality is moderate. On Nella soils, the adapted species include shortleaf pine, loblolly pine, and red oak.

On Nella soils, slope is a severe limitation for dwellings, small commercial buildings, local roads and streets, and septic tank absorption fields. On Mountainburg soils, shallowness to rock, 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 and impractical to overcome.

The soils are in capability subclass VIIs. Nella soils are in woodland suitability group 4x9, and Mountainburg soils are in group 5x3.

25—NIxa very cherty silt loam, 3 to 8 percent slopes. This is a deep, moderately well drained, gently sloping soil on ridgetops. Individual areas range from about 5 to 200 acres in size.

Typically, the surface layer is very dark grayish brown very cherty silt loam about 2 inches thick. The subsurface layer is brown very cherty silt loam about 7 inches thick. The upper part of the subsoil is yellowish brown very cherty silt loam about 12 inches thick; the middle part is a compact, brittle, strong brown, mottled, very cherty silt loam fragipan about 14 inches thick; and the lower part is mottled red and light gray very cherty silty clay about 37 inches thick.

The natural fertility of this soil is low, and the content of organic matter is low. The soil is strongly acid or very strongly acid except in areas where the surface layer has been limed. Permeability is very slow, and the available water capacity is low. The soil is droughty because of the high content of chert fragments, and tilling is difficult. The fragipan restricts root penetration and slows the movement of water through the soil.

Included with this soil in mapping are small areas where the slopes are less than 3 percent or more than 8 percent. Also included are small areas of Captina and Noark soils.

This soil is moderately suited to cultivated crops. Adapted crops include small grains. The main limitations are the high content of chert and the shallowness of the rooting zone. Erosion is a severe hazard. Crops that leave large amounts of residue on the surface can be grown year after year on the less sloping parts if contour cultivation and terracing are used.

In most areas, the soil is used for hay and pasture; it is moderately suited to hay and pasture. Adapted pasture plants include tall fescue, white clover, and bermudagrass.

This soil is moderately suited to shortleaf pine, loblolly pine, eastern redcedar, red oak, and white oak (fig. 9). Erosion is a slight hazard. The use of equipment is slightly limited, and seedling mortality is moderate.

This soil is moderately suited to most urban uses. Slope is a moderate limitation for small commercial buildings. The very slow permeability is a severe limitation for septic tank absorption fields. This limitation is difficult to overcome.

This soil is in capability subclass IIIs and in woodland suitability group 4f8.

26—NIxa very cherty silt loam, 8 to 12 percent slopes. This is a deep, moderately well drained, moderately sloping soil on long narrow ridgetops. Individual areas range from about 10 to 2,000 acres in size.

Typically, the surface layer is very dark grayish brown very cherty silt loam about 2 inches thick. The subsurface layer is brown very cherty silt loam about 7 inches thick. The upper part of the subsoil is yellowish brown very cherty silt loam about 12 inches thick; the middle part is a compact and brittle, strong brown, mottled, very cherty silt loam fragipan about 14 inches thick; and the lower part is mottled red and light gray very cherty silty clay about 37 inches thick.

The natural fertility of this soil is low, and the content of organic matter is low. The soil is strongly acid or very strongly acid except areas where the surface layer has been limed. Permeability is very slow, and the available water capacity is low. The soil is droughty because of the high content of chert fragments, and tilling is difficult. The fragipan restricts root penetration and slows the movement of water through the soil.

Included with this soil in mapping are small areas where the slopes are less than 8 percent or are more than 12 percent and areas of Clarksville, Noark, and Arkana soils.

This soil is poorly suited to cultivated crops. The main limitation is the high content of chert. Erosion is a very severe hazard. Crops that leave a large amount of residue on the surface may be grown occasionally if a close-growing cover is kept on the soil most of the time.

In most areas the soil is used for hay and pasture; it is moderately suited to hay and pasture. Adapted plants include tall fescue, white clover, lespedeza, and bermudagrass.

This soil is moderately suited to shortleaf pine, loblolly pine, eastern redcedar, red oak, and white oak. Erosion is a slight hazard. The use of equipment is slightly limited, and seedling mortality is moderate.

This soil is moderately 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. These limitations can be overcome by proper engineering design and construction techniques. The very slow permeability is a severe

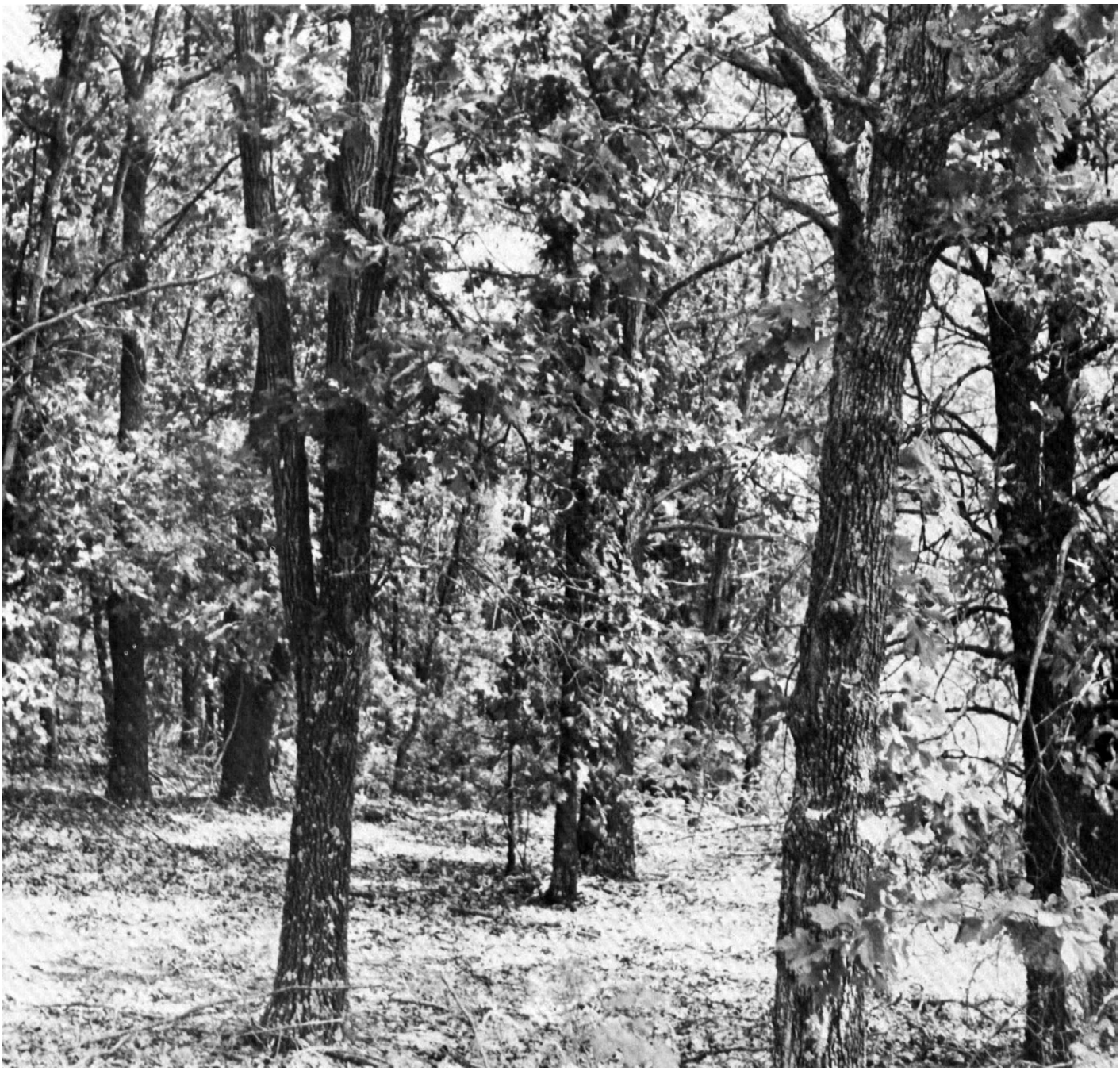


Figure 9.—Low-grade hardwood trees on Nixa very cherty silt loam, 3 to 8 percent slopes.

limitation for septic tank absorption fields. This limitation is difficult to overcome.

This soil is in capability subclass IVs and in woodland suitability group 4f8.

27—Noark very cherty silt loam, 3 to 8 percent slopes. This is a deep, well drained, gently sloping soil on ridgetops. Individual areas range from about 10 to 500 acres in size.

Typically, the surface layer is dark grayish brown very cherty silt loam about 5 inches thick. The subsurface layer is yellowish brown very cherty silt loam about 7 inches thick. The upper part of the subsoil is yellowish red very cherty silty clay loam about 8 inches thick, the middle part is red very cherty silty clay about 13 inches thick, and the lower part is dark red very cherty clay about 39 or more inches thick.

The natural fertility of this soil is low, and the content of organic matter is low. The surface layer is slightly acid to strongly acid except in areas where the soil has been limed. The subsoil is strongly acid or very strongly acid. Permeability is moderate, and the available water capacity is medium. The soil is difficult to till because of the high content of chert. The root zone is deep. It is easily penetrated by roots.

Included with this soil in mapping are areas of soils similar to Noark soils except that they are less than 60 inches deep to chert or limestone bedrock. Also included are small areas of Nixa, Captina, and Arkana soils.

This soil is moderately suited to cultivated crops. Adapted crops include small grains. The soil is limited because of the high content of chert and the slopes. Erosion is a severe hazard. Clean-tilled crops that leave large amounts of residue on the surface can be grown year after year in the less sloping areas if contour cultivation and terraces are used.

In most areas, the soil is used for hay and pasture. It is moderately suited to hay and pasture. Adapted plants include tall fescue, bermudagrass, white clover, and lespedeza.

This soil is moderately suited to shortleaf pine, eastern redcedar, red oak, and white oak. Erosion is a slight hazard. The use of equipment is slightly limited, and seedling mortality is moderate.

This soil is well suited to moderately suited to most urban uses. The limitations for dwellings and for local roads and streets are slight. Slope is a moderate limitation for small commercial buildings. This limitation can be overcome by proper engineering design and construction techniques. The moderate permeability is a moderate limitation for septic tank absorption fields. This limitation can be overcome by proper engineering design.

This soil is in capability subclass IIIe and in woodland suitability group 4f8.

28—Noark very cherty silt loam, 8 to 20 percent slopes. This is a deep, well drained, moderately sloping to moderately steep soil on hillsides. Individual areas range from about 20 to several thousand acres in size.

Typically, the surface layer is dark grayish brown very cherty silt loam about 5 inches thick. The subsurface layer is yellowish brown very cherty silt loam about 7 inches thick. The upper part of the subsoil is yellowish red very cherty silty clay loam about 8 inches thick, the middle part is red very cherty silty clay about 13 inches thick, and the lower part is dark red very cherty clay about 39 or more inches thick.

The natural fertility of this soil is low, and the content of organic matter is low. The surface layer is slightly acid to strongly acid except in areas where the soil has been limed. The subsoil is strongly acid or very strongly acid. Permeability is moderate, and the available water capacity is medium. The root zone is deep. It can be easily penetrated by roots.

Included with this soil in mapping are areas of soils similar to Noark soils except that they have chert or limestone bedrock at a depth of less than 60 inches. Also included are areas of Nixa, Clarksville, Arkana, and Moko soils.

This soil is not suited to cultivated crops. It is limited because of the high content of chert, the slope, and the rapid runoff. Erosion is a very severe hazard.

This soil is moderately suited to hay and pasture, and this is the main use. Adapted pasture plants include tall fescue, white clover, lespedeza, and bermudagrass.

This soil is moderately suited to shortleaf pine, eastern redcedar, red oak, and white oak. The use of equipment is moderately limited, and seedling mortality is moderate.

This soil is moderately 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. These limitations can be overcome by proper engineering design. Slope and the moderate permeability are moderate limitations for septic tank absorption fields. These limitations can be overcome by proper engineering design and construction techniques.

This soil is in subclass VIe and in woodland suitability group 4f8.

29—Noark very cherty silt loam, 20 to 40 percent slopes. This is a deep, well drained, steep soil on hillsides. Individual areas range from about 10 to 500 acres in size.

Typically, the surface layer is dark grayish brown very cherty silt loam about 5 inches thick. The subsurface layer is yellowish brown very cherty silt loam about 7 inches thick. The upper part of the subsoil is yellowish red very cherty silty clay loam about 8 inches thick, the middle part is red very cherty silty clay about 13 inches thick, and the lower part is dark red very cherty clay about 39 or more inches thick.

The natural fertility of this soil is low, and the content of organic matter is low. The surface layer is slightly acid to strongly acid except in areas where the soil has been limed. The subsoil is strongly acid or very strongly acid. Permeability is moderate, and the available water capacity is medium. The root zone is deep. It is easily penetrated by roots.

Included with this soil in mapping are a few small areas where there are limestone outcrops and areas of soils similar to Noark soils except that they have bedrock

at a depth of less than 60 inches. Also included are small areas of Clarksville, Arkana, and Moko soils.

This soil is not suited to cultivated crops or to pasture. It is severely limited because of the steep slopes. Erosion is a very severe hazard if the soil is cleared.

This soil is best suited to use as woodland and habitat for wildlife, and these are the main uses. This soil is moderately suited to shortleaf pine, loblolly pine, eastern redcedar, red oak, and white oak. Erosion is a moderate hazard. The use of equipment is severely limited, and seedling mortality is moderate.

This soil is poorly suited to most urban uses. Steepness of slope is a severe limitation that is difficult or impractical to overcome.

This soil is in subclass VIIs and in woodland suitability group 4r9.

30—Peridge silt loam, 3 to 8 percent slopes. This is a deep, well drained, gently sloping soil on stream terraces and broad uplands. The slopes are smooth and convex. Individual areas are mostly 10 to 40 acres in size.

Typically, the surface layer is dark brown silt loam about 8 inches thick. The upper part of the subsoil is yellowish red silt loam about 20 inches thick, the middle part is red silty clay loam about 25 inches thick, and the lower part is mottled yellowish red, pale brown, and brown silty clay loam about 21 or more inches thick.

The natural fertility of this soil is moderate, and the content of organic matter is low. The soil is medium acid to very strongly acid throughout except in areas where the surface layer has been limed. Permeability is moderate, and the available water capacity is high. Tilth is good; the soil can be worked within a wide range of moisture content. The root zone is deep. It can be easily penetrated by roots.

Included with this soil in mapping are areas where the soil is eroded, and plowing has mixed the surface layer with the subsoil material. Also included are a few shallow gullies, areas of soils similar to Peridge soils except that they are 50 to 60 inches deep to bedrock, and areas of Britwater, Captina, and Razort soils.

This soil is moderately suited to cultivated crops. Adapted crops include corn, soybeans, small grains, and truck crops. Erosion is a severe hazard if the soil is cultivated. Clean-tilled crops that leave large amounts of residue on the surface can be grown year after year in the less sloping areas if contour cultivation and terraces are used.

This soil is well suited to hay and pasture, and it is used mainly for hay and pasture. Adapted pasture plants include tall fescue, white clover, bermudagrass, alfalfa, and lespedeza.

This soil is well suited to loblolly pine, shortleaf pine, red oak, white oak, black walnut, and white ash.

This soil is moderately suited to most urban uses. Low strength is a severe limitation for local roads and streets. Slope is a moderate limitation for small commercial buildings. These limitations can be overcome by proper engineering design and construction techniques. The moderate permeability is a moderate limitation for septic tank absorption fields. This limitation can be overcome by increasing the size of the absorption field or by modifying the field.

This soil is in capability subclass IIIe and in woodland suitability group 3o7.

31—Portia loam, 3 to 8 percent slopes. This is a deep, well drained, gently sloping soil on broad uplands, stream terraces, and foot slopes. The slopes are smooth and convex. Individual areas range from about 10 to 500 acres.

Typically, the surface layer is brown loam about 7 inches thick. The upper part of the subsoil is dark brown silt loam about 5 inches thick; the next part is yellowish red sandy clay loam about 12 inches thick; the next part is red clay loam about 31 inches thick; and the lower part is red gravelly clay loam about 17 or more inches thick.

The natural fertility of this soil is low, and the content of organic matter is low. Except in areas where the soil has been limed, the surface layer is slightly acid or medium acid. The subsoil is medium acid to very strongly acid. Permeability is moderately slow, and the available water capacity is medium to high. The soil has good tilth and can be worked within a wide range of moisture content. The root zone is deep. It is easily penetrated by roots.

Included with this soil in mapping are areas of Britwater and Peridge soils, areas of eroded soils where plowing has mixed the surface layer and subsoil, and small gravelly areas.

This soil is moderately suited to cultivated crops. Adapted crops include corn, soybeans, small grains, and truck crops. The soil is limited because of the slope and the content of stones in the adjacent soils. Erosion is a severe hazard if cultivated crops are grown. Clean-tilled crops that leave large amounts of residue on the surface can be grown year after year in the less sloping areas if contour cultivation and terraces are used.

In most areas, the soil is used for hay and pasture. The soil is well suited to hay and pasture. Adapted pasture plants include tall fescue, white clover, bermudagrass, and lespedeza.

This soil is well suited to use as woodland. Shortleaf pine, loblolly pine, white oak, red oak, sweetgum, and eastern redcedar are adapted species.

This soil is well suited to moderately suited to most urban uses. Slope is a moderate limitation for small commercial buildings. This limitation can be overcome by proper engineering design and construction techniques. The moderately slow permeability is a severe limitation for septic tank absorption fields. This limitation can be overcome by increasing the size of the absorption field.

This soil is in capability subclass IIIe and in woodland suitability group 3o7.

32—Ramsey-Lily complex, 20 to 40 percent slopes. This complex consists of Ramsey and Lily soils in areas that are so intermingled that they could not be mapped separately at the scale used in mapping. The individual areas of each soil are about 4 to 6 acres in size, and the mapped areas of this complex are about 15 to 500 acres in size. Ramsey soils make up about 45 percent of each mapped area, Lily soils make up 35 percent, and included areas make up 20 percent. The soils are on hillsides near streams.

Typically, the surface layer of the Ramsey soils is dark brown very stony loam about 2 inches thick. The subsurface layer is brown very stony loam about 6 inches thick. The subsoil is light yellowish brown stony loam about 7 inches thick. Hard sandstone bedrock is at a depth of 15 inches.

The natural fertility of Ramsey soils is low, and the content of organic matter is low. The surface layer is medium acid to very strongly acid, and the subsoil is strongly acid or very strongly acid. Permeability is rapid, and the available water capacity is very low. The root zone is shallow; roots can penetrate to bedrock.

Typically, the surface layer of the Lily soils is dark brown stony loam about 4 inches thick. The subsurface layer is yellowish brown stony loam about 6 inches thick. The upper part of the subsoil is yellowish red stony sandy clay loam about 22 inches thick, and the lower part is mottled yellowish red, dark red, and light brownish gray stony sandy clay loam about 8 inches thick. Hard sandstone bedrock is at a depth of 40 inches.

The natural fertility of Lily soils is low, and the content of organic matter is low. The surface layer is neutral to medium acid, and the rest of the soil is medium acid to very strongly acid. Permeability is moderately rapid, and the available water capacity is low.

Included with these soils in mapping are areas of Clarksville, Arkana, and Moko soils, vertical bedrock bluffs, bouldery areas where the boulders are up to 10 feet in diameter, and areas of soils similar to Lily soils except that the depth to sandstone bedrock is 40 to 50 inches.

Figure 10.—Razort loam, occasionally flooded, is well suited to hay and pasture.

The soils in this complex are not suited to cultivated crops or to pasture. The native vegetation should not be disturbed because erosion is a very severe hazard.

Ramsey soils are poorly suited to use as woodland, and Lily soils are moderately suited. The main use of these soils, nevertheless, is for trees, which are mostly low-grade hardwoods and redcedars. The adapted species are eastern redcedar and shortleaf pine. The use of equipment is severely limited, and erosion is a severe hazard. Seedling mortality is severe on Ramsey soils and slight on Lily soils. The wooded areas provide habitat for wildlife.

Ramsey soils are not suited to most urban uses. Shallowness to rock and the 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.

Lily soils also are not suited to most urban uses. The shallow to moderate depth to rock and the slope severely limit their use as septic tank absorption fields. Slope is also a severe limitation for dwellings, small commercial buildings, and local roads and streets. The limitations are difficult or impractical to overcome.

The soils are in capability subclass VIIs. Ramsey soils are in woodland suitability group 5x3, and Lily soils are in group 4r9.

33—Razort loam, occasionally flooded. This is a deep, well drained, level and nearly level soil on flood plains of streams. Individual areas range from about 5 to 200 acres or more in size. The slopes range from 0 to 3 percent.

Typically, the surface layer is dark brown loam about 10 inches thick. The upper part of the subsoil is dark brown loam about 13 inches thick, the middle part is dark yellowish brown clay loam about 35 inches thick, and the lower part is dark brown very gravelly loam about 14 inches thick.

The natural fertility of this soil and the content of organic matter are moderate. The surface layer is neutral or slightly acid, and the subsoil is slightly acid or medium acid. Permeability is moderate, and the available water capacity is high. This soil has good tilth; it can be worked within a wide range of moisture content. The root zone is deep. It is easily penetrated by roots. Flooding occurs for brief to very brief periods late in winter and early in spring.

Included with this soil in mapping are small areas of sandy and gravelly overwash, areas that are not so subject to flooding, and small areas of soils similar to Razort soils except that they have a thicker surface layer. Also included are small areas of Britwater, Peridge, Wideman, and Elsah soils.

This soil is well suited to cultivated crops. Flooding is a hazard. Suitable crops include corn, soybeans, small grains, and truck crops.

In most areas, the soil is used for pasture and hay (fig. 10). The soil is well suited to hay and pasture. Adapted pasture plants include bermudagrass, tall fescue, alfalfa, white clover, and lespedeza.

This soil is well suited to loblolly pine, red oak, white oak, sweetgum, cottonwood, black walnut, and sycamore.

This soil has severe limitations for most urban uses. Flooding is a severe limitation for dwellings, small commercial buildings, local roads and streets, and septic tank absorption fields. Major flood control measures are necessary to overcome this limitation.

This soil is in capability subclass IIw and in woodland suitability group 2o7.

34—Wideman loamy fine sand, frequently flooded. This is a deep, excessively drained, level to nearly level soil on flood plains and natural levees along streams. The slopes range from 0 to 3 percent and are smooth and undulating. Individual areas are long and narrow and range from about 5 to 30 acres in size.

Typically, the surface layer is dark brown loamy fine sand about 9 inches thick. The underlying material is mostly stratified layers of brown or brownish loamy fine sand, loamy sand, sandy loam, and sand to a depth of about 72 inches. Some of the individual layers are only 1 inch to 4 inches thick, but they range to 15 inches in thickness.

The natural fertility of this soil and the content of organic matter are low. The soil is neutral to medium acid throughout. Permeability is moderately rapid, and the available water capacity is low. The soil is droughty. Tilth is good; the soil can be worked within a wide range of moisture content. The root zone is deep and is easily penetrated by roots. In most areas, this soil is flooded early in spring in most years. It is flooded for very brief periods by fast-moving water, which can cause severe damage in a short time.

Included with this soil in mapping are small areas of Britwater, Portia, and Razort soils. Also included are narrow overflow channels and gravel bars.

This soil is not suited to cultivated crops because flooding is a hazard. This soil is moderately suited to hay and pasture, and it is used mainly for hay and pasture. Adapted pasture plants include tall fescue, bermudagrass, lespedeza, and white clover.

This soil is well suited to loblolly pine, shortleaf pine, sweetgum, cottonwood, black walnut, and sycamore. The use of equipment is moderately limited, and seedling mortality is moderate.

This soil has severe limitations for most urban uses. Flooding is a severe limitation for dwellings, small commercial buildings, local roads and streets, and septic tank absorption fields. Major flood control measures are necessary to overcome this limitation.

This soil is in capability subclass Vw and in woodland suitability group 3s8.

Prime Farmland

In this section, prime farmland is defined and discussed, and the prime farmland soils in Carroll 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, and 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 and water areas cannot be considered prime farmland.

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

Soils that have a high water table may qualify as prime farmland soils if this limitation is overcome by drainage. Onsite evaluation is necessary to determine the effectiveness of corrective measures. More information on the criteria for prime farmland soils can be obtained at the local office of the Soil Conservation Service.

About 28,838 acres in Carroll County, or nearly 7 percent of the county, is prime farmland. Areas of prime farmland are along the larger streams throughout the county. They are also in the southeastern part of the county on gently sloping mountaintops and ridgetops and in the northeastern part on broad uplands. The largest areas are in map units 1, 2, and 3 on the general soil map.

A recent national trend in land use has been the conversion of some prime farmland to urban and industrial uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are wet, more erodible, droughty, or difficult to cultivate and less productive than prime farmland. In Carroll County, however, most of the urban expansion is in areas where there is little or no prime farmland.

The following map units, or soils, make up prime farmland in Carroll County. On one soil included in the list, appropriate measures have been applied to overcome wetness. Some areas of these soils, however, are urban or built-up land, which is defined as any contiguous unit of land 10 acres or more in size that is used for nonfarm uses including 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. The location of each map unit is shown on the detailed soil maps at the back of this publication. The extent of each unit is given in table 4. The soil qualities that affect use and management are described in the section "Detailed Soil Map Units." This list does not constitute a recommendation for a particular land use.

- 8 Captina silt loam, 1 to 3 percent slopes
- 16 Linker loam, 3 to 8 percent slopes
- 19 Mayes silt loam, 0 to 2 percent slopes (where drained)
- 31 Portia loam, 3 to 8 percent slopes
- 33 Razort loam, occasionally flooded

Use and Management of the Soils

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

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

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland and 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 in harmony with the natural soil.

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

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

Crops and Pasture

Thomas Burkett, conservation agronomist, Soil Conservation Service, helped to prepare this section.

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

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

In 1981, approximately 84,079 acres in Carroll County was used for pasture and 39,684 acres was used for crops *(3)*. Most of the open areas in the county are used for pasture and hay. A small acreage is used for commercial or private orchards or for home gardens, and a small acreage is in silage crops.

Most of the soils in Carroll County are poorly suited or are not suited to intensive uses because they are shallow or have a high content of coarse fragments. Many of the soils that are suited to crops are susceptible to erosion. Most of the soils in the county are low in fertility and have poor tilth.

Erosion is a severe hazard on many of the soils. Annual cover crops or grasses and legumes should be included in the cropping system if the crops do not leave large amounts of residue on the surface. Crop residue can be shredded and spread on the soil to provide additional cover and to increase the content of organic matter.

On the sloping soils, contour tillage, grassed waterways, and terraces are needed if the soil is cultivated. Conservation tillage should be used if possible to help maintain soil fertility and tilth.

Most of the soils in Carroll County are low in nitrogen, potassium, phosphorus, and calcium. In addition, the content of organic matter in these soils is low. Applications of fertilizer can be beneficial. The kinds and amounts of fertilizer to apply should be based on soil tests, the kinds of crops to be grown, the productive capacity of the soil, and the expected yields. Periodic applications of lime are beneficial on most soils. The applications should be based on soil tests and are necessary for production of crops such as alfalfa, white clover, and red clover.

Cover crops and crop residue left on the surface help maintain or improve tilth. If left bare, most soils compact during a heavy rain, and the surface crusts.

The major use of land in Carroll County is pasture and hay. There are grasses and legumes that are suited to

many of the soils in the county. Selecting a grass or legume that is appropriate for the soil is important, and pasture management is necessary.

Plants such as alfalfa and hybrid bermudagrass are suited to soils that have a high available water capacity. Heavy applications of fertilizer are beneficial to these plants if enough water is available. These plants should be grown in deep soils because of their deep-rooting characteristics.

Plants such as weeping lovegrass, cool-season annual grasses, native grasses, and the Old World bluestems are suited to shallow, droughty soils and to soils on steep slopes. These soils do not have a high available water capacity, and the plants on these soils cannot utilize heavy applications of fertilizer. Frequent applications of small amounts of fertilizer are more beneficial.

Tall fescue, a cool-season perennial, is the grass most commonly grown in Carroll County. Common bermudagrass and hybrid bermudagrass are warm-season grasses that are suited to many of the soils in the county. Stands of these grasses should be started from sprigs; stands started from seeds are more susceptible to winterkill.

The most commonly grown legumes in the county are red clover and white clover. These generally are combined with a grass. Alfalfa is suited to the Razort and Peridge soils.

Grazing management is essential for the production of quality forage, for stand survival, and for erosion control. Sufficient top growth must be left on the plants for continued vigorous growth, and grazing of tall fescue must be restricted during summer. Brush control is necessary, and weed control commonly is needed.

Grass pastures respond well to nitrogen fertilizer. Grass and legume pastures may need applications of phosphate, potash, and lime. The applications should be based on soil tests.

Many field crops that are suited to the soils in Carroll County, such as soybeans and small grains, are not commonly grown.

Yields Per Acre

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

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

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

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

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

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider 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 have other limitations, impractical to remove, that limit their use.

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

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

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

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

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

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

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.

The original vegetation in the survey area consisted mainly of hardwood trees. There were a few needle-leaved trees among the hardwoods. A few prairie areas were scattered on the nearly level to gently sloping soils.

When settlers moved into the area, they converted many of the forest and grassland areas to cropland and grassland. Many fields were abandoned in the 1940's, though, because of the depression, and the conversion of woodland temporarily stopped. The abandoned fields began to revert to forest, which consisted mainly of shortleaf pine.

In 1959, according to a report by the United States Forest Service, 62 percent of the county was in forest *(7)*. In 1970, 59 percent of the county was in forest *(8)*, and in 1981, 53 percent was in forest *(3)*.

The quality of the commercial stands in the county ranges from good to poor. In general, the better stands are on the deep and moderately deep soils on the north-facing slopes. Hardwood trees are dominant, but there are scattered stands of needle-leaved trees.

The lumber produced in Carroll County is used to make furniture, crossties, fenceposts, and handles, or it is used as fuelwood. There are 19 mills in Carroll County, which contribute significantly to the economy of the county.

The extensive forests provide habitat for wildlife and contribute to soil and water conservation. The people in the county benefit not only from the economic value of the woodland but also from its esthetic and recreational values.

Table 6 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the woodland suitability group for each soil. Soils assigned the same woodland suitability group require the same general management and have about the same potential productivity.

The first part of the woodland suitability group designation, a number, indicates the potential productivity of the soils for important trees. The number 1 indicates very high productivity; 2, high; 3, moderately high; 4, moderate; and 5, low.

The second part of the designation, a letter, indicates the major kind of soil limitation. The letter *x* indicates stoniness or rockiness; *w*, excessive water in or on the soil; *d*, restricted root depth; *c*, clay in the upper part of the soil; *s*, sandy texture; *f*, high content of coarse fragments in the soil profile; and *r*, steep slopes. The letter *o* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: x, w, d, c, s, f, and r.

The third element in the designation, a numeral, indicates the kind of trees for 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 needleleaf trees. The numerals 4, 5, and 6 indicate slight, moderate, and severe limitations, respectively, and suitability for broadleaf trees. The numerals 7, 8, 9 indicate slight, moderate, and severe limitations, respectively, and suitability for both needleleaf and broadleaf trees.

In table 6, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Ratings of the *erosion hazard* indicate the risk of loss of soil in well managed woodland. The risk is *slight* if the expected soil loss is small, *moderate* if measures are needed to control erosion during logging and road construction, and *severe* if intensive management or special equipment and methods are needed to prevent excessive loss of soil.

Ratings of *equipment limitation* reflect the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland

management or harvesting. A rating of *slight* indicates that use of equipment is not limited to a particular kind of equipment or time of year; *moderate* indicates a short seasonal limitation or a need for some modification in management or in equipment; and *severe* indicates a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings indicate the degree to which the soil affects the mortality of tree seedlings. Plant competition is not considered in the ratings. The ratings apply to seedlings from good stock that are properly planted during a period of sufficient rainfall. A rating of *slight* indicates that the expected mortality is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index*. This index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. In this survey, the site index was determined at the age of 30 years for eastern cottonwood, at 35 years for American sycamore, and at 50 years for all other species. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

Trees to plant are those that are suited to the soils and to commercial wood production.

Recreation

The soils of the survey area are rated in table 7 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public 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 recreation 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 7, 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 7 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 10 and interpretations for dwellings without basements and for local roads and streets in table 9.

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

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

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

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

Wildlife Habitat

Paul M. Brady, biologist, Soil Conservation Service, helped prepare this section.

In Carroll County, there is abundant wildlife and wildlife habitat. The types of habitat range from hardwood forests to ponds and streams. Many varieties of plants provide food and cover.

The wildlife habitat consists mainly of forests and pastures in the Ozark Mountains. These areas, which include fencerows and edge areas, provide habitat for white-tailed deer, squirrels, bobwhite quail, raccoons, coyotes, opossums, foxes, wild turkeys, rabbits, owls, and hawks, and other birds, small mammals, and reptiles.

Carroll County includes many areas of open water. Beaver Lake has an area of 4,655 acres (fig. 11), and

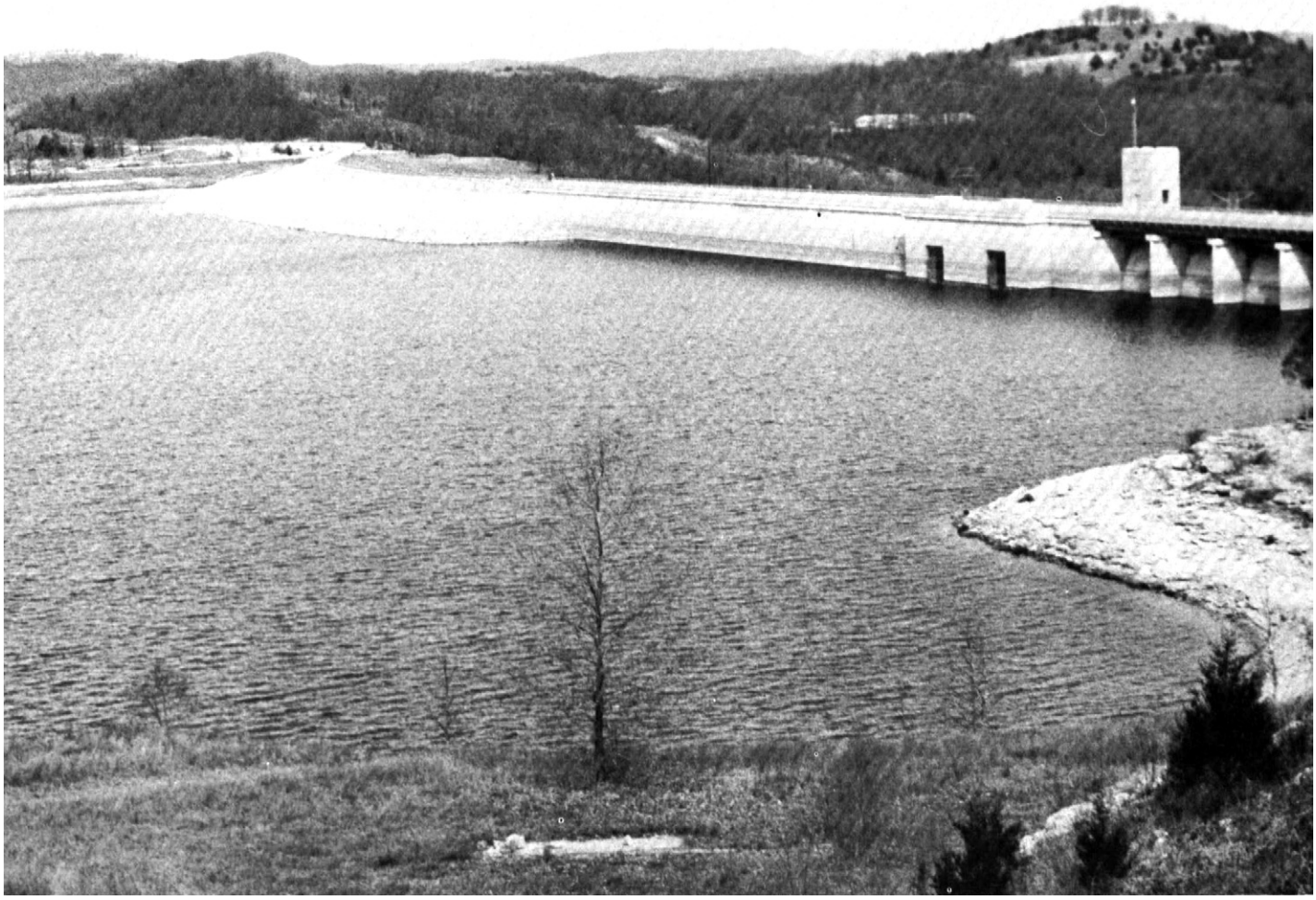


Figure 11.—Beaver Dam and Reservoir. The dominant soils along the shore are in the Arkana-Moko general soil map unit.

Table Rock Lake has an area of 1,969 acres. In addition, there are approximately 3,200 acres of ponds. Numerous fish live in these lakes and ponds, including largemouth bass, bluegill, redear sunfish, and channel catfish.

In Carroll County, there are about 144 miles of streams that support fish. The largest and most important streams are the Kings River and Osage Creek. Other streams are Piney Creek, Dry Fork Creek, Long Creek, Dry Creek, and Yocum Creek. Smallmouth bass, rock bass, white sucker, and sculpins are among the cool-water species that inhabit these streams.

There are many varieties of plants that are important to the wildlife in Carroll County. These plants include woolly croton, bush lespedeza, annual lespedeza, sericea lespedeza, milk pea, panicgrasses, partridge pea, paspalums, ragweeds, tickclover, sumacs, and vetches. Some important woody plants are oak, hickory, hackberry, shortleaf pine, eastern redcedar, elderberry, grape, dogwood, blackberry, greenbrier, honeysuckle, persimmon, black walnut, and wild cherry.

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 8, 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, cherry, sweetgum, apple, grapes, 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 and cedar.

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

James L. Janski, assistant state conservation engineer, Soil Conservation Service, helped prepare this section.

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

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

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

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to 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 (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) 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 9 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, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

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

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of

gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

Sanitary Facilities

Table 10 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 10 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 good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

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

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

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

Table 10 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

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

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

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

The ratings in table 10 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary

landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

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

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

Construction Materials

Table 11 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 11, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

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

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

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

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

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

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

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

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

Water Management

Table 12 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, 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 even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

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

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

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 or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, 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 or to a cemented pan 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 or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, 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 13 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

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

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

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

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

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

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

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

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

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

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

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

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

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

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The 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 in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 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 without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

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

In table 14, 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 15 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 not protected by vegetation 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 a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, nor is water in swamps and marshes.

Table 15 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it occurs, on the average, no more than once in 2 years; and *frequent* that it occurs, on the average, more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in 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 15 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 high. A water table that is seasonally high for less than 1 month is not indicated in table 15.

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 beneath 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. Only saturated zones within a depth of about 6 feet are indicated.

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

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

boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

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

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

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories *(9)*. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 16 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 *udults*, the suborder of the Ultisols that have 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. The texture of the surface layer or of the substratum can differ 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 *(6)*. Many of the technical terms used in the descriptions are defined in Soil Taxonomy *(9)*. 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, gently sloping to steep soils on limestone ridges and on hillsides. Arkana soils formed in residuum of limestone. The native vegetation was an open stand of upland hardwoods and tall grasses in the open areas. The slopes range from 3 to 40 percent.

Arkana soils are near Clarksville, Eldon, Lily, and Moko soils. Clarksville soils are on hillsides at a higher elevation than Arkana soils. They are more than 60 inches deep to bedrock and have a loamy-skeletal

control section. Eldon soils are in positions on the landscape similar to those of Arkana soils and are more than 60 inches deep to bedrock. Lily soils are in similar positions on the landscape and have a fine-loamy control section. Moko soils are adjacent to Arkana soils on similar landscapes and are less than 20 inches deep to bedrock. They do not have an argillic horizon.

Typical pedon of Arkana very cherty silt loam, in an area of Arkana-Eldon complex, 3 to 8 percent slopes, in a sparsely wooded area in the SE1/4SW1/4NW1/4 sec. 33, T. 20 N., R. 24 W.

A11—0 to 5 inches; very dark gray (10YR 3/1) very cherty silt loam; weak fine granular structure; very friable; many fine and medium roots; about 45 percent fragments of chert; neutral; clear wavy boundary.

A12—5 to 9 inches; very dark grayish brown (10YR 3/2) very cherty silt loam; weak fine granular structure; very friable; many fine roots; about 60 percent fragments of chert; neutral; clear smooth boundary.

B21t—9 to 18 inches; yellowish red (5YR 4/6) clay; moderate fine subangular blocky structure; firm; common fine roots; thin patchy clay films on faces of peds; few dark coatings on peds; about 10 percent fragments of chert; neutral; clear wavy boundary.

B22t—18 to 24 inches; yellowish red (5YR 5/8) clay; moderate coarse subangular blocky structure; firm, plastic; common fine roots; thick continuous clay films on faces of peds; about 10 percent fragments of chert; neutral; gradual wavy boundary.

B23t—24 to 38 inches; strong brown (7.5YR 5/8) clay; few medium distinct red (2.5YR 4/8) mottles; moderate coarse subangular blocky structure; firm, plastic; common dark stains on faces of peds; thick continuous clay films on faces of peds; moderately alkaline; abrupt smooth boundary.

R—38 to 42 inches; hard, level-bedded, dolomitic bedrock.

The solum ranges in thickness from 20 to 40 inches. The A horizon is medium acid to mildly alkaline, and the Bt horizon is strongly acid to moderately alkaline.

The A11 horizon has hue of 10YR, value of 2 or 3, and chroma of 1 to 3. The A12 horizon has hue of 10YR, value of 3 or 4, and chroma of 2 to 4 or value of 5 and chroma of 4. The A1 horizon ranges from 5 to 14 inches in thickness. In some places there is an A2 horizon. It has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. The A2 horizon ranges from 0 to 5 inches in thickness.

The B21t and B22t horizons have hue of 7.5YR, 5YR, or 2.5YR, value of 4 or 5, and chroma of 4 or 6, or they have hue of 5YR or 2.5YR, value of 4 or 5, and chroma of 8. The B23t horizon has hue of 10YR, 7.5YR, or 5YR, value of 4 or 5, and chroma of 4 to 8. The B21t horizon is clay loam, silty clay, clay, or their cherty or very cherty phases. The content of coarse fragments ranges from 10 to 60 percent. The B22t and B23t horizons are clay or cherty clay. The content of coarse fragments ranges from 0 to 35 percent.

The R horizon is hard, level-bedded dolomitic or limestone bedrock at a depth of 20 to 40 inches.

Britwater Series

The Britwater series consists of deep, well drained, moderately permeable, gently sloping to moderately sloping soils. Britwater soils are mainly on stream terraces; some areas are on uplands. These soils formed in old loamy, gravelly, and clayey alluvium from limestone uplands. The slopes range from 3 to 12 percent.

Britwater soils are near Elsah, Peridge, Portia, and Razort soils. Elsah soils are on flood plains and do not have an argillic horizon. Peridge soils are adjacent to Britwater soils on the landscape. They have a fine-silty control section, and they have less gravel than Britwater soils. Portia soils are also adjacent to Britwater soils on similar landscapes and have less gravel throughout. Razort soils are on adjacent, lower lying flood plains. They have a darker surface layer and a brown argillic horizon.

Typical pedon of Britwater gravelly silt loam, 3 to 8 percent slopes, in a pasture in the SE1/4SW1/4SE1/4 sec. 33, T. 18 N., R. 24 W.

Ap—0 to 6 inches; dark yellowish brown (10YR 4/4) gravelly silt loam; moderate medium granular structure; very friable; many fine and medium roots; 15 percent gravel; medium acid; clear smooth boundary.

B21t—6 to 11 inches; yellowish red (5YR 4/6) silty clay loam; weak medium subangular blocky structure; friable; common fine and medium roots; thin patchy clay films on ped faces and pore walls; many fine and medium pores; 10 percent gravel; medium acid; gradual smooth boundary.

B22t—11 to 20 inches; yellowish red (5YR 4/8) gravelly silty clay loam; moderate medium angular blocky structure; friable; common fine roots; medium discontinuous clay films on ped faces and pore walls; many fine and medium pores; 15 percent gravel; medium acid; gradual smooth boundary.

B23t—20 to 40 inches; red (2.5YR 4/6) gravelly silty clay loam; many coarse distinct strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; friable; few fine roots; medium continuous clay films on ped faces and pore walls; common fine and medium pores; 15 percent gravel; medium acid; gradual smooth boundary.

B24t—40 to 55 inches; yellowish red (5YR 4/8) gravelly silty clay loam; many medium distinct strong brown (7.5YR 5/6) and grayish brown (10YR 5/2) mottles;

moderate medium angular blocky structure; firm; medium continuous clay films on faces of peds; common fine and medium pores; 15 percent gravel; strongly acid; clear smooth boundary.

B25t—55 to 80 inches; yellowish red (5YR 4/6) very gravelly silty clay loam; few fine distinct grayish brown (10YR 5/2) mottles; moderate fine angular blocky structure; firm; medium continuous clay films on faces of peds; common fine and medium pores; 55 percent gravel; strongly acid.

The solum ranges from 60 to more than 80 inches in thickness. The soil is medium acid or strongly acid throughout.

The A horizon ranges from 5 to 8 inches in thickness. It 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.

In some places there is a B1 horizon. It is 3 to 7 inches thick and has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4. The texture is gravelly loam or gravelly silt loam. The content of gravel ranges from 15 to 25 percent.

The B21t horizon has hue of 5YR, value of 4, and chroma of 6 or 8, or it has hue of 7.5YR, value of 5, and chroma of 6 or 8. It is silty clay loam, clay loam, gravelly silty clay loam, or gravelly clay loam. The content of gravel ranges from 5 to 30 percent.

The B22t horizon has hue of 5YR or 2.5YR, value of 4, and chroma of 6 or 8. It is very gravelly silty clay loam, gravelly silty clay loam, very gravelly clay loam, or gravelly clay loam. The content of gravel ranges from 15 to 45 percent.

The B23t, B24t, and B25t horizons have hue of 2.5YR, value of 3 or 4, and chroma of 6, or they have hue of 5YR, value of 4, and chroma of 6 or 8. These horizons are mottled in shades of red or brown. They are a gravelly or very gravelly phase of silty clay, silty clay loam, or clay loam. The content of gravel ranges from 15 to 70 percent.

Cane Series

The Cane series consists of deep, moderately well drained, slowly permeable, gently sloping soils on plateaus and stream terraces. Cane soils developed in residuum of weathered sandstone and in old alluvium. The native vegetation was mixed hardwoods and some shortleaf pine. The slopes range from 3 to 8 percent.

Cane soils are near Enders, Linker, and Mountainburg soils, none of which has a fragipan. Enders soils are on gently sloping to steep mountainsides, hillsides, and ridges. They have a clayey control section. Linker soils are on mountaintops and ridgetops adjacent to Cane soils. Mountainburg soils are on the top and sides of ridges, hills, and mountains. They are less than 20 inches deep to bedrock.

Typical pedon of Cane loam, 3 to 8 percent slopes, in a meadow in the SE1/4NE1/4NW1/4 sec. 6, T. 17 N., R. 23 W.

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

B21t—6 to 13 inches; reddish brown (5YR 4/4) silt loam; moderate medium subangular blocky structure; friable; common fine roots; thin patchy clay films; medium acid; clear smooth boundary.

B22t—13 to 24 inches; yellowish red (5YR 5/6) clay loam; moderate medium subangular blocky structure; firm; medium patchy clay films on faces of peds; common dark stains on faces of peds; few quartz pebbles; medium acid; abrupt irregular boundary.

Bx1—24 to 63 inches; dark red (2.5YR 3/6) clay loam; common medium prominent brown (10YR 5/3) silt loam seams and streaks; weak coarse prismatic structure breaking to weak coarse angular blocky; firm, brittle; few fine roots along prism faces; medium patchy clay films on faces of peds; few quartz pebbles; strongly acid; abrupt smooth boundary.

Bx2—63 to 72 inches; yellowish red (5YR 5/6) clay loam; common medium prominent yellowish brown (10YR 5/6) silt loam seams and streaks; weak coarse prismatic structure breaking to moderate medium subangular blocky; firm, brittle; few quartz pebbles; strongly acid.

The solum ranges from 60 to 90 inches in thickness. Depth to the fragipan ranges from 20 to 35 inches. The surface layer is medium acid or strongly acid unless the soil has been limed, and the subsoil is very strongly acid to medium acid.

The A horizon ranges from 4 to 10 inches in thickness. It has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. The content of sandstone gravel ranges from 0 to 10 percent.

The B2t horizon has hue of 5YR, value of 4 or 5, and chroma of 4 or 6, or it has hue of 2.5YR, value of 3, and chroma of 6 or value of 4 and chroma of 6 or 8. It is silt loam, sandy clay loam, or clay loam. The content of sandstone fragments ranges from 0 to 15 percent.

The Bx horizon has hue of 5YR, value of 4 or 5, and chroma of 6 or 8, or it has hue of 2.5YR, value of 3 or 4, and chroma of 6 or 8. It has streaks, seams, and mottles in shades of red, brown, and gray. The texture is loam, sandy clay loam, or clay loam. The content of sandstone fragments is 0 to 15 percent.

Captina Series

The Captina series consists of deep, moderately well drained, slowly permeable, nearly level to gently sloping

soils on broad uplands and stream terraces. Captina soils formed in loamy and cherty material over limestone. The slopes range from 1 to 8 percent.

Captina soils are near Nixa and Noark soils. Nixa soils are on nearby ridgetops. They are very cherty throughout and have a loamy-skeletal control section. Noark soils are on side slopes and ridgetops adjacent to Captina soils. They do not have a fragipan.

Typical pedon of Captina silt loam, 1 to 8 percent slopes, in a meadow in the NW1/4SE1/4SW1/4 sec. 28, T. 21 N., R. 23 W.

Ap—0 to 8 inches; dark brown (10YR 4/3) silt loam; weak medium granular structure; very friable; many medium and fine roots; neutral; abrupt smooth boundary.

B1—8 to 15 inches; yellowish brown (10YR 5/6) silt loam; weak medium subangular blocky structure; friable; many fine and medium roots; strongly acid; clear smooth boundary.

B21t—15 to 26 inches; yellowish brown (10YR 5/4) silty clay loam; moderate medium subangular blocky structure; firm; few fine roots; thin patchy clay films on faces of peds; strongly acid; gradual smooth boundary.

Bx1—26 to 40 inches; yellowish brown (10YR 5/4) silty clay loam; common medium faint light brownish gray (10YR 6/2) mottles, common medium distinct strong brown (7.5YR 5/6) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm, slightly brittle; many fine vesicular pores; thin patchy clay films on faces of peds; very strongly acid; clear wavy boundary.

Bx2—40 to 52 inches; yellowish brown (10YR 5/4) silty clay loam; common medium faint grayish brown (10YR 5/2) mottles, common medium prominent dark red (2.5YR 3/6) mottles; weak coarse prismatic structure parting to moderate medium angular blocky; firm, brittle; common fine and medium vesicular pores; clay films on pore walls; very strongly acid; abrupt irregular boundary.

B22t—52 to 72 inches; mottled strong brown (7.5YR 5/6), light brownish gray (10YR 6/2), and dark red (2.5YR 3/6) very cherty silty clay loam; moderate medium subangular blocky structure; firm; continuous thick clay films on faces of peds; 80 percent fragments of chert; strongly acid.

The solum ranges in thickness from 36 to 72 inches. Depth to the fragipan ranges from 16 to 28 inches. The A horizon is slightly acid to strongly acid unless the soil has been limed, and the B horizon is strongly acid to extremely acid.

The A horizon ranges from 5 to 10 inches in thickness. It has hue of 10YR, value of 4, and chroma of 2 or 3 or value of 5 and chroma of 3 or 4.

In some places there is a B1 horizon. It has hue of 10YR, value of 5, and chroma of 4 or 6.

The B21t horizon has hue of 10YR or 7.5YR, value of 5, and chroma of 4 or 6. It is silt loam or silty clay loam.

The Bx horizon has hue of 7.5YR or 10YR, value of 5, and chroma of 4 or 6. It commonly is mottled in yellowish brown, strong brown, and shades of gray and red. The texture is silt loam or silty clay loam. The content of chert ranges from 0 to 5 percent in the Bx1 horizon and from 0 to 50 percent in the Bx2 horizon.

The B22t horizon is 50 to 90 percent chert fragments or is rippable cherty limestone bedrock that has cracks and crevices in it. It has hue of 5YR, 7.5YR, or 10YR, value of 5, and chroma of 4 to 8, or it is mottled in these colors. The texture is very cherty silty clay or very cherty silty clay loam.

Clarksville Series

The Clarksville series consists of deep, somewhat excessively drained, moderately rapidly permeable, very cherty, steep and very steep soils on hillsides. Clarksville soils formed in residuum of weathered cherty limestone. The slopes range from 20 to 50 percent.

Clarksville soils are near Arkana, Lily, Moko, Nixa, and Noark soils. Arkana and Lily soils are at lower elevations adjacent to Clarksville soils. Arkana soils are less than 40 inches deep to bedrock and have a very-fine control section. Lily soils have a fine-loamy control section. Moko soils are on lower hilltops and side slopes. They are less than 20 inches deep to bedrock and do not have an argillic horizon. Nixa soils are on higher ridgetops adjacent to Clarksville soils and have a fragipan. Noark soils are adjacent to Clarksville soils in similar positions on the landscape. They have a clayey-skeletal control section.

Typical pedon of Clarksville very cherty silt loam, 20 to 50 percent slopes, in a wooded area in the SE1/4NW1/4NE1/4 sec. 19, T. 18 N., R. 24 W.

O1—2 inches to 0; shortleaf pine litter and hardwood leaves and twigs.

A1—0 to 4 inches; dark brown (10YR 3/3) very cherty silt loam; moderate medium granular structure; very friable; many fine roots; about 75 percent chert fragments up to 8 inches in size; slightly acid; clear wavy boundary.

A2—4 to 14 inches; pale brown (10YR 6/3) very cherty silt loam; moderate medium granular structure; friable; many fine roots; about 75 percent chert fragments up to 8 inches in size; medium acid; gradual wavy boundary.

B1—14 to 27 inches; light yellowish brown (10YR 6/4) very cherty silt loam; weak medium subangular blocky structure; friable; common fine roots; many fine pores; about 75 percent chert fragments up to 8 inches in size; very strongly acid; gradual wavy boundary.

B21t—27 to 44 inches; brown (7.5YR 5/4) very cherty silt loam; weak medium subangular blocky structure; friable; common fine roots; many fine pores; about 80 percent chert fragments up to 8 inches in size; very strongly acid; gradual smooth boundary.
B22t—44 to 57 inches; strong brown (7.5YR 5/6) very cherty silt loam; weak fine angular blocky structure; friable; few fine roots; many fine pores; thin (less than 1 inch thick) layer of strong brown (7.5YR 5/8) and very pale brown (10YR 7/3) silt loam between two horizontal layers of chert bedrock; about 80 percent chert fragments up to 8 inches in size; very strongly acid; gradual smooth boundary.
B23t—57 to 72 inches; mottled 85 percent red (2.5YR 4/6) and 15 percent reddish yellow (7.5YR 6/6) very cherty silty clay; moderate fine angular blocky structure; firm; few fine roots; many fine pores; few dark coatings on peds; about 75 percent chert fragments up to 8 inches in size; very strongly acid.

The solum ranges from 60 to more than 72 inches in thickness. The A horizon is medium acid to very strongly acid, and the B horizon is strongly acid or very strongly acid.

The A horizon ranges from 7 to 18 inches in thickness. The content of chert ranges from 60 to 80 percent. The A1 horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. The A2 horizon has hue of 10YR, value of 4 to 6, and chroma of 2 or 3.

In some places there is a B1 horizon. It has hue of 10YR, value of 5 or 6, and chroma of 3 to 6. The B21t horizon has hue of 7.5YR, value of 5 or 6, and chroma of 4 or 6. It is very cherty silt loam or very cherty silty clay loam. In some places the B21t horizon is mottled in brown or pale brown. The B22t and B23t horizons have hue of 7.5YR, 5YR, or 2.5YR, value of 4 to 6, and chroma of 4 or 6. They are very cherty silt loam, very cherty silty clay loam, or very cherty silty clay. The content of chert ranges from 65 to 90 percent in the B horizon.

Eldon Series

The Eldon series consists of deep, well drained, moderately permeable, gently sloping to moderately sloping soils on ridges and hillsides. Eldon soils formed in residuum of limestone. The native vegetation was an open stand of mixed hardwoods and tall prairie grasses in the open areas. The slopes range from 3 to 12 percent.

Eldon soils are near Arkana and Moko soils. Arkana soils are in positions on the landscape similar to those of Eldon soils and are less than 45 inches deep to bedrock. Moko soils are adjacent to Eldon soils on landscapes that have bedrock ledges. They are less than 20 inches deep to bedrock and do not have an argillic horizon.

Typical pedon of Eldon cherty silt loam, in an area of Arkana-Eldon complex, 3 to 8 percent slopes, in a pasture in the SE1/4SE1/4SW1/4 sec. 23, T. 20 N., R. 24 W.

Ap—0 to 8 inches; dark brown (10YR 3/3) cherty silt loam; moderate medium granular structure; friable; many fine and medium roots; 20 percent fragments of chert, 5 percent more than 3 inches in size; medium acid; clear smooth boundary.
B1—8 to 13 inches; yellowish brown (10YR 5/4) cherty silty clay loam; weak medium subangular blocky structure; firm; common fine roots and pores; thin patchy clay films on faces of peds; 20 percent fragments of chert, 3 percent more than 3 inches in size; medium acid; gradual wavy boundary.
B21t—13 to 21 inches; strong brown (7.5YR 5/6) cherty silty clay; moderate medium subangular blocky structure; firm; few fine roots and pores; thin continuous clay films on faces of peds; 25 percent fragments of chert, 3 percent more than 3 inches in size; slightly acid; gradual wavy boundary.
B22t—21 to 42 inches; brown (7.5YR 5/4) very cherty silty clay; many medium distinct strong brown (7.5YR 5/6) and light yellowish brown (10YR 6/4) mottles; moderate medium subangular blocky structure; firm; few fine roots and pores; thin continuous clay films on faces of peds; many dark concretions; 50 percent fragments of chert and limestone, 10 percent more than 3 inches in size; mildly alkaline; gradual wavy boundary.
B23t—42 to 72 inches; reddish yellow (7.5YR 6/8) very cherty clay; many medium distinct light brownish gray (10YR 6/2) mottles; moderate fine angular blocky structure; plastic; medium continuous clay films on faces of peds; common dark concretions; 50 percent fragments of chert, limestone, and sandstone, 30 percent more than 3 inches in size; mildly alkaline.

The thickness of the solum and the depth to limestone bedrock range from 60 to 100 inches or more. The A horizon is strongly acid to neutral, and the B horizon is very strongly acid to mildly alkaline.

The A horizon ranges from 5 to 8 inches in thickness. It has hue of 10YR, value of 2 or 3, and chroma of 2 or 3. In some places there is an A2 horizon. It ranges from 4 to 7 inches in thickness and has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. The content of coarse fragments in the A horizon ranges from 20 to 35 percent. The fragments are mostly chert; there are small amounts of sandstone.

In some places there is a B1 horizon. It has hue of 10YR, value of 5, and chroma of 4 or 6 or value of 6 and chroma of 3, or it has hue of 7.5YR, value of 5, and chroma of 4 to 8. In some places there are mottles that have hue of 10YR, value of 6, and chroma of 3. The texture is a cherty or very cherty phase of silt loam, loam, clay loam, or silty clay loam. The content of coarse

fragments ranges from 20 to 70 percent. The fragments are mostly chert; there are small amounts of sandstone.

The upper part of the B2t horizon has hue of 7.5YR, value of 5, and chroma of 4 to 8, or it has hue of 5YR or 2.5YR, value of 4 or 5, and chroma of 6 or 8. In many places there are mottles that have hue of 10YR, value of 6, and chroma of 3 or 4. The middle and lower parts of the B2t horizon have hue of 7.5YR, value of 5 or 6, and chroma of 4 to 8, or they have hue of 2.5YR or 5YR, value of 4 or 5, and chroma of 6 or 8. They are mottled in shades of gray and brown. The B2t horizon is a cherty or very cherty phase of silty clay loam, silty clay, or clay.

The upper 20 inches of the argillic horizon averages between 35 and 50 percent clay. The content of coarse fragments is mostly 10 to 50 percent, but some subhorizons are as much as 70 percent coarse fragments, and others have none.

The control section is about 35 to 50 percent coarse fragments. The fragments are mostly chert; there are small amounts of limestone and sandstone.

Elsah Series

The Elsah series consists of deep, well drained and somewhat excessively drained, moderately permeable, nearly level soils on flood plains of small streams. Elsah soils formed in cherty, loamy alluvium. The native vegetation was mixed hardwood trees. The slopes range from 0 to 2 percent.

Elsah soils are near Britwater and Razort soils. Britwater soils are on stream terraces adjacent to Elsah soils and have an argillic horizon. Razort soils are mostly on broad flood plains and have fewer coarse fragments.

Typical pedon of Elsah cherty silt loam, frequently flooded, in a fescue pasture in the SE1/4NE1/4NE1/4 sec. 15, T. 21 N., R. 23 W.

Ap—0 to 6 inches; brown (10YR 4/3) cherty silt loam; moderate medium granular structure; friable; many fine and medium roots; about 15 percent chert; neutral; clear wavy boundary.

C1—6 to 10 inches; brown (7.5YR 4/4) very cherty silt loam; massive; friable; many fine and medium roots; about 75 percent chert gravel; neutral; clear wavy boundary.

C2—10 to 12 inches; dark yellowish brown (10YR 4/4) very cherty silt loam; massive; friable; many fine and medium roots; about 75 percent chert gravel; neutral; clear wavy boundary.

C3—12 to 22 inches; dark grayish brown (10YR 4/2) very cherty silt loam; massive; friable; common fine and medium roots; about 75 percent chert gravel; neutral; clear wavy boundary.

C4—22 to 30 inches; very dark grayish brown (10YR 3/2) very cherty silt loam; massive; friable; common fine roots; about 80 percent chert gravel; neutral; gradual wavy boundary.

C5—30 to 50 inches; dark brown (10YR 4/3) very cherty silt loam; massive; friable; few fine roots; about 80 percent chert gravel; neutral; gradual wavy boundary.

C6—50 to 72 inches; brown (7.5YR 4/4) very cherty loam; single grained; friable, loose; few fine roots; about 75 percent chert gravel; neutral.

The soil is medium acid to neutral throughout.

The A horizon ranges from 6 to 10 inches in thickness. It has hue of 10YR, value of 4, and chroma of 2 to 4. The content of chert gravel ranges from 15 to 35 percent.

The C horizon has hue of 10YR, value of 3 or 4, and chroma of 2 to 4, or it has hue of 7.5YR, value of 4 or 5, and chroma of 4. It is a cherty or very cherty phase of silt loam, loam, or silty clay loam. The content of chert gravel ranges from 15 to 85 percent in every horizon below the A horizon.

Enders Series

The Enders series consists of deep, well drained, very slowly permeable, gently sloping to steep soils on mountainsides, hillsides, and ridges. The A horizon of Enders soils developed in loamy colluvium, and the B horizon developed in residuum of weathered, acid shale. The native vegetation was an open stand of low-grade hardwoods and tall prairie grasses in the open areas. The slopes range from 3 to 40 percent.

Enders soils are near Cane, Leesburg, Mountainburg, and Nella soils. Cane soils are on plateaus and stream terraces. They have a fine-loamy control section and a fragipan. Mountainburg soils are on the top and sides of ridges, hills, and mountains. They have a loamy-skeletal control section and are less than 20 inches deep to bedrock. Leesburg and Nella soils are on side slopes and have a fine-loamy control section.

Typical pedon of Enders stony loam, in an area of Enders-Leesburg complex, 8 to 20 percent slopes, in a wooded area in the NW1/4SW1/4NW1/4 sec. 9, T. 18 N., R. 22 W.

O1—2 inches to 0; hardwood leaves and twigs.

A1—0 to 2 inches; dark brown (10YR 4/3) stony loam; weak fine granular structure; very friable; many fine and medium roots; about 30 percent fragments of sandstone more than 3 inches in diameter; strongly acid; clear smooth boundary.

A2—2 to 8 inches; yellowish brown (10YR 5/4) stony loam; weak medium granular structure; friable; many fine and medium roots; about 30 percent fragments of sandstone more than 3 inches in diameter; strongly acid; clear smooth boundary.

B21t—8 to 14 inches; yellowish red (5YR 4/6) silty clay; moderate fine subangular blocky structure; firm; few fine roots; few thin patchy clay films on faces of

peds; few fragments of sandstone; very strongly acid; clear smooth boundary.
B22t—14 to 25 inches; yellowish red (5YR 4/6) clay; moderate medium subangular blocky structure; firm, sticky; common thin patchy clay films on faces of peds; very strongly acid; clear wavy boundary.
B23t—25 to 35 inches; variegated red (2.5YR 4/6) and gray (10YR 5/1) clay; strong fine angular blocky structure; firm, plastic; thick continuous clay films on faces of peds; very strongly acid; clear wavy boundary.
B3—35 to 47 inches; variegated gray (10YR 5/1) and red (2.5YR 4/6) clay; moderate coarse angular blocky structure; firm, plastic; thin continuous clay films on faces of peds; very strongly acid; gradual smooth boundary.
Cr—47 to 64 inches; gray (10YR 5/1) weathered soft shale; gradual smooth boundary.
R—64 inches; gray and dark gray soft shale bedrock.

The solum ranges from 36 to 58 inches in thickness. The depth to bedrock ranges from 40 to more than 62 inches. The soil is strongly acid to extremely acid throughout.

The A horizon ranges from 4 to 8 inches in thickness. The A1 horizon ranges from 1 to 6 inches in thickness and has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. The A2 horizon ranges from 2 to 8 inches in thickness and has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. In cultivated areas there is an Ap horizon 4 to 7 inches thick. It has hue of 10YR, value of 5, and chroma of 3. The A horizon is gravelly loam or stony loam. Sandstone fragments more than 3 inches in size make up 5 to 35 percent of the volume.

In some places there is a B1 horizon. It has hue of 7.5YR, value of 5, and chroma of 6. The texture is gravelly loam, gravelly silt loam, or stony loam.

The B21t, B22t, and B23t horizons have hue of 5YR or 2.5YR, value of 4 or 5, and chroma of 6 or 8. The B23t and B3 horizons include gray colors derived from the shale bedrock. The texture is silty clay or clay. The content of sandstone fragments ranges from 0 to 15 percent.

Leesburg Series

The Leesburg series consists of deep, well drained, moderately permeable, moderately sloping to steep soils on side slopes. Leesburg soils developed in colluvium from acid sandstone and shale. The native vegetation was mixed upland hardwoods. The slopes range from 8 to 40 percent.

Leesburg soils are near Enders, Mountainburg, and Nella soils. Enders soils are on mountainsides, hillsides, and ridges and have a clayey control section. Mountainburg soils are on ridgetops and mountainsides and are less than 20 inches deep to bedrock. Nella soils are in positions on the landscape similar to those of Leesburg soils and have a yellowish red argillic horizon.

Typical pedon of Leesburg stony loam, in an area of Enders-Leesburg complex, 8 to 20 percent slopes, in the NW1/4NW1/4SE1/4 sec. 5, T. 17 N., R. 22 W.

Ap—0 to 7 inches; brown (10YR 4/3) stony loam; weak fine granular structure; very friable; many fine and medium roots; about 35 percent fragments of sandstone; strongly acid; clear smooth boundary.
B1—7 to 14 inches; yellowish brown (10YR 5/6) gravelly loam; weak fine subangular blocky structure; firm; thin patchy clay films on faces of peds; about 20 percent fragments of sandstone; very strongly acid; gradual smooth boundary.
B21t—14 to 31 inches; yellowish brown (10YR 5/6) gravelly clay loam; weak medium subangular blocky structure; firm; thin patchy clay films on faces of peds; about 30 percent fragments of sandstone; very strongly acid; gradual wavy boundary.
B22t—31 to 47 inches; strong brown (7.5YR 5/6) very gravelly clay loam; many medium distinct brown (10YR 5/3) mottles; moderate medium subangular blocky structure; firm; thin patchy clay films on faces of peds; about 45 percent fragments of sandstone; common dark coatings on peds; very strongly acid; gradual wavy boundary.
B23t—47 to 72 inches; mottled strong brown (7.5YR 5/6), yellowish red (5YR 4/6), and brown (10YR 5/3) very gravelly clay loam; moderate medium subangular blocky structure; firm; thin patchy clay films on faces of peds; about 35 percent fragments of sandstone; common dark coatings on peds; very strongly acid.

The solum ranges from 60 to more than 80 inches in thickness. Depth to bedrock is more than 6 feet. The soil is very strongly acid or strongly acid throughout.

The A horizon ranges from 6 to 8 inches in thickness. The A1 horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. In some places there is an A2 horizon. The A2 or Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or value of 5 and chroma of 4.

The B1 horizon has hue of 7.5YR or 10YR, value of 5, and chroma of 6 or 8. It is loam, sandy clay loam, or their gravelly or stony phases. The B2t horizon has hue of 7.5YR or 10YR, value of 5, and chroma of 6 or 8. In many places, the middle and lower parts are mottled in shades of red and brown. The texture is a gravelly or very gravelly phase of sandy clay loam or clay loam.

The content of coarse sandstone fragments ranges from 10 to 35 percent in the A, B1, and B21t horizons and from 15 to 45 percent in the B22t and B23t horizons.

Lily Series

The Lily series consists of moderately deep, well drained, moderately rapidly permeable, steep soils on hillsides near streams. Lily soils developed in residuum of sandstone. The native vegetation was mixed hardwoods and some shortleaf pine. The slopes range from 20 to 40 percent.

Lily soils are near Arkana, Clarksville, Moko, and Ramsey soils. Arkana soils are in positions on the landscape similar to those of Lily soils and have a very-fine control section. Moko and Ramsey soils are in similar positions on the landscape and are less than 20 inches deep to bedrock. They do not have an argillic horizon. Clarksville soils are at higher elevations adjacent to Lily soils and have a loamy-skeletal control section.

Typical pedon of Lily stony loam, in an area of Ramsey-Lily complex, 20 to 40 percent slopes, in a wooded area in the SW1/4SE1/4SW1/4 sec. 25, T. 19 N., R. 25 W.

O1—1 inch to 0; hardwood leaves and twigs.
A1—0 to 4 inches; dark brown (10YR 3/3) stony loam; weak fine granular structure; very friable; many fine and medium roots; 20 percent fragments of sandstone; neutral; abrupt wavy boundary.
A2—4 to 10 inches; yellowish brown (10YR 5/4) stony loam; moderate medium granular structure; friable; many fine and medium roots; 15 percent fragments of sandstone; medium acid; gradual smooth boundary.
B21t—10 to 20 inches; yellowish red (5YR 5/6) stony sandy clay loam; moderate medium subangular blocky structure; firm; common fine and medium roots; thin patchy clay films on faces of peds; 20 percent fragments of sandstone; strongly acid; gradual smooth boundary.
B22t—20 to 32 inches; yellowish red (5YR 4/6) stony sandy clay loam; moderate medium subangular blocky structure; firm; common fine and medium roots; medium patchy clay films on faces of peds; 35 percent fragments of sandstone; medium acid; gradual wavy boundary.
B3—32 to 40 inches; mottled yellowish red (5YR 5/6), dark red (2.5YR 3/6), and light brownish gray (10YR 6/2) stony sandy clay loam; firm; few fine roots; thin patchy clay films on faces of peds; 30 percent fragments of sandstone; strongly acid; abrupt smooth boundary.
R—40 to 42 inches; hard, level-bedded sandstone bedrock.

The thickness of the solum and the depth to sandstone bedrock range from 30 to 40 inches. The A1 horizon is neutral to medium acid, and the rest of the soil is medium acid to very strongly acid.

The A1 horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. The A2 horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. The content of sandstone fragments ranges from 15 to 35 percent in the A horizon. The fragments are as much as 24 inches in diameter.

In some places there is a B1 horizon, which ranges from 5 to 10 inches in thickness. It has hue of 5YR or 7.5YR, value of 5, and chroma of 4 to 6. It is stony sandy clay loam or stony loam. The content of sandstone fragments ranges from 15 to 35 percent. The fragments are as much as 18 inches in diameter.

The B2t horizon has hue of 5YR, value of 4 or 5, and chroma of 4 to 8. In some places the lower part is mottled in shades of brown and red. The B2t horizon is stony clay loam, stony sandy clay loam, or stony loam. The content of sandstone fragments ranges from 15 to 35 percent. The fragments are up to 18 inches in diameter.

The B3 horizon is mottled in hue of 5YR, value of 4 or 5, and chroma of 6 or 8, hue of 2.5YR, value of 3, and chroma of 6, and hue of 10YR, value of 5 or 6, and chroma of 2 or 3. It is stony or very stony sandy clay loam or stony or very stony loam. The content of sandstone fragments ranges from 20 to 60 percent. The fragments are up to 18 inches in diameter.

Linker Series

The Linker series consists of moderately deep, well drained, moderately permeable, gently sloping to moderately steep soils on mountaintops and ridgetops. Linker soils formed in residuum of weathered, acid sandstone. The native vegetation was mixed hardwoods and some shortleaf pine. The slopes range from 3 to 20 percent.

Linker soils are near Cane and Mountainburg soils. Cane soils are on plateaus and stream terraces and have a fragipan. Mountainburg soils are on hilltops and mountaintops adjacent to Linker soils. They are less than 20 inches deep to bedrock and have a loamy-skeletal control section.

Typical pedon of Linker loam, 3 to 8 percent slopes, in a pasture in the NE1/4NW1/4NE1/4 sec. 34, T. 18 N., R. 22 W.

Ap—0 to 6 inches; dark brown (10YR 4/3) loam; weak medium granular structure; friable; many fine and medium roots; strongly acid; clear smooth boundary.
B1—6 to 14 inches; yellowish red (5YR 5/6) loam; weak medium subangular blocky structure; firm; common fine roots; strongly acid; clear wavy boundary.
B2t—14 to 20 inches; yellowish red (5YR 5/6) clay loam; moderate medium subangular blocky structure; firm; common thin patchy clay films on faces of peds; 10 percent gravel; very strongly acid; clear wavy boundary.

B3—20 to 29 inches; mottled red (2.5YR 4/6) and pale brown (10YR 6/3) clay loam; moderate medium subangular blocky structure; firm; few thin patchy clay films on faces of peds; 25 percent gravel; very strongly acid; abrupt smooth boundary.
R—29 inches; level-bedded sandstone; soft in the upper 6 inches, hard below a depth of 35 inches.

The thickness of the solum and the depth to sandstone range from 20 to 40 inches. The soil is extremely acid to strongly acid throughout.

The A1 or Ap horizon is 4 to 7 inches thick. The A1 horizon has hue of 10YR, value of 3 or 4, and chroma of 2 to 4. The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or value of 4 and chroma of 2 to 4, or it has hue of 7.5YR, value of 5, and chroma of 4. In some places there is an A2 horizon. It is 4 to 6 inches thick. It has hue of 10YR, value of 5, and chroma of 2 to 4. The texture is loam or stony fine sandy loam. The content of sandstone ranges from 0 to 25 percent.

In some places there is a B1 horizon. It has hue of 5YR, value of 4 or 5, and chroma of 6 or 8, or it has hue of 7.5YR, value of 5, and chroma of 6. It is fine sandy loam, sandy clay loam, or loam. The B2t horizon has hue of 5YR or 2.5YR, value of 4 or 5, and chroma of 6 or 8. It is sandy clay loam, clay loam, or loam. The lower part is mottled in shades of brown and red in some places. The content of sandstone in the B1 and B2t horizons ranges from 0 to 10 percent. The B3 horizon has hue, value, and chroma similar to those of the B2t horizon and is mottled in red, brown, and gray. The content of coarse fragments ranges from 0 to 25 percent.

Mayes Series

The Mayes series consists of deep, somewhat poorly drained, very slowly permeable, level to nearly level soils on broad uplands. Mayes soils developed in silty and clayey material. The slopes range from 0 to 2 percent.

Mayes soils are near Arkana, Captina, and Eldon soils. Arkana and Eldon soils are on gentle slopes adjacent to Mayes soils and have more coarse fragments. Captina soils are on gentle slopes adjacent to Mayes soils. They have a fine-silty control section and a fragipan.

Typical pedon of Mayes silt loam, 0 to 2 percent slopes, in a fescue pasture in the NE1/4NE1/4NW1/4 sec. 4, T. 19 N., R. 23 W.

A11—0 to 8 inches; very dark gray (10YR 3/1) silt loam; moderate medium granular structure; friable; many roots; slightly acid; clear smooth boundary.
A12—8 to 14 inches; very dark grayish brown (10YR 3/2) silt loam; many coarse faint dark yellowish brown (10YR 3/4) mottles; moderate medium granular structure; friable; many roots; slightly acid; clear smooth boundary.
B21t—14 to 30 inches; dark grayish brown (10YR 4/2) clay; many medium prominent red (10R 4/8) and strong brown (7.5YR 5/6) mottles; moderate fine angular blocky structure; firm, plastic; roots common in upper part and few in lower part; medium continuous clay films on faces of peds; neutral; gradual smooth boundary.
B22t—30 to 60 inches; grayish brown (10YR 5/2) clay; many coarse distinct strong brown (7.5YR 5/6) mottles; moderate fine angular blocky structure; firm, plastic; few roots; medium continuous clay films on faces of peds; moderately alkaline.

The thickness of the solum and the depth to limestone bedrock range from 60 to 72 inches. The A horizon is slightly acid or neutral, and the B horizon is neutral to moderately alkaline.

The A horizon ranges from 7 to 15 inches in thickness. It has hue of 10YR, value of 2 or 3, and chroma of 1 to 3.

The B21t horizon has hue of 10YR, value of 3 or 4, and chroma of 2 and is mottled in shades of brown and red. It is silty clay or clay. The B22t horizon has hue of 10YR, value of 4 or 5, and chroma of 2. The mottles have hue of 10YR or 7.5YR, value of 5, and chroma of 6. The B22t horizon is 0 to 15 percent fragments of limestone, which are up to 24 inches across.

These soils are a taxadjunct to the Mayes series because they do not crack to a depth of 20 inches, have a thicker Bt horizon than is defined in the range for the series, and are moderately alkaline in the B22t horizon. These differences, however, do not affect the use or behavior of these soils.

Moko Series

The Moko series consists of shallow, well drained, moderately permeable, moderately sloping to very steep soils on hillsides, mountainsides, and ridges. Moko soils formed in residuum of limestone or dolomite. The slopes range from 8 to 50 percent.

Moko soils are near Arkana, Clarksville, Lily, and Eldon soils. Arkana, Lily, and Eldon soils are adjacent to Moko soils in similar positions on the landscape. They are more than 20 inches deep to bedrock and have an argillic horizon. Clarksville soils are on higher hillsides. They are more than 60 inches deep to bedrock and have an argillic horizon.

Typical pedon of Moko very stony silt loam, in an area of Moko-Rock outcrop complex, 12 to 50 percent slopes, in a wooded area in the SE1/4SE1/4NW1/4 sec. 20, T. 20 N., R. 24 W.

A11—0 to 3 inches; very dark gray (10YR 3/1) very stony silt loam; moderate medium granular structure; friable; many fine and medium roots; 55 percent fragments of chert and limestone; mildly alkaline; clear wavy boundary.

A12—3 to 11 inches; very dark gray (10YR 3/1) very stony silty clay loam; weak fine subangular blocky structure; friable; many fine and medium roots; 55 percent fragments of chert and limestone; mildly alkaline; abrupt smooth boundary.
R—11 to 13 inches; hard dolomite.

The thickness of the solum and the depth to limestone or dolomitic bedrock range from 6 to 20 inches. Reaction is neutral or mildly alkaline throughout. Chert fragments make up 10 to 25 percent of the volume. Fragments of limestone more than 3 inches in diameter make up 25 to 60 percent of the volume.

The A horizon is 6 to 20 inches thick. It has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The texture is a very stony phase of silt loam, silty clay loam, clay loam, or loam.

The R horizon is level-bedded limestone or dolomite that in many places is fractured with few to common cracks. The cracks are filled with material from the A horizon.

Mountainburg Series

The Mountainburg series consists of shallow, well drained, moderately rapidly permeable, gently sloping to steep soils on the top and sides of ridges, hills, and mountains. Mountainburg soils developed in residuum of acid sandstone. The native vegetation was an open stand of mixed hardwoods and pines and native grasses in the open areas. The slopes range from 3 to 40 percent.

Mountainburg soils are near Cane, Enders, Linker, and Nella soils, which are all more than 20 inches deep to bedrock. Cane soils are on plateaus and have a fragipan. Enders soils are on side slopes adjacent to Mountainburg soils and have a clayey control section. Linker soils are on adjacent ridgetops and mountaintops and have a fine-loamy control section. Nella soils are on side slopes and have a fine-loamy control section.

Typical pedon of Mountainburg very stony fine sandy loam, 8 to 20 percent slopes, in a wooded area in the SW1/4SE1/4SE1/4 sec. 9, T. 17 N., R. 22 W.

O1—1 inch to 0; hardwood leaves and twigs.
A1—0 to 3 inches; very dark grayish brown (10YR 3/2) very stony fine sandy loam; weak fine granular structure; friable; many fine and medium roots; about 35 percent fragments of sandstone up to 2 feet across; very strongly acid; clear smooth boundary.
A2—3 to 9 inches; yellowish brown (10YR 5/4) very stony fine sandy loam; weak fine granular structure; friable; many fine and medium roots; about 35 percent fragments of sandstone more than 3 inches in diameter; very strongly acid; clear smooth boundary.
B2t—9 to 17 inches; strong brown (7.5YR 5/6) very stony sandy clay loam; moderate medium subangular blocky structure; firm; common medium and coarse roots; about 40 percent fragments of sandstone more than 3 inches in diameter; thin patchy clay films on faces of peds; very strongly acid; abrupt smooth boundary.
R—17 inches; sandstone bedrock; soft in the upper 5 inches, hard below a depth of 22 inches.

The thickness of the solum and the depth to sandstone bedrock range from 12 to 20 inches. The A horizon is medium acid to very strongly acid, and the B2t horizon is strongly acid or very strongly acid.

In areas that have been cultivated, the Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 3, or it has value of 4 and chroma of 2. It is 4 to 8 inches thick.

The A1 horizon ranges from 2 to 4 inches in thickness. It has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. It is gravelly fine sandy loam or very stony fine sandy loam. The A2 horizon ranges from 3 to 7 inches in thickness. It has hue of 10YR, value of 5, and chroma of 3 or 4, or it has value of 4 and chroma of 3. It is gravelly or very stony fine sandy loam. Coarse fragments make up 10 to 60 percent of the A horizon.

The B2t horizon has hue of 10YR or 7.5YR, value of 5, and chroma of 6. It is a very gravelly or very stony phase of fine sandy loam, loam, or sandy clay loam. Coarse fragments make up 35 to 50 percent of the B2t horizon.

The R horizon is horizontally bedded sandstone. The upper 5 inches is soft, and the lower part is hard.

Nella Series

The Nella series consists of deep, well drained, moderately permeable, steep soils on side slopes. Nella soils developed in colluvium from acid sandstone and shale. The native vegetation was mixed upland hardwoods. The slopes range from 20 to 40 percent.

Nella soils are near Enders, Leesburg, and Mountainburg soils. Enders soils are on mountainsides, hillsides, and ridges and have a clayey control section. Leesburg soils are in positions on the landscape similar to those of Nella soils and have a yellowish brown argillic horizon. Mountainburg soils are on steep ridgetops and mountainsides and are less than 20 inches deep to bedrock.

Typical pedon of Nella stony fine sandy loam, in an area of Nella-Mountainburg complex, 20 to 40 percent slopes, in a wooded area in the NW1/4SE1/4SE1/4 sec. 4, T. 17 N., R. 23 W.

O1—1 inch to 0; hardwood leaves and twigs.
A1—0 to 3 inches; dark grayish brown (10YR 4/2) stony fine sandy loam; weak fine granular structure; friable; about 20 percent fragments of sandstone more than 3 inches in diameter; many fine and medium roots; strongly acid; clear smooth boundary.

A2—3 to 10 inches; yellowish brown (10YR 5/4) stony fine sandy loam; moderate medium granular structure; friable; about 25 percent fragments of sandstone more than 3 inches in diameter; many fine and medium roots; strongly acid; clear smooth boundary.

B1—10 to 17 inches; yellowish brown (10YR 5/6) stony loam; weak fine subangular blocky structure; firm; about 20 percent fragments of sandstone more than 3 inches in diameter; many medium roots; very strongly acid; clear smooth boundary.

B21t—17 to 27 inches; yellowish red (5YR 5/6) stony clay loam; moderate medium subangular blocky structure; firm; about 35 percent fragments of sandstone more than 3 inches in diameter; thin patchy clay films on faces of peds; many medium roots; very strongly acid; gradual smooth boundary.

B22t—27 to 67 inches; yellowish red (5YR 5/6) stony clay loam; many medium distinct brown (10YR 5/3) mottles; moderate medium subangular blocky structure; firm, slightly brittle; about 35 percent fragments of sandstone more than 3 inches in diameter; thin patchy clay films on faces of peds; very strongly acid.

The solum ranges from 60 to more than 80 inches in thickness. Depth to bedrock is more than 6 feet. The soil is very strongly acid or strongly acid throughout.

The A1 horizon ranges from 1 inch to 3 inches in thickness. It has hue of 10YR, value of 4, and chroma of 2 or 3. The A2 horizon ranges from 5 to 8 inches in thickness. It has hue of 10YR, value of 4 or 5, and chroma of 3 or value of 5 and chroma of 4. The content of sandstone ranges from 10 to 35 percent.

The B1 horizon has hue of 7.5YR or 10YR, value of 5, and chroma of 6 or 8. It is loam, clay loam, or sandy clay loam, or the stony phases. The content of sandstone ranges from 10 to 35 percent. The B2t horizon has hue of 2.5YR or 5YR, value of 4 or 5, and chroma of 6 or 8. In many places, the middle and lower parts of the B2t horizon are mottled in shades of red, brown, and gray. The texture is sandy clay loam, clay loam, stony sandy clay loam, stony clay loam, and, in the lower part in some places, clay. The content of sandstone ranges from 15 to 35 percent.

Nixa Series

The Nixa series consists of deep, moderately well drained, very slowly permeable, very cherty, gently sloping to moderately sloping soils on ridgetops. Nixa soils formed in residuum of weathered cherty limestone. The slopes range from 3 to 12 percent.

Nixa soils are near Captina, Clarksville, Noark, Arkana, and Moko soils. Captina soils are on broad upland flats adjacent to Nixa soils. They do not have chert in the A horizon and have a fine-silty control section. Clarksville soils are on adjacent lower hillsides and do not have a fragipan. Noark soils are on ridgetops and do not have a fragipan. Arkana and Moko soils are on lower hillsides and ridges. Moko soils are less than 20 inches deep to bedrock and do not have an argillic horizon. Arkana soils are less than 45 inches deep to bedrock and have a very-fine control section.

Typical pedon of Nixa very cherty silt loam, 8 to 12 percent slopes, in a wooded area in the NW1/4SW1/4NW1/4 sec. 19, T. 18 N., R. 24 W.

A1—0 to 2 inches; very dark grayish brown (10YR 3/2) very cherty silt loam; moderate medium granular structure; very friable; many fine and medium roots; about 75 percent fragments of chert; neutral; abrupt wavy boundary.

A2—2 to 9 inches; brown (10YR 5/3) very cherty silt loam; moderate medium granular structure; friable; many fine and medium roots; about 75 percent fragments of chert; strongly acid; wavy boundary.

B1—9 to 21 inches; yellowish brown (10YR 5/6) very cherty silt loam; weak fine subangular blocky structure; friable; common fine and medium roots; many fine pores; thin patchy clay films on faces of peds; about 70 percent fragments of chert; strongly acid; clear wavy boundary.

Bx—21 to 35 inches; strong brown (7.5YR 5/6) very cherty silt loam; many coarse distinct pale brown (10YR 6/3) mottles; moderate fine angular blocky structure; firm, brittle; common fine and very fine vesicular pores; thin continuous clay films on pore walls; about 75 percent fragments of chert; strongly acid; clear wavy boundary.

B2t—35 to 72 inches; red (2.5YR 4/6) and light gray (10YR 7/1) very cherty silty clay; moderate fine angular blocky structure; firm; common fine pores; about 80 percent fragments of chert; strongly acid.

Depth to the fragipan is 14 to 22 inches. Depth to consolidated bedrock is more than 60 inches. The soil is strongly acid or very strongly acid throughout except where the soil has been limed.

The A horizon ranges from 6 to 14 inches in thickness. In cultivated areas, there is an Ap horizon that is about 8 inches thick. It has hue of 10YR, value of 4 or 5, and chroma of 3. The A1 horizon ranges from 2 to 6 inches in thickness. It has hue of 10YR, value of 3 or 4, and chroma of 2. The A2 horizon ranges from 4 to 8 inches in thickness. It has hue of 10YR, value of 5, and chroma of 2 or 3 or value of 6 and chroma of 3. In some places there is an A12 horizon that has hue of 10YR, value of 6, and chroma of 3. The content of chert in the A horizon ranges from 45 to 75 percent.

The B1 horizon has hue of 10YR, value of 5 or 6, and chroma of 4 or 6.

The Bx horizon has hue of 10YR, value of 5 or 6, and chroma of 4 or 6, or it has hue of 7.5YR, value of 5, and chroma of 6. It is very cherty silt loam or very cherty silty

clay loam. The content of chert ranges from 40 to 75 percent.

The B2t horizon has hue of 2.5YR, value of 3 or 4, and chroma of 6, or it has hue of 5YR, value of 4 or 5, and chroma of 6 or 8. It may be mottled in shades of red, brown, or gray. The texture is a very cherty phase of silty clay loam, silty clay, or clay. The content of chert ranges from 50 to 85 percent.

Noark Series

The Noark series consists of deep, well drained, moderately permeable, gently sloping to steep soils on ridgetops and hillsides. Noark soils formed in residuum of weathered cherty limestone.

Noark soils are near Captina, Clarksville, Nixa, Moko, and Arkana soils. Captina and Nixa soils are adjacent to Noark soils on similar landscapes and have a fragipan. Clarksville soils are on adjacent similar landscapes and have a loamy-skeletal control section. Arkana and Moko soils are on lower hillsides and ridges. Moko soils are less than 20 inches deep to bedrock and do not have an argillic horizon. Arkana soils are less than 45 inches deep to bedrock and have a very-fine control section.

Typical pedon of Noark very cherty silt loam, 8 to 20 percent slopes, in a pasture in the SW1/4NW1/4SE1/4 sec. 33, T. 20 N., R. 22 W.

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) very cherty silt loam; weak medium granular structure; friable; many fine and medium roots; few fine pores; about 35 percent fragments of chert; neutral; clear smooth boundary.

A2—5 to 12 inches; yellowish brown (10YR 5/4) very cherty silt loam; moderate medium granular structure; friable; many fine and medium roots; few fine pores; about 45 percent fragments of chert; medium acid; clear wavy boundary.

B1—12 to 20 inches; yellowish red (5YR 4/6) very cherty silty clay loam; weak medium subangular blocky structure; friable; few fine roots; few fine pores; thin patchy clay films on faces of peds; about 40 percent fragments of chert; strongly acid; clear wavy boundary.

B21t—20 to 33 inches; red (2.5YR 4/6) very cherty silty clay; moderate medium subangular blocky structure; firm; few fine pores; thin continuous clay films on faces of peds; about 40 percent fragments of chert; very strongly acid; gradual wavy boundary.

B22t—33 to 72 inches; dark red (2.5YR 3/6) very cherty clay; moderate medium subangular blocky structure; firm; few fine pores; thick continuous clay films on faces of peds; about 45 percent fragments of chert; very strongly acid.

The solum ranges from 60 to more than 80 inches in thickness. The A horizon is strongly acid to lightly acid except in areas that have been limed, and the B horizon is very strongly acid or strongly acid.

The A horizon ranges from 4 to 17 inches in thickness. In some places there is an Ap horizon. It has hue of 10YR, value of 3 or 4, and chroma of 2 to 4. The A1 horizon ranges from 2 to 7 inches in thickness. It has hue of 10YR, value of 4, and chroma of 2 or 3 or value of 3 and chroma of 3. The A2 horizon ranges from 4 to 9 inches in thickness. It has hue of 10YR, value of 5 or 6, and chroma of 3 or 4. The content of chert in the A horizon ranges from 35 to 70 percent.

The B1 horizon has hue of 5YR, value of 4, and chroma of 6, or it has hue of 7.5YR or 10YR, value of 5, and chroma of 6. It is very cherty silt loam or very cherty silty clay loam. The B21t horizon has hue of 2.5YR, value of 4 or 5, and chroma of 6 or value of 3 and chroma of 6, or it has hue of 5YR, value of 4, and chroma of 6 or 8. It is very cherty clay or very cherty silty clay. The B22t horizon is the same as the B21t except that in some places it has few to common strong brown mottles. The content of chert ranges from 35 to 70 percent in the B21t horizon and from 45 to 80 percent in the B22t horizon.

Peridge Series

The Peridge series consists of deep, well drained, moderately permeable, gently sloping soils on stream terraces and broad uplands. Peridge soils formed in material that weathered from limestone, siltstone, or old alluvium composed of beds of gravelly or silty material. The slopes range from 3 to 8 percent.

Peridge soils are near Britwater, Razort, and Wideman soils. Britwater soils are adjacent to Peridge soils in similar positions on the landscape. They have a fine-loamy control section and a higher content of gravel. Razort soils are on lower flood plains adjacent to Peridge soils. They have a fine-loamy control section and a brown argillic horizon. Wideman soils are on lower flood plains. They have a sandy control section and are not so red.

Typical pedon of Peridge silt loam, 3 to 8 percent slopes, in a meadow in the SW1/4SW1/4NE1/4 sec. 29, R. 25 W., T. 19 N.

Ap—0 to 8 inches; dark brown (7.5YR 4/4) silt loam; moderate fine granular structure; very friable; slightly acid; abrupt smooth boundary.

B21t—8 to 28 inches; yellowish red (5YR 4/6) silt loam; weak medium subangular blocky structure; friable; many fine dark bodies; many fine pores; thin patchy clay films on faces of peds; slightly acid; clear smooth boundary.

B22t—28 to 53 inches; red (2.5YR 4/6) silty clay loam; moderate medium subangular blocky structure; firm; many fine dark bodies; many fine pores; thin

continuous clay films on faces of peds; medium acid; clear smooth boundary.

B23t—53 to 68 inches; mottled yellowish red (5YR 4/6), pale brown (10YR 6/3), and brown (7.5YR 5/4) silty clay loam; moderate medium angular blocky structure; firm; medium continuous clay films on faces of peds; many fine pores; many fine dark bodies; medium acid; clear smooth boundary.

B24t—68 to 74 inches; mottled yellowish red (5YR 4/6), pale brown (10YR 6/3), and brown (7.5YR 5/4) silty clay loam; weak coarse prismatic structure parting to moderate coarse subangular blocky; medium continuous clay films on faces of peds; firm; slightly brittle; medium acid.

The solum is 80 inches or more thick. The soil is very strongly acid to medium acid throughout except in areas where the surface has been limed.

The Ap horizon is 5 to 10 inches thick. It has hue of 10YR, value of 4 or 5, and chroma of 3, or it has hue of 7.5YR, value of 4, and chroma of 4.

In some places there is a B1 horizon. It is 3 to 8 inches thick and has hue of 7.5YR, value of 5, and chroma of 4 or 6, or it has hue of 5YR, value of 4, and chroma of 4.

The B21t horizon has hue of 5YR, value of 4, and chroma of 6 or 8. The content of gravel generally is less than 5 percent. The B22t horizon has hue of 2.5YR, value of 4, and chroma of 6 or 8, and in some places, it has mottles in shades of brown. The content of gravel generally is less than 5 percent.

The B23t and B24t horizons have hue of 2.5YR or 5YR, value of 4 or 5, and chroma of 6 or 8. They have mottles that have hue of 10YR, value of 5, and chroma of 6 or value of 6 and chroma of 3, or that have hue of 7.5YR, value of 5 or 6, and chroma of 4 or 6; or the horizons are variegated in shades of brown and red. The texture is silty clay loam or silty clay. The content of gravel ranges from 0 to 35 percent.

Portia Series

The Portia series consists of deep, well drained, moderately slowly permeable, gently sloping soils on broad uplands, stream terraces, and foot slopes. Portia soils formed in residuum of weathered sandstone. The native vegetation was mixed hardwoods. The slopes range from 3 to 8 percent.

Portia soils are near Britwater, Razort, and Wideman soils. Britwater soils are adjacent to Portia soils in similar positions on the landscape and have gravel throughout. Razort soils are on lower flood plains adjacent to Portia soils and have an argillic horizon that is brown and contains less clay. Wideman soils are on lower flood plains adjacent to Portia soils and have more sand throughout.

Typical pedon of Portia loam, 3 to 8 percent slopes, in a pasture in the SW1/4NW1/4NW1/4 sec. 11, T. 19 N., R. 23 W.

Ap—0 to 7 inches; brown (10YR 4/3) loam; weak fine granular structure; friable; many fine and medium roots; neutral; clear wavy boundary.

B1—7 to 12 inches; brown (7.5YR 4/4) silt loam; moderate medium granular structure; friable; many fine and medium roots; neutral; clear smooth boundary.

B21t—12 to 24 inches; yellowish red (5YR 4/6) sandy clay loam; moderate medium subangular blocky structure; firm; common fine roots; thin patchy clay films on faces of peds; strongly acid; clear wavy boundary.

B22t—24 to 36 inches; red (2.5YR 4/8) clay loam; common medium distinct pale brown (10YR 6/3) mottles; moderate medium subangular blocky structure; firm; common fine roots; few fine pores; thin patchy clay films on faces of peds; strongly acid; gradual wavy boundary.

B23t—36 to 55 inches; red (2.5YR 4/6) clay loam; common medium distinct pale brown (10YR 6/3) mottles; moderate medium subangular blocky structure; firm; thin patchy clay films on faces of peds; about 5 percent coarse fragments; strongly acid; gradual wavy boundary.

B24t—55 to 72 inches; red (2.5YR 4/6) gravelly clay loam; common medium distinct pale brown (10YR 6/3) and strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; firm; thin patchy clay films on faces of peds; about 20 percent coarse fragments; small pockets of strong brown (7.5YR 5/6) sand; strongly acid.

The solum ranges from 60 to more than 80 inches in thickness. The A horizon is medium acid or slightly acid except in areas where the soil has been limed; the upper part of the B horizon is very strongly acid or strongly acid, and the lower part is strongly acid or medium acid. The content of coarse fragments ranges from 0 to 10 percent throughout, but in some places it can be as much as 25 percent in the lower part of the solum.

The A horizon ranges from 5 to 15 inches in thickness. The Ap horizon is 5 to 9 inches thick. It has hue of 10YR, value of 4, and chroma of 3 or 4, or it has value of 5 and chroma of 3. In some places there is an A2 horizon. It is 3 to 6 inches thick and has hue of 10YR, value of 5, and chroma of 3 or 4.

In some places there is a B1 horizon. It has hue of 7.5YR, value of 4 or 5, and chroma of 4 or value or 5 and chroma of 6. It is silt loam or fine sandy loam.

The B21t horizon has hue of 5YR, value of 4 or 5, and chroma of 6 or 8, or it has hue of 7.5YR, value of 5, and chroma of 6. It is sandy clay loam or loam. The B22t horizon has hue of 5YR or 2.5YR, value of 4 or 5, and

chroma of 6 or 8. It is sandy clay loam or clay loam. In some places the B21t and B22t horizons are mottled in shades of red and brown. The B23t and B24t horizons have hue of 2.5YR or 5YR, value of 4, and chroma of 6 or 8 and are mottled in shades of brown. The texture is sandy clay, sandy clay loam, clay loam, or the gravelly phases. The content of gravel ranges from 0 to 25 percent.

Ramsey Series

The Ramsey series consists of shallow, somewhat excessively drained, rapidly permeable, steep soils on hillsides near streams in the Ozark Highland. Ramsey soils formed in residuum of sandstone. The native vegetation was an open stand of pine, eastern redcedar, and mixed hardwoods and tall prairie grasses in the open areas. The slopes range from 20 to 40 percent.

Ramsey soils are near Arkana, Clarksville, Lily, and Moko soils. Clarksville soils are at higher elevations adjacent to Ramsey soils and are more than 60 inches deep to bedrock. Arkana and Moko soils are in positions on the landscape similar to those of Ramsey soils. Arkana soils are more than 20 inches deep to bedrock, and Moko soils are Mollisols. Lily soils are in similar positions. They are more than 20 inches deep to bedrock and have an argillic horizon.

Typical pedon of Ramsey very stony loam, in an area of Ramsey-Lily complex, 20 to 40 percent slopes, in the SW1/4NW1/4SE1/4 sec. 14, T. 19 N., R. 27 W.

O1—1 inch to 0; hardwood leaves and twigs and redcedar twigs.

A1—0 to 2 inches; dark brown (10YR 3/3) very stony loam; moderate medium granular structure; very friable; many fine and medium roots; about 45 percent coarse fragments, mostly sandstone, small amounts of chert; medium acid; abrupt smooth boundary.

A2—2 to 8 inches; brown (10YR 5/3) very stony loam; moderate medium granular structure; friable; common fine roots; about 45 percent coarse fragments, mostly sandstone, small amounts of chert; very strongly acid; clear smooth boundary.

B2—8 to 15 inches; light yellowish brown (10YR 6/4) stony loam; moderate medium subangular blocky structure; friable; few fine roots; thin patchy clay films on ped faces; about 35 percent coarse fragments, mostly sandstone, small amounts of chert; very strongly acid; clear smooth boundary.

R—15 to 17 inches; hard, level-bedded sandstone bedrock.

The thickness of the solum and the depth to hard sandstone bedrock range from 7 to 20 inches. The A1 horizon is medium acid or strongly acid, and the A2 and B horizons are strongly acid or very strongly acid.

The A1 horizon is less than 1 inch to 2 inches thick. It has hue of 10YR, value of 3, and chroma of 2 or 3.

The A2 horizon is 3 to 6 inches thick. It has hue of 10YR, value of 4, and chroma of 2 or 3 or value of 5 and chroma of 3 or 4. The A horizon is 30 to 60 percent sandstone gravel and stones.

The B2 horizon has hue of 10YR, value of 5, and chroma of 3 to 6 or value of 6 and chroma of 3 or 4, or it has hue of 7.5YR, value of 5, and chroma of 6. It is stony loam or stony sandy loam. The content of sandstone is 20 to 35 percent.

In some places there is a B3 horizon. It has hue of 10YR, value of 5, and chroma of 4 or 6 or value of 6 and chroma of 3 or 4. It is very stony loam or very stony sandy loam. The content of sandstone is 35 to 65 percent.

Razort Series

The Razort series consists of deep, well drained, moderately permeable, level and nearly level soils on flood plains of streams. Razort soils formed in loamy alluvium. The slopes range from 0 to 3 percent.

Razort soils are near Britwater, Elsah, Peridge, and Wideman soils. Britwater soils are on higher stream terraces. Their surface layer is not so dark, and their subsoil is redder. Elsah soils are adjacent to Razort soils in similar positions on the landscape and have more coarse fragments in the control section. Peridge soils are on uplands and higher terraces. They have a fine-silty control section and a red subsoil. Wideman soils are on lower flood plains and have a sandy control section.

Typical pedon of Razort loam, occasionally flooded, in a meadow in the NE1/4NW1/4SE1/4 sec. 27, T. 18 N., R. 23 W.

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

B21t—10 to 23 inches; dark brown (10YR 3/3) loam; moderate medium subangular blocky structure; friable; many fine pores; common roots; thin continuous clay films on faces of peds; slightly acid; gradual smooth boundary.

B22t—23 to 58 inches; dark yellowish brown (10YR 3/4) clay loam, dark grayish brown (10YR 3/2) on surface of peds; moderate medium subangular blocky structure; firm; many fine pores; common roots; thin continuous clay films on faces of peds; slightly acid; clear smooth boundary.

B3—58 to 72 inches; brown (10YR 4/3) very gravelly loam, dark brown (10YR 3/3) on surface of peds; weak coarse subangular blocky structure; firm; thin patchy clay films on faces of peds; about 40 percent chert gravel; slightly acid.

The thickness of the solum ranges from 40 to more than 70 inches. The A horizon is neutral or slightly acid, and the B horizon is slightly acid or medium acid.

The A horizon is 6 to 10 inches thick. It has hue of 10YR, value of 3, and chroma of 3 or 4, or it has hue of 7.5YR, value of 3, and chroma of 2.

In some places there is a B1 horizon. It has hue of 10YR, value of 3, and chroma of 3 or 4 or value of 4 and chroma of 3, or it has hue of 7.5YR, value of 3, and chroma of 2. It is loam or silt loam.

The B2t horizon has hue of 10YR, value of 3, and chroma of 2 to 4 or value of 4 and chroma of 3 or 4 or value of 5 and chroma of 3, or it has hue of 7.5YR, value of 4 or 5, and chroma of 4. The texture is silt loam, loam, or clay loam. Chert or gravel makes up 0 to 25 percent of the volume.

The B3 horizon has colors similar to those of the B2t horizon. The content of chert or gravel ranges from 20 to 50 percent.

In some places there is an underlying IIC horizon that is stratified silty, sandy, and gravelly material.

Wideman Series

The Wideman series consists of deep, excessively drained, moderately rapidly permeable, level and nearly level soils on flood plains and natural levees along streams. Wideman soils formed in recent sandy alluvium. They are frequently flooded. The slope ranges from 0 to 3 percent.

Wideman soils are near Britwater, Portia, Peridge, and Razort soils. Britwater and Portia soils are on higher stream terraces and have a fine-loamy control section. Peridge soils are on uplands and higher terraces and have a fine-silty control section that is redder. Razort soils are on slightly higher flood plains. They have a fine-loamy control section, and their surface layer is darker.

Typical pedon of Wideman loamy fine sand, frequently flooded, in a meadow, in the SE1/4SW1/4NE1/4 sec. 9, R. 22 W., T. 20 N.

Ap—0 to 9 inches; dark brown (10YR 4/3) loamy fine sand; single grained; very friable; many fine and medium roots; neutral; clear smooth boundary.

C1—9 to 13 inches; dark yellowish brown (10YR 3/4) loamy fine sand; weak fine granular structure; friable; many fine and medium roots; few fine black masses; neutral; clear smooth boundary.

C2—13 to 16 inches; dark grayish brown (10YR 4/2) loamy sand; single grained; very friable; many fine and medium roots; few fine black masses; neutral; abrupt smooth boundary.

C3—16 to 24 inches; dark brown (10YR 4/3) sandy loam; weak fine granular structure; friable; many fine and medium roots; few fine black masses; neutral; abrupt smooth boundary.

C4—24 to 39 inches; stratified layers 1 inch to 4 inches thick of dark brown (10YR 5/3) fine sand, dark grayish brown (10YR 4/2) loam, and dark brown (10YR 4/4) loamy fine sand; single grained and weak fine granular structure; very friable and friable; common medium black masses; common fine roots; neutral; abrupt smooth boundary.

C5—39 to 46 inches; dark yellowish brown (10YR 3/4) sandy loam; weak fine granular structure; friable; neutral; abrupt smooth boundary.

C6—46 to 60 inches; brown (10YR 5/3) fine sand; single grained; very friable; common medium black masses; neutral; abrupt smooth boundary.

C7—60 to 72 inches; dark yellowish brown (10YR 3/4) sandy loam; weak fine granular structure; friable; common medium black masses; neutral.

The sandy sediment ranges from 60 to more than 80 inches in thickness. The soil is neutral to medium acid throughout.

The A horizon is 6 to 9 inches thick. It has hue of 10YR, value of 3 to 5, and chroma of 2 to 4.

The C horizon has hue of 10YR, value of 3 to 6, and chroma of 2 to 4. The 10- to 40-inch control section is dominantly loamy sand or fine sand and has thin strata of loamy fine sand or finer textured material. Coarse fragments, dominantly gravel, make up 0 to 20 percent, by volume, of the lenses in some of the lower parts of the C horizon.

Formation of the Soils

In this section the factors of soil formation are discussed and are related to the soils in the county. The processes of soil formation are also discussed.

Factors of Soil Formation

The characteristics of a soil are determined by the physical and mineralogical composition of the parent material, the climate under which the soil material has accumulated and existed since accumulation, the plant and animal life on and in the soil, the relief, or lay of the land, and the length of time the forces of soil formation have acted on the soil material.

Climate and plants and animals, chiefly plants, are the active factors in soil formation. They act on parent material that has accumulated through the weathering of rocks and slowly bring about the formation of a natural body that has genetically related horizons. The effects of climate and of plant and animal life are conditioned by relief. The parent material also affects soil formation, and in extreme cases it determines entirely the kind of soil that is formed. Finally, time is needed for changing the parent material into a horizonal soil. Generally, a long time is required for the development of distinct horizons.

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effect of any one factor unless conditions are specified for all five factors.

Parent Material

The soils in Carroll County formed in alluvium and in Paleozoic bedrock *(4, 5)*. The soils on the Salem Plateau formed in Ordovician sandstone and dolomitic limestone. The soils on the Springfield Plateau formed in cherty limestone of the Mississippian period, and those in the Boston Mountains formed in interbedded acid sandstone and shale of the Mississippian and Pennsylvanian periods.

The Arkana, Eldon, and Moko soils formed in residuum of the Cotter and Powell Formations. These formations are on the Salem Plateau and are of the Ordovician period. Both are fine-grained, gray dolomitic limestone; the Cotter Formation also has small amounts of chert in it.

The Ramsey and Lily soils formed in residuum of the St. Peter Sandstone and Everton Formations, which overlie the Powell Formation on the Salem Plateau and are of the Ordovician period. These formations consist mainly of massive, buff to white, medium- to fine-grained friable sandstone and small amounts of interbedded limestone and shale. They are thick enough to be important in soil formation only in the southwestern part of the county.

The Clarksville, Nixa, and Noark soils formed in dissected areas of the Boone Formation. This formation overlies the St. Peter Sandstone and Everton Formations and is of the Mississippian period. It forms the Springfield Plateau and consists of alternating beds of limestone and chert from cherty limestone, which formed in material deposited in marine waters. The limestone weathers more rapidly than the chert, and soils that form in these areas contain large amounts of chert. The amount of chert in the formation varies both vertically and laterally.

The Boston Mountains in Carroll County consist of acid sandstone and shale of the Mississippian and Pennsylvanian periods and small amounts of limestone. The subsoil of Enders soils formed in residuum of shale. The Linker and Mountainburg soils formed in residuum of sandstone. The soils on foot slopes and mountain benches, Leesburg soils for example, formed in deep, loamy, stony colluvium that was washed or sloughed from adjacent higher slopes.

The Razort and Elsah soils formed in deep, loamy alluvium on flood plains. The alluvium washed from local uplands.

Climate

The climate of Carroll County is characterized by mild winters, warm or hot summers, and fairly abundant rainfall. The present climate is probably similar to the one that influenced soil formation in the past. The average daily maximum temperature in July is about 90° F, and in January it is about 49°. The total annual rainfall is about 43 inches and is well distributed throughout the year. The section "General Nature of the County" discusses the climate of Carroll County.

The warm, moist climate promotes rapid soil formation. The warmth promotes rapid chemical reaction, and the abundant rainfall makes a large amount of water available for dissolving and moving dissolved and suspended material downward in the soil. Plant residue decomposes rapidly, and the organic acid released during decomposition hastens the removal of carbonates

and the formation of clay minerals. Because the soil is frozen only in the upper few inches and only for short periods, soil formation continues almost year-round. Although the climate is uniform throughout the county, its effect is modified locally by elevation and slope. Climate alone does not account for differences in the soils in the county.

Living Organisms

Living organisms, including insects, bacteria, and fungi, are important in the formation of soils. They furnish organic matter and bring plant nutrients up from the lower horizons to the upper ones. In addition, they add nitrogen and change the structure and porosity of the soils.

Before Carroll County was settled, the native vegetation had more influence on soil formation than did animal activities. Sparse to dense stands of hardwoods or mixed hardwoods and shortleaf pine covered most of the county. There were small, scattered tall-grass prairies throughout the county. The soils on uplands underlain by limestone in the central part of the county supported savannas. The vegetation on the savannas was eastern redcedar or mixed eastern redcedar, hardwoods, and tall grasses, similar to those on the small prairies, in the open areas between the trees. Arkana, Eldon, and Moko soils are the major soils in these areas.

The native vegetation on most of the other uplands was sparse to dense stands of upland oaks and hickory, some mixed with shortleaf pine. In these areas, only the upper few inches of the soils have a significant accumulation of organic matter and a dark color. Cane, Captina, Enders, Leesburg, Linker, Mountainburg, Nella, Nixa, Noark, and Portia soils formed on forested uplands.

There were a few small, gently sloping tall-grass prairies scattered throughout the county. The native vegetation was mostly tall grasses, such as big bluestem, little bluestem, indiangrass, and switchgrass, and a variety of forbs. The surface layer of the soils on these prairies has been slightly darkened to a depth of several inches by the accumulation of organic matter.

In the alluvial areas, the native vegetation was mainly hardwoods, such as sycamore, hackberry, elm, black walnut, ash, oak, and hickory. Razort and Elsah soils formed in these areas.

Characteristics of the soils reflect only the major differences in the original vegetation. Variations in the native vegetation are related partly to variations in the available water capacity of the soils and in the drainage. Differences in slope, aspect, and soil fertility can cause minor variations.

Man is an important influence in the future rate and direction of soil formation. He clears and cultivates the soils and introduces new kinds of plants. He adds fertilizer, organic residue, lime, and chemicals for insect, disease, and weed control. He builds dams to control flooding and grades the soil. He covers the soil with impermeable pavement and buildings. He cultivates erodible areas and causes fires, which affect the kind and amount of vegetation on the soil. All these activities affect the formation of soils. The results of some activities may not be evident for many centuries; nevertheless, the complex ecosystem that affects soil formation in this county has been drastically changed by man.

Relief

In Carroll County, the inequality in elevation, or relief, is the result of the uplift of Paleozoic rocks and the subsequent erosion and entrenchment of drainage channels into the land surface. The relief ranges from nearly vertical bluffs to level to gently sloping areas. The highest elevation in the county, about 2,280 feet above sea level, is in the southeastern part of the county. The lowest elevation, about 900 feet above sea level, is in the northeastern part of the county along Table Rock Lake.

Some of the greatest differences between the soils in Carroll County are caused by differences in relief. Relief affects drainage, runoff, erosion, and the percolation of water through the soil.

Some of the steeper slopes, narrow ridges, and hilltops have lost so much soil material through geologic erosion that the soils, Moko and Mountainburg soils, for example, are shallow. In other areas of strong relief, Clarksville, Nixa, and Noark soils formed in cherty limestone. Because the limestone weathers faster than the chert, these soils contain large amounts of chert residue. The chert mantle retards geologic erosion.

The nearly level to moderately sloping Captina, Cane, Linker, and Portia soils on uplands have lost little soil material. These soils contain few coarse fragments in the upper part of the profile and are moderately deep or deep.

On foot slopes and mountain benches, there are accumulations of material that was washed or sloughed from the adjacent higher slopes. Leesburg and Nella soils and the surface layer of Enders soils formed in this colluvium. In places, rocks have broken off and rolled downslope, and in these places the soils are stony.

The nearly level to moderately sloping Britwater and Peridge soils are on old stream terraces. These soils formed in the deep, loamy and silty material that washed from the uplands and was deposited on stream flood plains before the streams became further entrenched.

The flood plains presently along streams are level to nearly level and are subject to occasional or frequent flooding. Elsah, Razort, and Wideman soils formed on these flood plains in the deep, loamy alluvial deposits.

Time

The length of time required for a soil to form depends on the other factors of soil formation. If the climate is warm and humid and the vegetation is luxuriant, less time is generally needed. Also, less time is needed if the parent material is coarse textured than if it is fine textured, other factors being equal.

Geologically, most soils in Carroll County are old, regardless of whether they are on mountaintops, mountainsides, or stream terraces. The soils of intermediate age formed in alluvium along the larger streams. The soils that are young formed in residuum of bedrock in places where geologic erosion is nearly as rapid as weathering.

Some soils on uplands are old soils. These soils formed in residuum of cherty limestone, sandstone, and interbedded shale and sandstone and have a fairly high degree of development. Most are so old that most of the cations have been leached out, and there has been considerable weathering and translocation of clay. Because iron as well as clay has been translocated from the A horizon to the B horizon and then oxidized, the B horizon has stronger red, brown, and yellow colors than the A horizon. The cherty Clarksville, Nixa, and Noark soils clearly show the impact of time on the cherty limestone parent material.

Razort and Elsah soils are of intermediate age. They formed in loamy alluvium over nonconforming alluvium, residuum, or bedrock of varying character. Horizonation is weak. The B horizon is underlain by stratified beds of silty, sandy, and gravelly material.

Elsah and Wideman soils are young soils that formed in recent alluvium on flood plains along streams. No definite horizons have formed other than an A horizon. Instead, these soils still have a depositional rock structure, or bedding planes, and little or no soil structure. Base saturation is high, and the reaction is medium acid to neutral, which indicates that leaching has been slight.

The shallow Moko soils are young soils that formed over limestone in places where geologic erosion has been nearly as rapid as the weathering of the rock material.

Processes of Soil Formation

The effects of the soil-forming factors are recorded in the soil profile, which is a succession of layers, or horizons, from the surface to the parent material. The horizons differ in one or more properties such as color, texture, structure, consistence, and porosity.

Most soil profiles consist of three major horizons, which are called the A, B, and C horizons. Very young soils do not have a B horizon.

The horizon of maximum accumulation of organic matter is called the A1 horizon, or surface layer. The horizon of maximum leaching of dissolved or suspended material is called the A2 horizon, or subsurface layer.

The B horizon, which is directly below the A horizon, is sometimes called the subsoil *(10)*. It is the horizon of maximum accumulation of suspended material, such as clay and iron. The B horizon commonly has a blocky structure and is firmer than the horizons directly above and below it.

The C horizon is below the B horizon. It is little affected by the soil-forming processes but can be materially modified by weathering. In some young soils, the C horizon is just below the A horizon and has been slightly modified by living organisms and by weathering.

Several processes have been active in the formation of soils in Carroll County. Among these processes are the accumulation of organic matter, the leaching of 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 process has been active in soil formation.

Physical weathering of rocks, a result of heating, cooling, wetting, and drying, slowly breaks them into small fragments. Such fragments are the parent material of the soils in the county that developed in residuum. This derivation is most evident in Lily, Linker, and Mountainburg soils.

In some soils, organic matter has accumulated in the upper part of the profile to form an A1 horizon.

Leaching of bases has occurred to some degree in nearly all the soils in Carroll County. It is generally accepted that bases are leached downward before silicate clay minerals begin to move. Elsah, Wideman, and Moko soils are only slightly leached. Razort soils are moderately leached. Enders, Linker, Mountainburg, and Clarksville soils are strongly leached.

Oxidation of iron is evident in the moderately well drained and well drained soils in the county, for example, Britwater, Peridge, and Noark soils. Red and brown colors in the B horizon are an indication of the oxidation of iron.

In Carroll County, the reduction and transfer of iron, or gleying, has occurred to a significant degree only in the poorly drained Mayes soils. Gray colors in the horizons below the surface layer indicate the reduction and loss of iron. Some horizons have reddish or yellowish mottles and concretions derived from segregated iron.

Translocation of silicate clay minerals has contributed to horizon development in most of the soils in the county. In cultivated areas, most of the A2 horizon has been destroyed. Where there is an A2 horizon, it has blocky structure. It also has less clay than the underlying horizons and is lighter in color. Clay films generally have accumulated in pores and on the surfaces of peds in the B horizon. Most of the carbonates and soluble salts probably were leached before the translocation of silicate clay began, although the content of bases is still moderate in some of the soils on lowlands.

References

(1) American Association of State Highway [and Transportation] Officials. 1970. Standard specifications for highway materials and methods of sampling and testing. Ed. 10, 2 vol., illus.

(2) American Society for Testing and Materials. 1974. Method for classification of soils for engineering purposes. ASTM Stand. D 2487-69. *In* 1974 Annual Book of ASTM Standards, Part 19, 464 pp., illus.

(3) Arkansas Forestry Commission. 1981. Land use and acreage for Arkansas. 62 pp.

(4) Croneis, Carey. 1930. Geology of the Arkansas Paleozoic area. Ark. Geol. Surv. Bull. 3, 457 pp., illus.

(5) Haley, Boyd R. and others. 1976. Geologic map of Arkansas. U.S. Geol. Surv.

(6) United States Department of Agriculture. 1951. Soil survey manual. U.S. Dep. Agric. Handb. 18, 503 pp., illus.

(7) United States Department of Agriculture. 1960. Arkansas forest survey release 84. Forest Serv., South. Forest Exp. Stn. 58 pp., illus.

(8) United States Department of Agriculture. 1970. Forest statistics for Arkansas counties. Forest Serv., South. Forest Exp. Stn. Resour. Bull. SO-22, 52 pp.

(9) 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.

(10) 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.

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

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

	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.

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.

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

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. Synonyms: clay coating, clay skin.

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

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). Excessive decrease in volume of soft soil 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, for example, fire, that exposes the surface.

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

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

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

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

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

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

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

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

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

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

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

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

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

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, alluminum, 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 (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. 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 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, as contrasted 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 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 affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

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

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

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

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

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

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

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 outlets (in tables). Refers to areas where 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.

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

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The 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. Bedrock or hardpan can be excavated using a single-tooth ripping attachment mounted on a tractor with a 200-300 draw bar horsepower rating.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

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

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

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

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

Sandstone. Sedimentary rock containing dominantly sand-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. Seepage adversely affects the specified use.

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

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer 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.

Silica-sesquioxide ratio. The ratio of the number of molecules of silica to the number of molecules of alumina and iron oxide. The more highly weathered soils or their clay fractions in warm-temperate, humid regions, and especially those in the tropics, generally have a low ratio.

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

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

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.

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

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

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

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

Stone line. A concentration of coarse fragments in a soil. Generally it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

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 which 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.

Subsoiling. Breaking up a compact subsoil by pulling a special chisel through the soil.

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 content of organic matter 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 across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet.

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 too thin for the specified use.

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

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

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

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

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

Upland (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 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 assumed to be inherited from the parent material rather than to be the result of poor drainage.

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

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

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

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Recorded in the period 1951-73 at Eureka Springs, Arkansas]

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days[1]	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- 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----	49.1	26.8	37.9	73	-2	14	1.94	0.71	2.96	4	2.8
February---	53.3	30.3	41.8	77	5	33	2.21	1.11	3.16	4	3.0
March------	57.9	34.4	46.2	82	10	123	2.85	1.93	3.69	4	3.2
April------	71.8	47.4	59.6	90	24	303	4.18	2.79	5.44	6	.5
May--------	78.4	54.8	66.6	90	33	515	5.47	2.93	7.70	7	.0
June-------	85.1	62.8	74.0	96	45	720	4.58	1.27	7.23	7	.0
July-------	90.3	66.8	78.6	101	49	887	4.20	1.67	6.33	5	.0
August-----	89.6	64.8	77.2	102	49	843	3.46	1.40	5.19	5	.0
September--	82.1	57.8	70.0	96	39	600	4.05	1.36	6.25	6	.0
October----	73.3	48.4	60.9	89	27	351	3.73	1.13	5.87	4	.0
November---	58.9	37.1	48.0	79	15	78	3.79	1.41	5.77	5	1.6
December---	50.1	29.3	39.7	73	0	18	2.99	1.37	4.38	4	3.1
Yearly:											
Average--	70.0	46.7	58.4	---	---	---	---	---	---	---	---
Extreme--	---	---	---	109	-3	---	---	---	---	---	---
Total----	---	---	---	---	---	4,485	43.45	35.36	43.06	61	14.2

[1] A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Recorded in the period 1951-73 at Eureka Springs, 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 4	April 13	April 27
2 years in 10 later than--	March 30	April 9	April 21
5 years in 10 later than--	March 19	April 1	April 11
First freezing temperature in fall:			
1 year in 10 earlier than--	October 28	October 18	October 10
2 years in 10 earlier than--	November 1	October 23	October 15
5 years in 10 earlier than--	November 11	November 2	October 24

TABLE 3.--GROWING SEASON

[Recorded in the period 1951-73 at Eureka Springs, Arkansas]

Probability	Length of growing season if daily minimum temperature is--		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	212	193	174
8 years in 10	220	200	181
5 years in 10	236	214	195
2 years in 10	251	227	208
1 year in 10	259	234	215

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

Map symbol	Soil name	Acres	Percent
1	Arkana-Eldon complex, 3 to 8 percent slopes	24,320	6.0
2	Arkana-Eldon complex, 8 to 12 percent slopes	10,530	2.6
3	Arkana-Moko complex, 8 to 20 percent slopes	41,790	10.3
4	Arkana-Moko complex, 20 to 40 percent slopes	44,970	11.1
5	Britwater gravelly silt loam, 3 to 8 percent slopes	3,310	0.8
6	Britwater gravelly silt loam, 8 to 12 percent slopes	1,110	0.3
7	Cane loam, 3 to 8 percent slopes	6,630	1.6
8	Captina silt loam, 1 to 3 percent slopes	6,480	1.6
9	Captina silt loam, 3 to 8 percent slopes	5,140	1.3
10	Clarksville very cherty silt loam, 20 to 50 percent slopes	55,320	13.6
11	Elsah cherty silt loam, frequently flooded	4,980	1.2
12	Enders gravelly loam, 3 to 8 percent slopes	2,430	0.6
13	Enders gravelly loam, 8 to 12 percent slopes	1,320	0.3
14	Enders-Leesburg complex, 8 to 20 percent slopes	17,920	4.4
15	Enders-Leesburg complex, 20 to 40 percent slopes	7,350	1.8
16	Linker loam, 3 to 8 percent slopes	8,690	2.1
17	Linker-Mountainburg complex, 3 to 8 percent slopes	2,330	0.6
18	Linker-Mountainburg complex, 8 to 20 percent slopes	4,930	1.2
19	Mayes silt loam, 0 to 2 percent slopes	1,140	0.3
20	Moko-Rock outcrop complex, 12 to 50 percent slopes	7,030	1.7
21	Mountainburg gravelly fine sandy loam, 8 to 12 percent slopes	1,210	0.3
22	Mountainburg very stony fine sandy loam, 8 to 20 percent slopes	6,900	1.7
23	Mountainburg very stony fine sandy loam, 20 to 40 percent slopes	4,440	1.1
24	Nella-Mountainburg complex, 20 to 40 percent slopes	10,760	2.7
25	Nixa very cherty silt loam, 3 to 8 percent slopes	13,200	3.3
26	Nixa very cherty silt loam, 8 to 12 percent slopes	21,610	5.3
27	Noark very cherty silt loam, 3 to 8 percent slopes	14,840	3.7
28	Noark very cherty silt loam, 8 to 20 percent slopes	23,200	5.7
29	Noark very cherty silt loam, 20 to 40 percent slopes	21,880	5.4
30	Peridge silt loam, 3 to 8 percent slopes	3,360	0.8
31	Portia loam, 3 to 8 percent slopes	5,650	1.4
32	Ramsey-Lily complex, 20 to 40 percent slopes	4,900	1.2
33	Razort loam, occasionally flooded	6,880	1.7
34	Wideman loamy fine sand, frequently flooded	1,200	0.3
	Large water areas*	8,010	2.0
	Total area	405,760	100.0

* Enclosed areas of water more than 40 acres in size, and streams, sloughs, and canals more than one-eighth of a statute mile in width.

TABLE 5.--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	Corn	Tall fescue	Common bermudagrass	Improved bermudagrass
	Bu	AUM*	AUM*	AUM*
1--- Arkana-Eldon	---	5.0	5.0	---
2--- Arkana-Eldon	---	4.5	4.5	---
3--- Arkana-Moko	---	3.5	3.5	---
4--- Arkana-Moko	---	---	---	---
5--- Britwater	55	7.0	5.5	7.0
6--- Britwater	---	6.0	4.5	6.0
7--- Cane	65	7.0	6.0	8.0
8--- Captina	65	8.0	7.0	8.5
9--- Captina	60	7.0	6.0	7.5
10--- Clarksville	---	---	---	---
11--- Elsah	---	7.5	6.5	7.0
12--- Enders	---	4.0	4.0	---
13--- Enders	---	3.5	3.5	---
14--- Enders-Leesburg	---	---	---	---
15--- Enders-Leesburg	---	---	---	---
16--- Linker	40	5.0	5.5	6.0
17--- Linker-Mountainburg	---	4.0	5.0	---
18--- Linker-Mountainburg	---	3.0	4.0	---
19--- Mayes	40	5.0	5.0	5.5
20--- Moko-Rock outcrop	---	---	---	---
21--- Mountainburg	---	3.0	4.0	---

See footnote at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Map symbol and soil name	Corn	Tall fescue	Common bermudagrass	Improved bermudagrass
	Bu	AUM*	AUM*	AUM*
22, 23--Mountainburg	---	---	---	---
24--Nella-Mountainburg	---	---	---	---
25--Nixa	---	5.0	---	4.0
26--Nixa	---	4.0	---	3.0
27--Noark	55	7.0	6.0	7.5
28--Noark	---	6.0	5.0	6.0
29--Noark	---	---	---	---
30--Peridge	70	7.0	6.0	7.5
31--Portia	70	7.0	6.0	7.5
32--Ramsey-Lily	---	---	---	---
33--Razort	80	10.0	8.0	10.0
34--Wideman	---	4.5	4.5	5.5

* 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.

TABLE 6.--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		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Common trees	Site index	
1*, 2*:							
Arkana	5c8	Slight	Moderate	Moderate	Shortleaf pine	55	Shortleaf pine, eastern redcedar, loblolly pine.
					Southern red oak	55	
					Eastern redcedar	35	
					White oak	---	
Eldon	4o7	Slight	Slight	Slight	Shortleaf pine	60	White oak, shortleaf pine, loblolly pine.
					Southern red oak	60	
					Eastern redcedar	40	
					White oak	---	
3*:							
Arkana	5c8	Slight	Moderate	Moderate	Shortleaf pine	55	Shortleaf pine, eastern redcedar, loblolly pine.
					Southern red oak	55	
					Eastern redcedar	35	
					White oak	---	
Moko	5x3	Severe	Severe	Severe	Eastern redcedar	30	Eastern redcedar.
4*:							
Arkana	5c9	Moderate	Severe	Severe	Shortleaf pine	55	Shortleaf pine, eastern redcedar.
					Southern red oak	55	
					Eastern redcedar	35	
					White oak	---	
Moko	5x3	Severe	Severe	Severe	Eastern redcedar	30	Eastern redcedar.
5, 6--- Britwater	3o7	Slight	Slight	Slight	Shortleaf pine	70	Shortleaf pine, southern red oak, eastern redcedar, loblolly pine.
					Southern red oak	70	
					Eastern redcedar	50	
					Loblolly pine	80	
7--- Cane	3o7	Slight	Slight	Slight	Sweetgum	80	Loblolly pine, shortleaf pine.
					Loblolly pine	80	
					Shortleaf pine	70	
8, 9--- Captina	4o7	Slight	Slight	Slight	Shortleaf pine	60	Shortleaf pine, loblolly pine, eastern redcedar, black locust, southern red oak.
					Southern red oak	65	
					Eastern redcedar	40	
					Black locust	---	
					Black walnut	---	
10--- Clarksville	4f9	Moderate	Severe	Severe	White oak	55	White oak, shortleaf pine, loblolly pine, sweetgum, green ash.
					Shortleaf pine	---	
11--- Elsah	3f5	Slight	Slight	Moderate	Eastern cottonwood	95	Black walnut, green ash, sweetgum.
					American sycamore	---	
					Sweetgum	---	
					Red maple	---	
12, 13--- Enders	4o1	Slight	Slight	Slight	Southern red oak	60	Loblolly pine, shortleaf pine.
					White oak	55	
14*:							
Enders	4x2	Slight	Moderate	Slight	Southern red oak	60	Loblolly pine, shortleaf pine, eastern redcedar.
					White oak	55	
					Eastern redcedar	40	
					Shortleaf pine	60	
Leesburg	3x8	Slight	Moderate	Slight	White oak	70	Loblolly pine, shortleaf pine.
					Shortleaf pine	70	
					Loblolly pine	80	

See footnote at end of table.

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Map symbol and soil name	Woodland suitability group	Management concerns			Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Common trees	Site index	
15*:							
Enders	5r3	Moderate	Severe	Moderate	Southern red oak	50	Loblolly pine, shortleaf pine, eastern redcedar.
					White oak	50	
					Eastern redcedar	35	
					Shortleaf pine	50	
Leesburg	4r9	Severe	Severe	Slight	White oak	70	Loblolly pine, shortleaf pine.
					Shortleaf pine	70	
					Loblolly pine	80	
16--- Linker	4o1	Slight	Slight	Slight	Shortleaf pine	60	Shortleaf pine, loblolly pine, eastern redcedar.
					Southern red oak	50	
					White oak	50	
					Eastern redcedar	40	
					Loblolly pine	---	
17*:							
Linker	4x2	Slight	Moderate	Slight	Shortleaf pine	60	Shortleaf pine, loblolly pine, eastern redcedar.
					Southern red oak	50	
					White oak	50	
					Eastern redcedar	40	
					Loblolly pine	---	
Mountainburg	5x3	Slight	Severe	Moderate	Shortleaf pine	50	Shortleaf pine, eastern redcedar, loblolly pine.
					Eastern redcedar	30	
					Loblolly pine	---	
18*:							
Linker	4x2	Slight	Moderate	Slight	Shortleaf pine	60	Shortleaf pine, loblolly pine, eastern redcedar.
					Southern red oak	50	
					White oak	50	
					Eastern redcedar	40	
					Loblolly pine	---	
Mountainburg	5x3	Moderate	Severe	Moderate	Shortleaf pine	50	Shortleaf pine, eastern redcedar, loblolly pine.
					Eastern redcedar	30	
					Loblolly pine	---	
19--- Mayes	5w6	Slight	Severe	Moderate	Water oak	55	Sweetgum, American sycamore.
					Green ash	---	
					Sweetgum	---	
20*:							
Moko	5x3	Severe	Severe	Severe	Eastern redcedar	30	Eastern redcedar.
Rock outcrop.							
21--- Mountainburg	5d2	Slight	Slight	Moderate	Shortleaf pine	50	Shortleaf pine, eastern redcedar, loblolly pine.
					Eastern redcedar	30	
					Loblolly pine	---	
22--- Mountainburg	5x3	Moderate	Severe	Moderate	Shortleaf pine	50	Shortleaf pine, eastern redcedar, loblolly pine.
					Eastern redcedar	30	
					Loblolly pine	---	
23--- Mountainburg	5x3	Severe	Severe	Moderate	Shortleaf pine	50	Shortleaf pine, eastern redcedar, loblolly pine.
					Eastern redcedar	30	
					Loblolly pine	---	
24*:							
Nella	4x9	Severe	Severe	Slight	Shortleaf pine	60	Shortleaf pine, loblolly pine.
					Southern red oak	60	
					Eastern redcedar	40	
					Black oak	---	
					Black walnut	---	
Mountainburg	5x3	Severe	Severe	Moderate	Shortleaf pine	50	Shortleaf pine, eastern redcedar, loblolly pine.
					Eastern redcedar	30	
					Loblolly pine	---	

See footnote at end of table.

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Map symbol and soil name	Woodland suitability group	Management concerns			Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Common trees	Site index	
25, 26---------- Nixa	4f8	Slight	Slight	Moderate	Shortleaf pine-------	60	Shortleaf pine, loblolly pine, eastern redcedar, black locust, southern red oak.
					Southern red oak-----	60	
					White oak----------	60	
					Eastern redcedar-----	40	
					Black walnut---------	---	
					Black locust---------	---	
27, 28---------- Noark	4f8	Slight	Slight	Moderate	Shortleaf pine-------	60	Shortleaf pine, eastern redcedar, southern red oak.
					Eastern redcedar-----	40	
					Southern red oak-----	60	
					White oak----------	---	
29---------- Noark	4r9	Moderate	Severe	Moderate	Shortleaf pine-------	60	Shortleaf pine, eastern redcedar, southern red oak.
					Eastern redcedar-----	40	
					Southern red oak-----	60	
					White oak----------	---	
30---------- Peridge	3o7	Slight	Slight	Slight	Shortleaf pine-------	70	Shortleaf pine, loblolly pine, black walnut, black locust, southern red oak, white ash, eastern redcedar.
					Southern red oak-----	70	
					Eastern redcedar-----	50	
					Black walnut---------	---	
					White oak----------	---	
					White ash----------	---	
					Black cherry---------	---	
					Black locust---------	---	
31---------- Portia	3o7	Slight	Slight	Slight	Sweetgum-----------	80	Loblolly pine, shortleaf pine, black walnut.
					Loblolly pine--------	75	
					Shortleaf pine-------	---	
					Northern red oak-----	---	
32*:							
Ramsey----------	5x3	Severe	Severe	Severe	White oak----------	50	White oak, shortleaf pine, loblolly pine, eastern redcedar.
					Shortleaf pine-------	55	
					Loblolly pine--------	65	
					Eastern redcedar-----	30	
Lily----------	4r9	Severe	Severe	Slight	Shortleaf pine-------	60	Shortleaf pine.
					White oak----------	---	
					Red oak------------	60	
					Loblolly pine--------	---	
33---------- Razort	2o7	Slight	Slight	Slight	Shortleaf pine-------	80	Shortleaf pine, loblolly pine, southern red oak, white oak, black walnut, American sycamore, eastern cottonwood, sweetgum.
					Southern red oak-----	80	
					Eastern cottonwood---	90	
					American sycamore----	85	
					Sweetgum-----------	80	
					White oak----------	75	
34---------- Wideman	3s8	Slight	Moderate	Moderate	Sweetgum-----------	80	Eastern cottonwood, American sycamore, loblolly pine, shortleaf pine, sweetgum.
					Eastern cottonwood---	90	
					American sycamore----	80	

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

TABLE 7.--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.
Eldon	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight.
2*:				
Arkana	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, small stones, percs slowly.	Slight.
Eldon	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight.
3*:				
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.
4*:				
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.
5--- Britwater	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight.
6--- Britwater	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight.
7--- Cane	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, small stones, wetness.	Slight.
8, 9--- Captina	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Slight.
10--- Clarksville	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.
11--- Elsah	Severe: flooding, small stones.	Severe: small stones.	Severe: flooding, small stones.	Moderate: flooding.

See footnote at end of table.

TABLE 7.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails
12--- Enders	Severe: small stones, percs slowly.	Severe: small stones, percs slowly.	Severe: small stones, percs slowly.	Slight.
13--- Enders	Severe: small stones, percs slowly.	Severe: small stones, percs slowly.	Severe: slope, small stones, percs slowly.	Slight.
14*: Enders---	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, small stones, percs slowly.	Moderate: large stones.
Leesburg---	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
15*: Enders---	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: slope, small stones, percs slowly.	Severe: slope.
Leesburg---	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
16--- Linker	Slight---	Slight---	Moderate: slope, small stones.	Slight.
17*: Linker---	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Moderate: large stones.
Mountainburg---	Severe: small stones, depth to rock.	Severe: small stones, depth to rock.	Severe: small stones, depth to rock.	Severe: large stones, small stones.
18*: Linker---	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Moderate: large stones.
Mountainburg---	Severe: small stones, depth to rock.	Severe: small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: large stones, small stones.
19--- Mayes	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, percs slowly.	Moderate: wetness.
20*: Moko---	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: large stones, slope, small stones.	Severe: large stones, slope.
Rock outcrop.				
21--- Mountainburg	Severe: small stones, depth to rock.	Severe: small stones, depth to rock.	Severe: large stones, slope, small stones.	Slight. large stones, small stones.
22--- Mountainburg	Severe: small stones, depth to rock.	Severe: small stones, depth to rock.	Severe: large stones, slope, small stones.	Severe: large stones, small stones.

See footnote at end of table.

TABLE 7.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails
23--- Mountainburg	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: large stones, slope, small stones.	Severe: large stones, slope, small stones.
24*:				
Nella---	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Mountainburg---	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: large stones, slope, small stones.	Severe: large stones, slope, small stones.
25--- Nixa	Severe: small stones, percs slowly.	Severe: small stones, percs slowly.	Severe: small stones, percs slowly.	Severe: small stones.
26--- Nixa	Severe: small stones, percs slowly.	Severe: small stones, percs slowly.	Severe: slope, small stones, percs slowly.	Severe: small stones.
27--- Noark	Severe: small stones.	Severe: small stones.	Severe: small stones.	Severe: small stones.
28--- Noark	Severe: small stones.	Severe: small stones.	Severe: slope, small stones.	Severe: small stones.
29--- Noark	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.
30--- Peridge	Slight---	Slight---	Moderate: slope.	Slight.
31--- Portia	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight.
32*:				
Ramsey---	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: large stones, slope, depth to rock.	Severe: slope.
Lily---	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Severe: slope.
33--- Razort	Severe: flooding.	Slight---	Moderate: small stones.	Slight.
34--- Wideman	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.

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

TABLE 8.--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.
Eldon	Fair	Good	Fair	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.
2*:										
Arkana	Fair	Good	Fair	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.
Eldon	Fair	Good	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
3*:										
Arkana	Fair	Good	Fair	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.
Moko	Very poor.	Poor	Poor	---	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
4*:										
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.
5, 6--- Britwater	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
7--- Cane	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
8--- Captina	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
9--- Captina	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
10--- Clarksville	Very poor.	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
11--- Elsah	Fair	Fair	Fair	Good	Fair	Poor	Poor	Fair	Good	Poor.
12, 13--- Enders	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
14*:										
Enders	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Leesburg	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
15*:										
Enders	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Leesburg	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.

See footnote at end of table.

TABLE 8.--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
16---------- Linker	Fair	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
17*: 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.
18*: 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.
19---------- Mayes	Fair	Good	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.
20*: Moko---------- Rock outcrop.	Very poor.	Poor	Poor	---	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
21---------- Mountainburg	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
22, 23---------- Mountainburg	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Poor	Very poor.
24*: Nella----------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Mountainburg------	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Poor	Very poor.
25---------- Nixa	Poor	Fair	Fair	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.
26---------- Nixa	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
27, 28---------- Noark	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
29---------- Noark	Very poor.	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
30---------- Peridge	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
31---------- Portia	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
32*: Ramsey----------	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Lily----------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
33---------- Razort	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
34---------- 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 9.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition; it does not eliminate the need for onsite investigation]

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
1*:					
Arkana	Severe: depth to rock.	Severe: shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
Eldon	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: 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.
Eldon	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: slope, shrink-swell.
3*:					
Arkana	Severe: depth to rock.	Sevgrg: 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.
4*:					
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.
5--- Britwater	Slight---	Slight---	Slight---	Moderate: slope.	Slight.
6--- Britwater	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
7--- Cane	Moderate: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness, slope.	Moderate: wetness.
8--- Captina	Moderate: too clayey, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Severe: low strength.
9--- Captina	Moderate: too clayey, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: slope, wetness.	Severe: low strength.
10--- Clarksville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
11--- Elsah	Moderate: large stones, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.

See footnote at end of table.

TABLE 9.--BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
12---------- Enders	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
13---------- Enders	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.
14*: 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.	Moderate: slope.	Severe: slope.	Moderate: slope.
15*: 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.
16---------- Linker	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: slope, depth to rock.	Moderate: depth to rock.
17*: 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, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.
18*: Linker----------	Severe: depth to rock.	Moderate: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock, slope.
Mountainburg-----	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.
19---------- Mayes	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, shrink-swell.
20*: 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.					
21---------- Mountainburg	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.
22---------- Mountainburg	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.

See footnote at end of table.

TABLE 9.--BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
23---------- Mountainburg	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.
24*:					
Nella----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Mountainburg-----	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.
25---------- Nixa	Slight----------	Slight----------	Slight----------	Moderate: slope.	Slight.
26---------- Nixa	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
27---------- Noark	Moderate: too clayey.	Slight----------	Slight----------	Moderate: slope.	Slight.
28---------- Noark	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
29---------- Noark	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
30---------- Peridge	Moderate: too clayey.	Slight----------	Slight----------	Moderate: slope.	Severe: low strength.
31---------- Portia	Slight----------	Slight----------	Slight----------	Moderate: slope.	Slight.
32*:					
Ramsey----------	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.
Lily----------	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.
33---------- Razort	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
34---------- 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 10.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition; it does not eliminate the need for onsite investigation]

Map symbol and soil name	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.
Eldon	Moderate: percs slowly.	Moderate: seepage, slope.	Severe: too clayey.	Slight	Poor: 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.
Eldon	Moderate: percs slowly, slope.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
3*:					
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.
4*:					
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.
5--- Britwater	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Poor: small stones.
6--- Britwater	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Poor: small stones.
7--- Cane	Severe: wetness, percs slowly.	Moderate: slope.	Moderate: wetness.	Moderate: wetness.	Fair: wetness.
8, 9--- Captina	Severe: percs slowly, wetness.	Moderate: slope.	Severe: too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
10--- Clarksville	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope, too clayey.	Severe: seepage, slope.	Poor: too clayey, small stones, slope.

See footnote at end of table.

TABLE 10.--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
11---------- Elsah	Severe: flooding.	Severe: seepage, flooding, large stones.	Severe: flooding, seepage, large stones.	Severe: flooding, seepage.	Poor: seepage, large stones.
12---------- 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.
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.	Severe: slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock, slope.	Poor: too clayey, hard to pack.
Leesburg----------	Moderate: slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: small stones.
15*: 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.
16---------- Linker	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, thin layer.
17*: 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, large stones.	Severe: seepage, depth to rock, large stones.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Poor: area reclaim, small stones, thin layer.
18*: 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, large stones.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Poor: area reclaim, small stones, thin layer.
19---------- Mayes	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
20*: 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.					

See footnote at end of table.

TABLE 10.--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
21---------- Mountainburg	Severe: depth to rock.	Severe: slope, depth to rock, seepage.	Severe: depth to rock, seepage.	Severe: seepage, depth to rock.	Poor: area reclaim, seepage, small stones.
22---------- Mountainburg	Severe: depth to rock, large stones.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Poor: area reclaim, small stones, thin layer.
23---------- Mountainburg	Severe: depth to rock, slope, large stones.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: area reclaim, small stones, slope.
24*: Nella---------- Mountainburg-------	Severe: slope. Severe: depth to rock, slope, large stones.	Severe: slope. Severe: seepage, depth to rock, slope.	Severe: slope. Severe: depth to rock, seepage, slope.	Severe: slope. Severe: depth to rock, seepage, slope.	Poor: small stones, slope. Poor: area reclaim, small stones, slope.
25---------- Nixa	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight----------	Poor: small stones.
26---------- Nixa	Severe: percs slowly.	Severe: slope.	Moderate: too clayey, slope.	Moderate: slope.	Poor: small stones.
27---------- Noark	Moderate: percs slowly.	Moderate: seepage, slope.	Severe: too clayey.	Slight----------	Poor: too clayey, small stones.
28---------- Noark	Moderate: percs slowly, slope.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, small stones.
29---------- Noark	Severe: slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, small stones, slope.
30---------- Peridge	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight----------	Fair: too clayey, thin layer.
31---------- Portia	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight----------	Fair: too clayey.
32*: Ramsey---------- Lily----------	Severe: depth to rock, slope. Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope. Severe: seepage, depth to rock, slope.	Severe: depth to rock, slope. Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope. Severe: depth to rock, seepage, slope.	Poor: area reclaim, small stones, slope. Poor: area reclaim, small stones, slope.
33---------- Razort	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding, seepage.	Severe: flooding.	Fair: too clayey.

See footnote at end of table.

TABLE 10.--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
34---------- 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 11.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," "probable," and "improbable." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition; it does not eliminate the need for onsite investigation]

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
1*, 2*:				
Arkana	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Eldon	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
3*:				
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.
4*:				
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.
5, 6 Britwater	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
7 Cane	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, thin layer.
8, 9 Captina	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
10 Clarksville	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
11 Elsah	Fair: large stones.	Improbable: small stones, large stones.	Improbable: large stones.	Poor: large stones, area reclaim.
12, 13 Enders	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
14*:				
Enders	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Leesburg	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.

See footnote at end of table.

TABLE 11.--CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
15*:				
Enders	Poor: low strength, slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, thin layer.
Leesburg	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
16--- Linker	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
17*, 18*:				
Linker	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Mountainburg	Poor: area reclaim, large stones, thin layer.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, small stones, thin layer.
19--- Mayes	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
20*:				
Moko	Poor: area reclaim, large stones, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, large stones, slope.
Rock outcrop.				
21--- Mountainburg	Poor: thin layer, area reclaim.	Improbable: thin layer.	Improbable: thin layer.	Poor: small stones, area reclaim.
22--- Mountainburg	Poor: area reclaim, large stones, thin layer.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, small stones, thin layer.
23--- Mountainburg	Poor: area reclaim, large stones, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, small stones, slope.
24*:				
Nella	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Mountainburg	Poor: area reclaim, large stones, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, small stones, slope.
25, 26--- Nixa	Good	Improbable: small stones.	Probable	Poor: small stones, area reclaim.
27, 28--- Noark	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.

See footnote at end of table.

TABLE 11.--CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
29--- Noark	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
30--- Peridge	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.
31--- Portia	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Good.
32*: Ramsey---	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
Lily---	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
33--- Razort	Good---	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.
34--- 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 12.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition; it does not eliminate the need for onsite investigation]

Map symbol and soil name	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
1*:						
Arkana	Moderate: depth to rock.	Severe: hard to pack.	Deep to water	Droughty, percs slowly, depth to rock.	Large stones, depth to rock.	Large stones, depth to rock.
Eldon	Moderate: seepage.	Moderate: hard to pack, large stones.	Deep to water	Droughty, slope.	Large stones	Large stones, droughty.
2*:						
Arkana	Moderate: depth to rock.	Severe: hard to pack.	Deep to water	Droughty, percs slowly, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
Eldon	Moderate: seepage.	Moderate: hard to pack, large stones.	Deep to water	Droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
3*:						
Arkana	Moderate: depth to rock.	Severe: hard to pack.	Deep to water	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.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
4*:						
Arkana	Severe: slope.	Severe: hard to pack.	Deep to water	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.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
5--- Britwater	Moderate: seepage.	Slight	Deep to water	Slope	Favorable	Favorable.
6--- Britwater	Moderate: seepage.	Slight	Deep to water	Slope	Slope	Slope.
7--- Cane	Slight	Severe: piping.	Percs slowly, slope.	Wetness, percs slowly, rooting depth.	Erodes easily, wetness, rooting depth.	Erodes easily, rooting depth.
8--- Captina	Slight	Moderate: hard to pack, wetness.	Percs slowly	Wetness, percs slowly, rooting depth.	Rooting depth, wetness, erodes easily.	Erodes easily, rooting depth, percs slowly.
9--- Captina	Slight	Moderate: hard to pack, wetness.	Percs slowly, slope.	Slope, percs slowly, rooting depth.	Rooting depth, wetness, erodes easily.	Erodes easily, rooting depth, percs slowly.
10--- Clarksville	Severe: seepage, slope.	Moderate: large stones.	Deep to water	Droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
11--- Elsah	Severe: seepage.	Severe: seepage, large stones.	Deep to water	Large stones, flooding.	Large stones	Large stones.

See footnote at end of table.

TABLE 12.--WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
12---------- Enders	Moderate: depth to rock.	Severe: hard to pack.	Deep to water	Percs slowly, slope.	Percs slowly---	Percs slowly.
13---------- Enders	Moderate: depth to rock.	Severe: hard to pack.	Deep to water	Percs slowly, slope.	Slope, percs slowly.	Slope, percs slowly.
14*: Enders----------	Moderate: depth to rock.	Moderate: hard to pack.	Deep to water	Percs slowly, slope.	Slope, percs slowly.	Slope, percs slowly.
Leesburg---------	Moderate: seepage.	Moderate: piping.	Deep to water	Slope----------	Slope----------	Slope.
15*: Enders----------	Severe: slope.	Moderate: hard to pack.	Deep to water	Percs slowly, slope.	Slope, percs slowly.	Slope, percs slowly.
Leesburg---------	Severe: slope.	Moderate: piping.	Deep to water	Slope----------	Slope----------	Slope.
16---------- Linker	Moderate: seepage, depth to rock.	Severe: piping.	Deep to water	Depth to rock, slope.	Depth to rock	Depth to rock.
17*: Linker----------	Moderate: seepage, depth to rock.	Severe: piping.	Deep to water	Droughty, depth to rock, slope.	Depth to rock	Droughty, depth to rock.
Mountainburg-----	Severe: depth to rock, seepage.	Severe: large stones, thin layer.	Deep to water	Slope, large stones, depth to rock.	Large stones, depth to rock.	Large stones, droughty, depth to rock.
18*: Linker----------	Moderate: seepage, depth to rock.	Severe: piping.	Deep to water	Droughty, depth to rock, slope.	Slope, depth to rock.	Slope, droughty, depth to rock.
Mountainburg-----	Severe: depth to rock, seepage.	Severe: large stones, thin layer.	Deep to water	Slope, large stones, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
19---------- Mayes	Slight---------	Severe: hard to pack.	Percs slowly---	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
20*: Moko----------	Severe: depth to rock, slope.	Severe: large stones.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Rock outcrop.						
21---------- Mountainburg	Severe: depth to rock, seepage.	Severe: thin layer, seepage.	Deep to water	Droughty, depth to rock, slope.	Large stones, depth to rock, slope.	Large stones, slope, droughty.
22, 23---------- Mountainburg	Severe: depth to rock, slope, seepage.	Severe: large stones, thin layer.	Deep to water	Slope, large stones, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
24*: Nella----------	Severe: slope.	Severe: piping.	Deep to water	Large stones, droughty, slope.	Slope, large stones.	Large stones, slope, droughty.

See footnote at end of table.

TABLE 12.--WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
24*: Mountainburg	Severe: depth to rock, slope, seepage.	Severe: large stones, thin layer.	Deep to water	Slope, large stones, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
25--- Nixa	Slight	Moderate: seepage, piping.	Deep to water	Droughty, percs slowly, erodes easily.	Erodes easily, rooting depth.	Erodes easily, droughty, rooting depth.
26--- Nixa	Slight	Moderate: seepage, piping.	Deep to water	Droughty, percs slowly.	Slope, rooting depth.	Slope, droughty.
27--- Noark	Moderate: seepage.	Slight	Deep to water	Droughty, slope.	Favorable	Droughty.
28--- Noark	Moderate: seepage.	Slight	Deep to water	Droughty, slope.	Slope	Slope, droughty.
29--- Noark	Severe: slope.	Slight	Deep to water	Droughty, slope.	Slope	Slope, droughty.
30--- Peridge	Moderate: seepage.	Moderate: piping.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
31--- Portia	Moderate: seepage.	Moderate: piping.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
32*: Ramsey	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Lily	Severe: seepage, slope.	Severe: piping.	Deep to water	Depth to rock, slope.	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
33--- Razort	Moderate: seepage.	Severe: piping.	Deep to water	Erodes easily, flooding.	Erodes easily	Erodes easily.
34--- Wideman	Severe: seepage.	Severe: piping, seepage.	Deep to water	Flooding, fast intake, droughty.	Too sandy	Droughty.

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

TABLE 13.--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		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
1*, 2*:											
Arkana	0-9	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
	9-18	Very cherty silty clay, cherty clay, clay.	GC, SC, CL, CH	A-2, A-7	15-30	60-90	45-80	40-70	25-55	40-65	20-35
	18-38	Clay, cherty clay	CH	A-7	0-10	70-100	70-100	65-95	60-85	51-80	31-50
	38-42	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Eldon	0-8	Cherty silt loam	ML, CL-ML, CL	A-4	5-25	70-95	65-90	60-85	55-80	20-30	2-8
	8-42	Very cherty silty clay loam, very cherty silty clay, cherty silty clay.	GC, GP-GC	A-2, A-7	5-30	20-50	15-45	15-40	10-40	40-50	25-30
	42-72	Silty clay, clay, very cherty silty clay.	CL, CH GC, SC	A-7, A-2	0-30	60-90	45-80	40-70	25-55	45-95	25-45
3*, 4*:											
Arkana	0-9	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
	9-18	Very cherty silty clay, cherty clay, clay.	GC, SC, CL, CH	A-2, A-7	15-30	60-90	45-80	40-70	25-55	40-65	20-35
	18-38	Clay, cherty clay	CH	A-7	0-10	70-100	70-100	65-95	60-85	51-80	31-50
	38-42	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Moko	0-11	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
	11-13	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
5, 6 Britwater	0-6	Gravelly silt loam.	ML, CL, CL-ML	A-4	0	70-85	70-85	65-80	65-80	<30	NP-10
	6-11	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
	11-20	Very gravelly silty clay loam, very gravelly clay loam, gravelly silty clay loam.	GC, SC	A-2, A-6, A-4	0	50-80	40-75	30-65	15-40	25-40	8-18
	20-80	Very gravelly silty clay loam, very gravelly clay, gravelly silty clay loam.	GC, SC	A-2, A-6, A-7	0	30-75	25-70	20-55	15-40	35-55	15-30
7 Cane	0-6	Loam	ML, SM	A-4	0-2	80-100	75-100	65-95	40-75	<30	NP-7
	6-24	Silt loam, sandy clay loam, clay loam.	ML, CL-ML, CL	A-4, A-6	0-2	90-100	80-100	75-100	60-85	17-32	3-12
	24-72	Loam, clay loam, sandy clay loam.	ML, CL-ML, CL	A-4, A-6	0-2	90-100	80-100	75-100	55-85	18-37	3-15

See footnote at end of table.

TABLE 13.--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	
8, 9---------- Captina	0-8	Silt loam--------	ML, CL-ML	A-4	0	95-100	90-100	85-100	75-95	<25	NP-7
	8-26	Silt loam, silty clay loam.	CL-ML, CL	A-4, A-6	0	95-100	90-100	85-100	80-90	20-40	5-20
	26-40	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0-5	95-100	90-100	80-95	75-90	20-40	5-20
	40-52	Very cherty silty clay loam, cherty silt loam, silty clay loam.	CL-ML, CL, GM-GC, GC	A-4, A-6	0-15	90-95	50-90	50-90	45-85	20-40	5-20
	52-72	Very cherty silty clay loam, very cherty silty clay.	CL, GC, SC	A-6, A-7	5-45	60-95	55-90	45-90	40-85	30-50	15-30
10---------- Clarksville	0-14	Very cherty silt loam.	GC, SC, SM-SC, GP-GC	A-2, A-1,	5-20	30-70	10-60	5-50	5-35	20-40	5-15
	14-44	Very cherty silty clay loam, very cherty silt 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
	44-72	Very cherty silty clay, very cherty silt loam, very cherty silty clay loam.	GC, SC, GP-GC, SP-SC	A-2, A-6 A-7	5-20	30-70	10-60	10-50	10-45	35-75	20-55
11---------- Elsah	0-6	Cherty silt loam	SM, SC, ML, CL	A-1, A-2, A-4	5-25	50-90	40-90	30-90	20-85	<30	NP-8
	6-30	Cherty loam, very cherty loam, very cherty silt loam.	SM, ML, CL, SC	A-2, A-4	15-60	80-90	70-85	60-80	30-70	<30	NP-8
	30-65	Very cherty loam, very cherty silt loam, cherty loam.	GM, GP-GM	A-1, A-2	60-85	20-50	20-45	20-40	10-25	<30	NP-6
12, 13---------- Enders	0-7	Gravelly loam----	ML, SM, SM-SC, CL-ML	A-2, A-4	0-15	50-95	35-75	30-70	30-60	20-35	2-10
	7-47	Silty clay, clay	CH	A-7	0	95-100	85-100	85-100	70-95	50-80	35-45
	47-64	Weathered bedrock, unweathered bedrock.	---	---	---	---	---	---	---	---	---
14*, 15*: Enders----------	0-8	Stony loam-------	SM, ML, SM-SC, CL-ML	A-4, A-2	20-40	80-90	70-80	65-75	30-60	20-35	2-10
	8-47	Silty clay, clay	CH	A-7	0-10	95-100	85-100	85-100	70-95	50-80	35-45
	47-64	Weathered bedrock, unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 13.--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	
14*, 15*:											
Leesburg	0-7	Stony loam	SM, GM, ML	A-2, A-4, A-1	10-20	60-85	55-80	40-65	15-55	<20	NP
	7-31	Gravelly loam, gravelly clay loam, gravelly sandy clay loam.	SM, ML, CL-ML, CL	A-4	0-15	65-85	55-80	45-70	40-60	<30	NP-10
	31-72	Gravelly clay loam, gravelly sandy clay loam, very gravelly clay loam.	SC, CL	A-4, A-6	0-20	45-70	50-75	55-75	40-65	26-40	8-20
16	0-6	Loam	SM, ML	A-4	0	85-100	80-100	70-100	40-70	<30	NP-7
Linker	6-14	Fine sandy loam, sandy clay loam, loam.	CL, SC, SM, ML	A-4, A-6	0-10	90-100	80-100	70-100	40-80	<40	NP-18
	14-29	Gravelly sandy clay loam, loam, clay loam.	CL, SC, GC, ML	A-4, A-6	0-10	65-100	60-100	55-100	40-80	<40	NP-18
	29-35	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
17*, 18*:											
Linker	0-6	Stony fine sandy loam.	SM, ML	A-4	5-30	80-100	70-95	55-80	40-60	<30	NP-7
	6-14	Fine sandy loam, sandy clay loam, loam.	CL, SC, SM, ML	A-4, A-6	0-10	90-100	80-100	70-100	40-80	<40	NP-18
	14-29	Gravelly sandy clay loam, loam, clay loam.	CL, SC, GC, ML	A-4, A-6	0-10	65-100	60-100	55-100	40-80	<40	NP-18
	29-35	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Mountainburg	0-9	Very stony fine sandy loam.	GM	A-1, A-2	30-60	40-50	30-50	20-40	15-25	<20	NP
	9-17	Very stony sandy clay loam, very stony loam, very gravelly fine sandy loam.	GM, GC, GM-GC	A-1, A-2	30-65	40-60	30-50	25-50	20-30	<30	NP-10
	17-22	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
19	0-14	Silt loam	ML, CL	A-4, A-6, A-7	0	100	100	96-100	80-98	30-43	6-20
Mayes	14-60	Clay, silty clay, silty clay loam.	CL, CH	A-6, A-7	0	100	98-100	96-100	80-99	37-65	15-38
20*:											
Moko	0-11	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
	11-13	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											

See footnote at end of table.

TABLE 13.--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	
21---------- Mountainburg	0-9	Gravelly fine sandy loam.	GM, SM	A-1, A-2	0-15	60-80	50-70	20-40	15-30	<20	NP
	9-17	Very gravelly sandy clay loam, very gravelly fine sandy 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
	17-22	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
22, 23---------- Mountainburg	0-9	Very stony fine sandy loam.	GM	A-1, A-2	30-65	40-50	30-50	20-40	15-25	<20	NP
	9-17	Very stony sandy clay loam, very stony loam, very gravelly fine sandy loam.	GM, GC, GM-GC	A-1, A-2	30-65	40-60	30-50	25-50	20-30	<30	NP-10
	17-22	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
24*:											
Nella----------	0-10	Stony fine sandy loam.	SC, SM, SM, GM	A-4, A-2	10-30	90-100	85-90	60-70	20-45	<20	NP-6
	10-67	Stony clay loam, stony sandy clay 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
Mountainburg----	0-9	Very stony fine sandy loam.	GM	A-1, A-2	30-65	40-50	30-50	20-40	15-25	<20	NP
	9-17	Very stony sandy clay loam, very, stony loam, very gravelly fine sandy loam.	GM, GC, GM-GC	A-1, A-2	30-65	40-60	30-50	25-50	20-30	<30	NP-10
	17-22	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
25, 26---------- Nixa	0-9	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
	9-21	Very cherty silt loam, very cherty silty clay loam.	GC, GM, SC, SM	A-1, A-2, A-4	0-10	40-70	30-60	25-55	20-50	<30	NP-8
	21-35	Very cherty silt loam, very cherty silty clay loam.	GC, GM, SC, SM	A-1, A-2, A-4	0-10	40-70	30-60	25-55	20-50	<30	NP-8
	35-72	Very cherty silty clay, very cherty silty clay loam, very 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
27, 28, 29------- Noark	0-12	Very cherty silt loam.	GM	A-2, A-1, A-4	0	20-50	20-50	20-50	15-45	<20	NP-3
	12-20	Very cherty silt loam, very cherty silty clay loam.	GC, GM-GC	A-2, A-4, A-6, A-1	0	20-50	20-50	20-50	15-45	20-35	5-15
	20-33	Very cherty clay, very cherty silty clay.	GC	A-2, A-7	5-10	20-50	20-50	20-50	15-45	41-60	20-35
	33-72	Very cherty clay, very cherty silty clay.	GC, GM-GC, GP-GC	A-2	5-10	10-40	10-40	10-40	5-35	41-60	20-35

See footnote at end of table.

TABLE 13.--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	
30---------- Peridge	0-8	Silt loam--------	ML, CL-ML	A-4	0	95-100	90-100	85-90	80-85	<20	NP-5
	8-53	Silty clay loam, silt loam.	CL	A-6	0	95-100	90-100	85-95	80-95	30-40	11-20
	53-74	Silty clay loam, clay, gravelly silty clay.	CL, SC, GC	A-7, A-6	0	55-100	50-100	45-90	40-85	35-50	15-25
31---------- Portia	0-7	Loam----------	ML, CL-ML	A-4	0	100	85-100	75-95	65-85	<25	NP-7
	7-24	Loam, silt loam, sandy clay loam.	CL, ML, CL-ML	A-4, A-6	0	100	85-100	75-95	65-80	18-30	3-12
	24-55	Clay loam, loam, sandy clay loam.	CL	A-4, A-6	0	100	85-100	80-95	65-85	25-40	8-20
	55-72	Sandy clay, clay loam, gravelly clay loam.	CL, CH, SC	A-4, A-6, A-7	0	100	80-100	80-95	36-75	25-55	8-30
32*:											
Ramsey----------	0-8	Very stony loam.	SM, SC, ML, CL	A-4, A-2	15-30	75-90	65-85	50-75	34-65	16-25	2-8
	8-15	Stony loam, stony sandy loam.	SM, SC ML, CL	A-2, A-4	15-30	75-90	65-85	50-75	34-65	16-25	2-8
	15-17	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Lily----------	0-10	Stony loam.	SM, ML	A-2, A-4	10-20	90-95	85-90	55-90	25-75	<35	NP-7
	10-32	Stony clay loam, stony sandy clay loam, stony loam.	SM, SC, ML, CL	A-4, A-6	10-20	90-95	85-90	60-85	40-80	<35	3-15
	32-40	Stony sandy clay loam, stony loam.	SM, GC, ML, CL	A-2, A-4, A-6	10-20	65-95	60-90	50-85	20-75	<35	NP-15
	40-42	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
33---------- Razort	0-10	Loam----------	ML, CL-ML	A-4	0	80-100	80-100	65-90	65-90	<25	NP-7
	10-58	Silt loam, loam, clay loam.	CL, CL-ML	A-4, A-6	0	85-100	85-100	75-85	70-80	25-40	7-15
	58-72	Gravelly silt loam, very gravelly loam.	GM, SM, ML, CL-ML	A-2, A-4, A-1	0	35-75	30-70	25-65	20-60	<20	NP-7
34---------- Wideman	0-9	Loamy fine sand	SM, SP-SM	A-2	0	100	70-100	50-75	10-30	---	NP
	9-24	Sandy loam, loamy fine sand, fine sand.	SP-SM, SM	A-2, A-3	0	100	100	60-100	10-35	---	NP
	24-39	Loamy sand, loamy fine sand, fine sand.	SM, SP-SM	A-2	0	100	70-100	50-75	10-35	---	NP
	39-72	Fine sandy loam, sandy loam, loamy fine sand.	SM, ML	A-2, A-4	0	100	95-100	65-90	25-55	<20	NP-3

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

TABLE 14.--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/cm³	In/hr	In/in	pH				Pct
1*, 2*:										
Arkana----------	0-9	15-30	1.25-1.50	0.6-2.0	0.08-0.12	5.6-7.8	Low----------	0.24	2	2-4
	9-18	35-85	1.20-1.45	0.06-0.2	0.06-0.10	5.1-8.4	Moderate-----	0.24		
	18-38	60-85	1.15-1.45	<0.06	0.12-0.18	5.1-8.4	High---------	0.32		
	38-42	---	---	---	---	---	----------	----		
Eldon----------	0-8	15-27	1.40-1.55	2.0-6.0	0.13-0.18	4.5-7.3	Low----------	0.24	2	.5-1
	8-42	35-50	1.35-1.45	0.6-2.0	0.03-0.08	4.5-7.3	Moderate-----	0.24		
	42-72	35-95	1.35-1.45	0.6-2.0	0.10-0.14	4.5-7.8	Moderate-----	0.24		
3*, 4*:										
Arkana----------	0-9	15-30	1.25-1.50	0.6-2.0	0.08-0.12	5.6-7.8	Low----------	0.24	2	2-4
	9-18	35-85	1.20-1.45	0.06-0.2	0.06-0.10	5.1-8.4	Moderate-----	0.24		
	18-38	60-85	1.15-1.45	<0.06	0.12-0.18	5.1-8.4	High---------	0.32		
	38-42	---	---	---	---	---	----------	----		
Moko----------	0-11	18-35	1.25-1.60	0.6-2.0	0.09-0.14	6.6-7.8	Low----------	0.24	1	2-4
	11-13	---	---	---	---	---	----------	----		
5, 6----------	0-6	15-25	1.40-1.60	0.6-2.0	0.12-0.20	5.1-6.0	Low----------	0.32	3	1-3
Britwater	6-11	18-34	1.40-1.60	0.6-2.0	0.12-0.15	5.1-6.0	Low----------	0.28		
	11-20	18-34	1.50-1.70	0.6-2.0	0.09-0.11	5.1-6.0	Low----------	0.28		
	20-80	18-45	1.40-1.60	0.6-2.0	0.07-0.09	5.1-6.0	Moderate-----	0.24		
7----------	0-6	7-18	1.25-1.60	0.6-2.0	0.10-0.18	5.6-6.5	Low----------	0.28	3	<1
Cane	6-24	18-35	1.30-1.60	0.6-2.0	0.14-0.19	4.5-6.0	Low----------	0.37		
	24-72	18-35	1.55-1.70	0.06-0.2	0.05-0.08	4.5-6.0	Low----------	0.37		
8, 9----------	0-8	10-25	1.30-1.50	0.6-2.0	0.16-0.24	5.1-6.5	Low----------	0.43	4	1-2
Captina	8-26	20-35	1.30-1.50	0.6-2.0	0.16-0.24	5.1-6.5	Low----------	0.37		
	26-40	25-40	1.20-1.40	0.06-0.2	0.14-0.16	3.6-5.5	Low----------	0.32		
	40-52	25-40	1.20-1.40	0.06-0.2	0.04-0.08	3.6-5.5	Low----------	0.32		
	52-72	35-45	1.40-1.60	0.06-0.2	0.02-0.08	3.6-5.5	Low----------	0.32		
10----------	0-14	14-20	1.30-1.60	2.0-6.0	0.07-0.12	4.5-6.0	Low----------	0.28	2	1-2
Clarksville	14-44	25-35	1.40-1.65	2.0-6.0	0.06-0.10	4.5-5.5	Low----------	0.28		
	44-72	25-60	1.40-1.80	2.0-6.0	0.05-0.08	4.5-5.5	Low----------	0.28		
11----------	0-6	10-25	1.40-1.60	2.0-6.0	0.08-0.17	5.6-7.3	Low----------	0.28	3	1-4
Elsah	6-30	10-30	1.40-1.60	2.0-6.0	0.10-0.15	5.6-7.3	Low----------	0.17		
	30-65	10-30	1.50-1.70	2.0-6.0	0.06-0.11	5.6-7.3	Low----------	0.17		
12, 13----------	0-7	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	7-47	40-60	1.15-1.45	<0.06	0.12-0.18	3.6-5.5	High---------	0.37		
	47-64	---	---	---	---	---	----------	----		
14*, 15*:										
Enders----------	0-8	10-25	1.25-1.60	0.6-2.0	0.15-0.22	3.6-5.5	Low----------	0.32	3	.5-2
	8-47	40-60	1.15-1.45	<0.06	0.09-0.13	3.6-5.5	High---------	0.24		
	47-64	---	---	---	---	---	----------	----		
Leesburg--------	0-7	5-18	1.30-1.60	2.0-6.0	0.08-0.16	4.5-5.5	Low----------	0.24	5	<2
	7-31	18-30	1.30-1.60	0.6-2.0	0.09-0.18	4.5-5.5	Low----------	0.24		
	31-72	20-40	1.30-1.60	0.6-2.0	0.08-0.12	4.5-5.5	Low----------	0.17		
16----------	0-6	5-20	1.30-1.60	0.6-2.0	0.11-0.20	3.6-5.5	Low----------	0.28	3	.5-3
Linker	6-14	18-35	1.30-1.60	0.6-2.0	0.11-0.20	3.6-5.5	Low----------	0.32		
	14-29	18-35	1.30-1.60	0.6-2.0	0.08-0.20	3.6-5.5	Low----------	0.28		
	29-35	---	---	---	---	---	----------	----		

See footnote at end of table.

TABLE 14.--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/cm³	In/hr	In/in	pH				Pct
17*, 18*:										
Linker	0-6	5-20	1.30-1.60	0.6-2.0	0.09-0.15	3.6-5.5	Low	0.20	3	.5-3
	6-14	18-35	1.30-1.60	0.6-2.0	0.11-0.20	3.6-5.5	Low	0.32		
	14-29	18-35	1.30-1.60	0.6-2.0	0.08-0.20	3.6-5.5	Low	0.28		
	29-35	---	---	---	---	---	---	---		
Mountainburg	0-9	4-12	1.30-1.60	2.0-6.0	0.05-0.10	4.5-6.0	Low	0.17	1	1-3
	9-17	10-28	1.30-1.60	2.0-6.0	0.05-0.10	4.5-5.5	Low	0.24		
	17-22	---	---	---	---	---	---	---		
19	0-14	10-25	1.30-1.50	0.2-0.6	0.15-0.24	5.1-7.3	Moderate	0.49	5	2-4
Mayes	14-60	28-50	1.35-1.45	<0.06	0.12-0.22	5.6-8.0	High	0.43		
20*:										
Moko	0-11	18-35	1.25-1.60	0.6-2.0	0.09-0.14	6.6-7.8	Low	0.24	1	2-4
	11-13	---	---	---	---	---	---	---		
Rock outcrop.										
21	0-9	3-10	1.40-1.60	2.0-6.0	0.05-0.10	5.1-6.0	Low	0.20	1	1-3
Mountainburg	9-17	15-25	1.50-1.70	2.0-6.0	0.05-0.10	4.5-5.5	Low	0.17		
	17-22	---	---	---	---	---	---	---		
22, 23	0-9	4-12	1.30-1.60	2.0-6.0	0.05-0.10	4.5-6.0	Low	0.15	1	1-3
Mountainburg	9-17	10-28	1.30-1.60	2.0-6.0	0.05-0.10	4.5-5.5	Low	0.24		
	17-22	---	---	---	---	---	---	---		
24*:										
Nella	0-10	10-20	1.30-1.50	0.6-2.0	0.08-0.15	4.5-5.5	Low	0.15	5	.5-3
	10-67	22-35	1.35-1.60	0.6-2.0	0.07-0.14	4.5-5.5	Low	0.20		
Mountainburg	0-9	4-12	1.30-1.60	2.0-6.0	0.05-0.10	4.5-6.0	Low	0.15	1	1-3
	9-17	10-28	1.30-1.60	2.0-6.0	0.05-0.10	4.5-5.5	Low	0.24		
	17-22	---	---	---	---	---	---	---		
25, 26	0-9	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	9-21	20-35	1.30-1.60	0.2-0.6	0.08-0.10	4.5-5.5	Low	0.43		
	21-35	20-35	1.40-1.80	<0.06	0.05-0.08	4.5-5.5	Low	0.43		
	35-72	30-50	1.30-1.45	<0.06	0.03-0.06	4.5-5.5	Low	0.37		
27, 28, 29	0-12	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	12-20	30-40	1.30-1.50	0.6-2.0	0.10-0.14	3.6-5.5	Low	0.28		
	20-33	45-75	1.20-1.50	0.6-2.0	0.09-0.13	3.6-5.5	Low	0.24		
	33-72	45-75	1.15-1.45	0.6-2.0	0.06-0.09	3.6-5.5	Low	0.24		
30	0-8	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	8-53	20-34	1.25-1.45	0.6-2.0	0.18-0.22	4.5-6.0	Low	0.32		
	53-74	30-60	1.15-1.35	0.6-2.0	0.09-0.18	4.5-6.0	Moderate	0.24		
31	0-7	15-25	1.25-1.60	0.6-2.0	0.15-0.24	5.1-6.5	Low	0.37	3	1-3
Portia	7-24	18-35	1.30-1.60	0.6-2.0	0.15-0.24	4.5-6.0	Low	0.32		
	24-55	20-40	1.30-1.60	0.2-2.0	0.10-0.17	4.5-6.0	Low	0.32		
	55-72	20-50	1.20-1.60	0.2-2.0	0.12-0.20	5.1-6.0	Moderate	0.28		
32*:										
Ramsey	0-8	8-25	1.30-1.60	6.0-20	0.04-0.08	4.5-5.5	Low	0.17	1	1-2
	8-15	8-25	1.30-1.60	6.0-20	0.06-0.10	4.5-5.5	Low	0.17		
	15-17	---	---	---	---	5.7-7.3	---	---		
Lily	0-10	5-25	1.20-1.40	0.6-6.0	0.09-0.16	3.6-5.5	Low	0.24	3	.5-3
	10-32	18-35	1.25-1.55	2.0-6.0	0.12-0.18	3.6-6.0	Low	0.24		
	32-40	18-35	1.25-1.55	2.0-6.0	0.08-0.17	3.6-6.0	Low	0.17		
	40-42	---	---	---	---	---	---	---		
33	0-10	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	10-58	18-35	1.25-1.60	0.6-2.0	0.13-0.22	5.6-6.5	Low	0.37		
	58-72	10-25	1.25-1.50	2.0-6.0	0.08-0.12	5.6-6.5	Low	0.32		

See footnote at end of table.

TABLE 14.--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/cm³	In/hr	In/in	pH				Pct
34----------	0-9	2-12	1.40-1.60	>6.0	0.05-0.11	3.6-7.3	Low----------	0.17	5	.5-1
Wideman	9-24	2-15	1.40-1.60	>6.0	0.06-0.14	5.1-7.3	Low----------	0.17		
	24-39	2-12	1.40-1.60	>6.0	0.05-0.11	5.1-7.3	Low----------	0.17		
	39-72	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 15.--SOIL AND WATER FEATURES

["Flooding" and "water table" and terms such as "brief" and "perched" are explained in the text. The symbol > 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			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					Ft			In			
1*, 2*: Arkana	C	None	---	---	>6.0	---	---	20-40	Hard	High	Moderate.
Eldon	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
3*, 4*: Arkana	C	None	---	---	>6.0	---	---	20-40	Hard	High	Moderate.
Moko	D	None	---	---	>6.0	---	---	6-20	Hard	Low	Low.
5, 6--- Britwater	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
7--- Cane	C	None	---	---	2.0-3.0	Perched	Nov-Mar	>60	---	Moderate	High.
8, 9--- Captina	C	None	---	---	2.0-3.0	Perched	Dec-Apr	>60	---	High	High.
10--- Clarksville	B	None	---	---	>6.0	---	---	>60	---	Low	High.
11--- Elsah	B	Frequent	Brief	Dec-May	>6.0	---	---	>60	---	Low	Moderate.
12, 13--- Enders	C	None	---	---	>6.0	---	---	40-60	Soft	High	High.
14*, 15*: Enders	C	None	---	---	>6.0	---	---	40-60	Soft	High	High.
Leesburg	B	None	---	---	>6.0	---	---	>60	---	Low	Moderate.
16--- Linker	B	None	---	---	>6.0	---	---	20-40	Hard	Low	High.
17*, 18*: Linker	B	None	---	---	>6.0	---	---	20-40	Hard	Low	High.
Mountainburg	D	None	---	---	>6.0	---	---	12-20	Hard	Low	Moderate.
19--- Mayes	D	None	---	---	1.0-2.0	Perched	Dec-Apr	>60	---	High	Moderate.
20*: Moko	D	None	---	---	>6.0	---	---	6-20	Hard	Low	Low.
Rock outcrop.											
21--- Mountainburg	D	None	---	---	>6.0	---	---	12-20	Hard	Low	High.
22, 23--- Mountainburg	D	None	---	---	>6.0	---	---	12-20	Hard	Low	Moderate.
24*: Nella	B	None	---	---	>6.0	---	---	>60	---	Low	Moderate.
Mountainburg	D	None	---	---	>6.0	---	---	12-20	Hard	Low	Moderate.
25, 26--- Nixa	C	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.

See footnote at end of table.

TABLE 15.--SOIL AND WATER FEATURES--Continued

Map symbol and soil name	Hydrologic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					Ft			In			
27, 28, 29--Noark	B	None	---	---	>6.0	---	---	>60	---	Moderate	High.
30--Peridge	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
31--Portia	C	None	---	---	>6.0	---	---	>60	---	High	High.
32*:											
Ramsey	D	None	---	---	>6.0	---	---	7-20	Hard	Low	Moderate.
Lily	B	None	---	---	>6.0	---	---	20-40	Hard	Moderate	High.
33--Razort	B	Occasional	Very brief to brief.	Jan-Apr	>6.0	---	---	>60	---	Low	Low.
34--Wideman	A	Frequent	Very brief	Mar-May	>6.0	---	---	>60	---	Low	Low.

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

TABLE 16.--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
Cane	Fine-loamy, siliceous, thermic Typic Fragiudults
Captina	Fine-silty, mixed, mesic Typic Fragiudults
Clarksville	Loamy-skeletal, siliceous, mesic Typic Paleudults
Eldon	Clayey-skeletal, mixed, mesic Mollic Paleudalfs
Elsah	Loamy-skeletal, mixed, nonacid, mesic Typic Udifluvents
Enders	Clayey, mixed, thermic Typic Hapludults
Leesburg	Fine-loamy, siliceous, thermic Typic Paleudults
Lily	Fine-loamy, siliceous, mesic Typic Hapludults
Linker	Fine-loamy, siliceous, thermic Typic Hapludults
*Mayes	Fine, montmorillonitic, thermic Vertic Argiaquolls
Moko	Loamy-skeletal, mixed, mesic Lithic Hapludolls
Mountainburg	Loamy-skeletal, siliceous, thermic Lithic Hapludults
Nella	Fine-loamy, siliceous, thermic Typic Paleudults
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
Ramsey	Loamy, siliceous, mesic Lithic Dystrochrepts
Razort	Fine-loamy, mixed, mesic Mollic Hapludalfs
Wideman	Sandy, siliceous, mesic Typic Udifluvents

* 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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