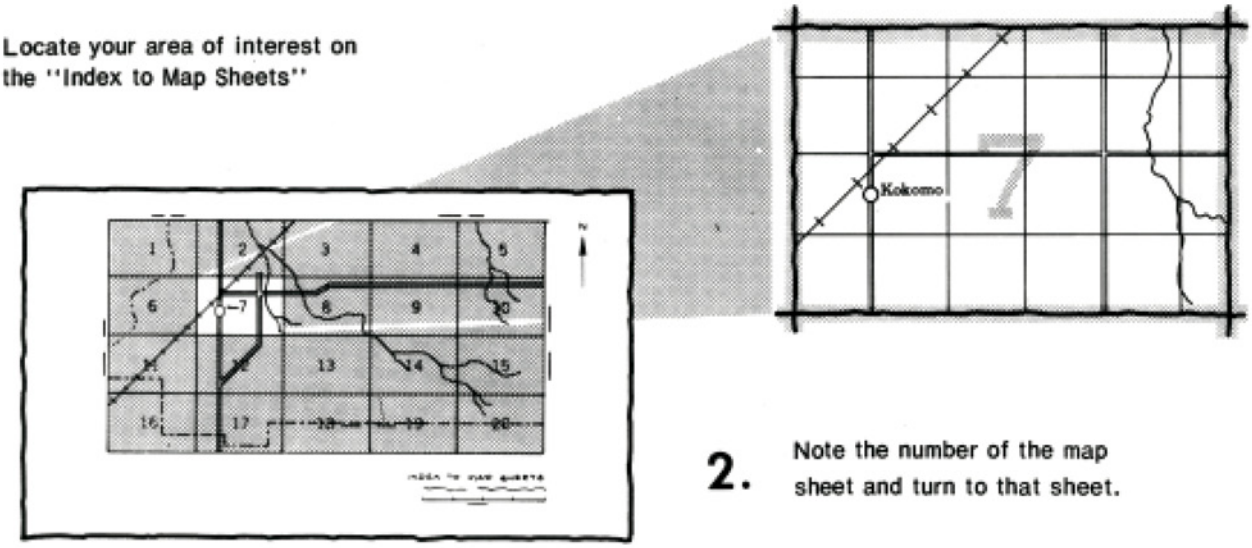
Soil Survey of

Boone County, Arkansas

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

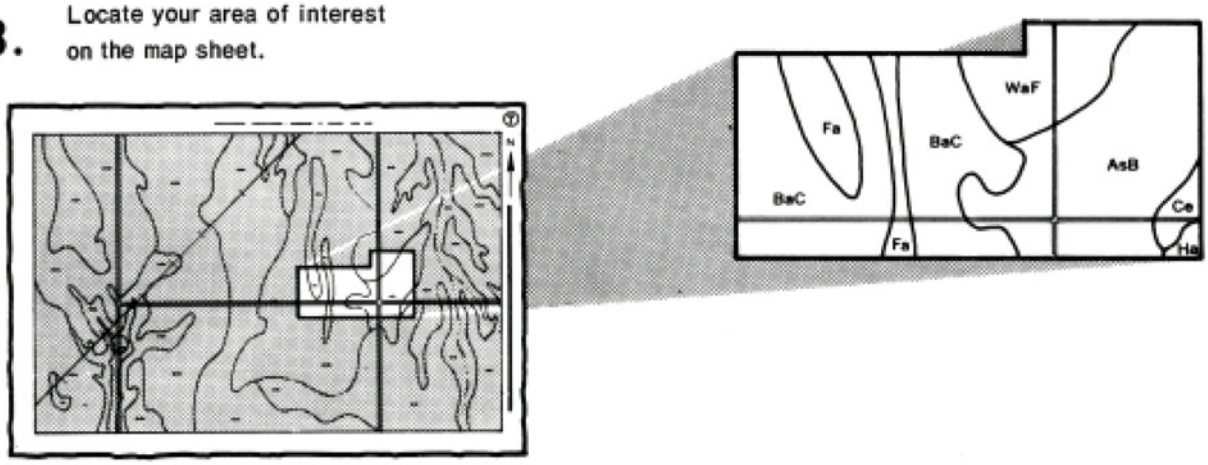
HOW TO USE

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

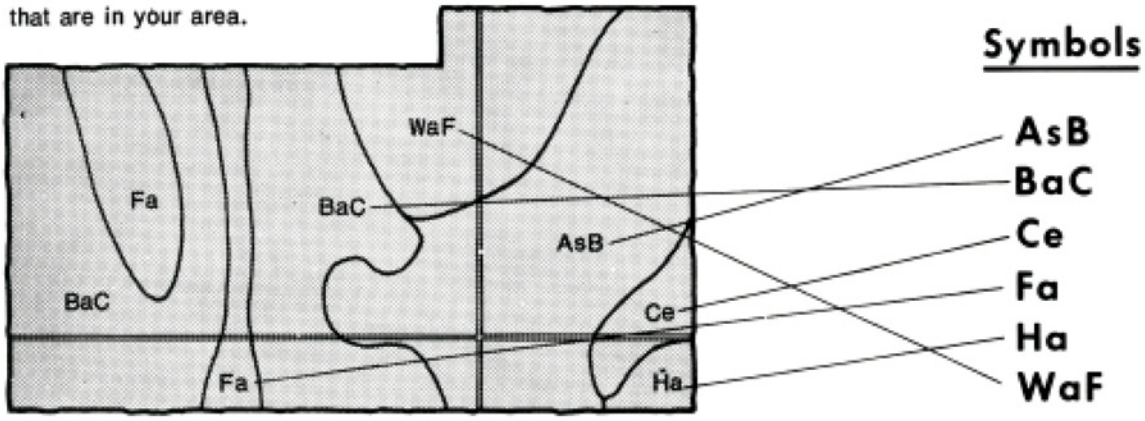


2. Note the number of the map sheet and turn to that sheet.

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

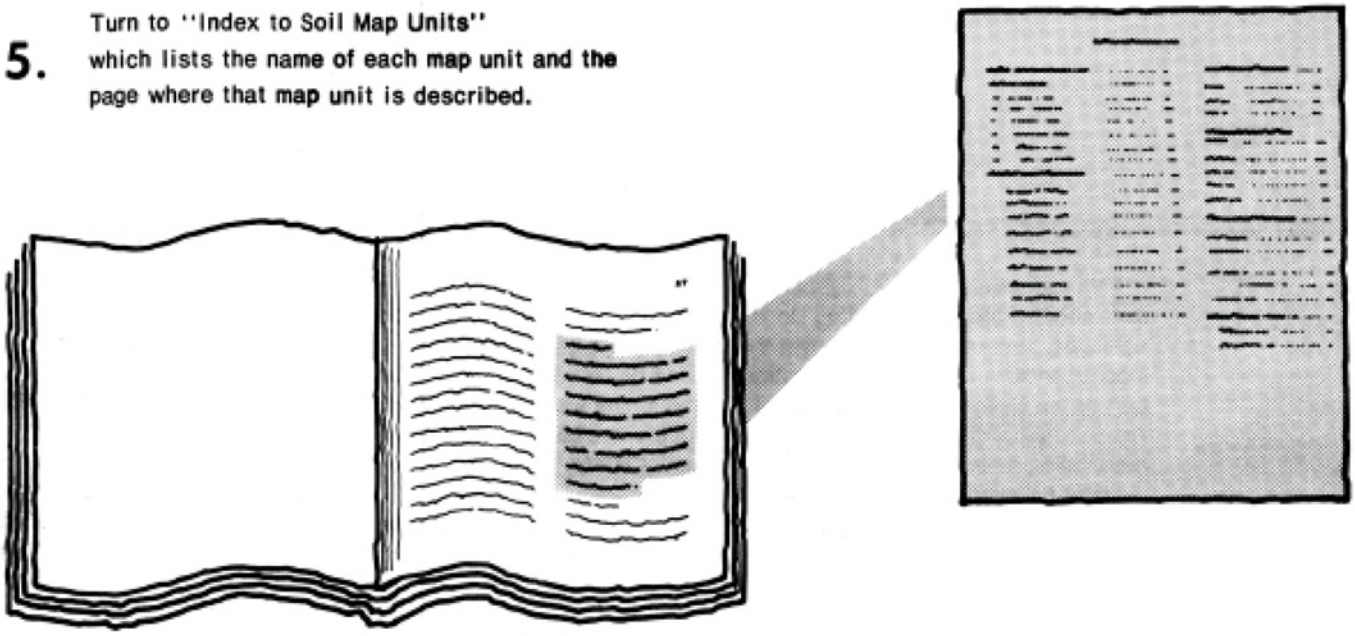


4. List the map unit symbols that are in your area.

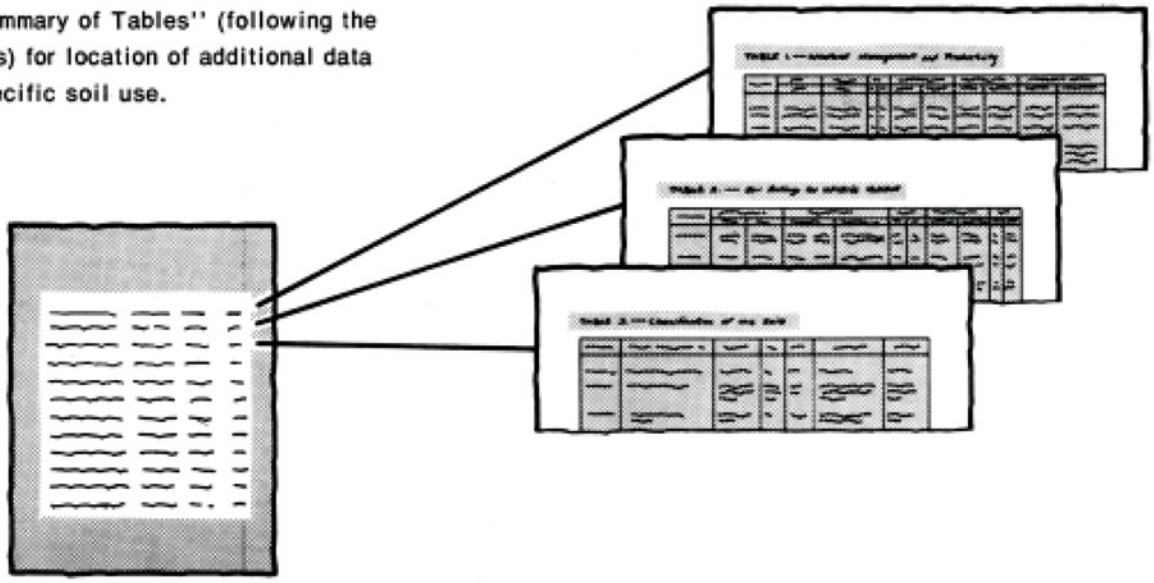


THIS SOIL SURVEY

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 performed in the period 1972-76. Soil names and descriptions were approved in 1977. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1977. 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 Boone 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: Farm pond in tall fescue pasture on Noark very cherty silt loam, 8 to 20 percent slopes.

Contents

Issued June 1981

Index to map units

Summary of tables

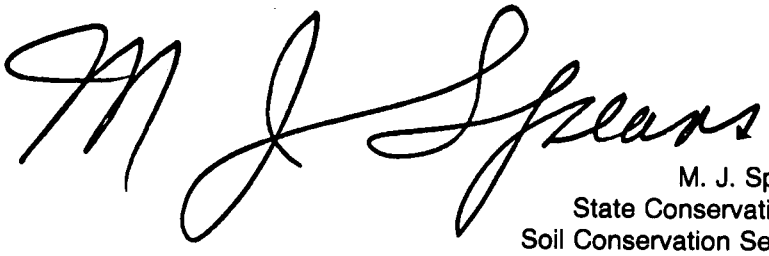
Foreword

This soil survey contains information that can be used in land-planning programs in Boone County, Arkansas. 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.



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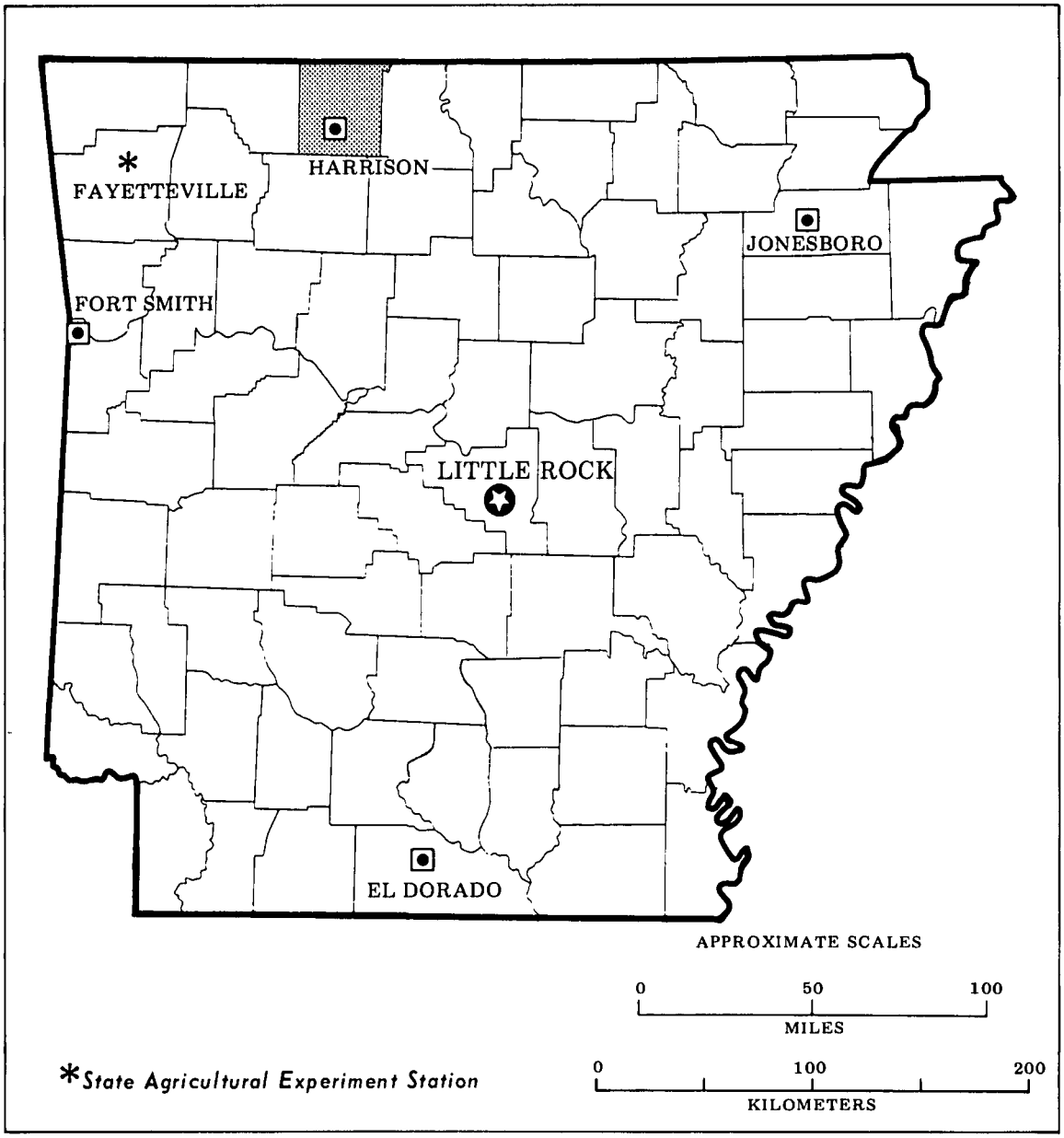

Location of Boone County in Arkansas.

Soil Survey of
Boone County, Arkansas

By M. Dean Harper, David H. Fowlkes, and
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United States Department of Agriculture
Soil Conservation Service, in cooperation with
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BOONE COUNTY is in northwestern Arkansas. It extends about 26 miles from north to south and 23 miles from east to west. It is bounded on the north by Missouri, on the west by Carroll County, on the south by Newton and Searcy Counties, and the east by Marion County. According to the 1970 census, the approximate land area, which included 1,209 acres of water in bodies of less than 40 acres, was 375,040 acres, or 586 square miles. The total area was 386,560 acres, or 604 square miles.

In 1970, the population of the county was 19,073. In Harrison, the county seat and largest town, the population was 7,293.

The economy is based mainly on beef cattle production, small industry, and business. Harrison is a trade center for several counties.

General nature of the survey area

Information on farming in Boone County, physiography and drainage, and climate follows. Statistics under Farming are from the 1974 Census of Agriculture.

Farming

Early settlers in Boone County were mostly subsistence farmers. They cleared and farmed the small scattered areas on flood plains and gently sloping uplands where the soil is deep and contains few if any pebbles or stones. As roads were built and markets developed, they produced cotton, fruit, grain, and livestock for cash sale. They also cut and sold the virgin hardwood timber.

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

For the most part, forests in the county, chiefly low grade hardwoods, are on the steep, stony, or shallow soils. Some soils are poor sites for commercial timber production. Most of the timber on good woodland sites has been poorly managed. Most timber sold in the county is used by furniture and other wood products mills in Harrison. Soils that are shallow over limestone in the northern part of the county produce cedar that is used for posts, lumber, furniture, and novelties.

Most farm income is from beef cattle. The cattle industry consists mainly of cow-calf operations. Most calves are sold as weaners. Some are sold as stockers the following year. Beef cattle are produced on cool and warm season pasture plants with mineral and protein supplement. They are fed grain and hay for only short periods late in winter. Most produced in the county are of good grade and are sold to midwestern feedlots. Table 1 shows the number of livestock in Boone County in 1969 and 1974.

Most areas on steep mountainsides and hillsides support poorly managed stands of hardwoods. Most are too steep, too stony, and too shallow to be intensively managed for meadow or tame pasture. As the population of the county increases, however, these areas are cleared and planted to tame pasture.

Many small farms are owned by residents who have off-the-farm jobs or are retired. Many retired people are moving into Boone County. Many of these new residents want a small acreage in a rural area; hence, much of the population of the county is in rural areas or small towns. Most farms are small enough so that the family can do most of the work.

According to the 1974 Census of Agriculture, 64.4 percent of the land area was in farms in Boone County. Farms are decreasing in size. Between 1969 and 1974, the average size decreased from 236 acres to 217 acres. Many farms have been divided into blocks of 10 acres or more and sold to retirees and people employed

off-the-farm. The acreage in farms decreased from 273,938 acres in 1969 to 241,618 acres in 1974.

Physiography and drainage

Boone County is within three physiographic areas of the Ozark Highlands. About half of the county is on the Springfield Plateau, and the rest is in the Boston Mountains and on the Salem Plateau.

The southwestern part of the county is in the Boston Mountains. Here, the stream valleys are about 1,200 to 1,400 feet above sea level. They range from a little wider than the stream itself to as much as one-fourth mile wide. The mountainsides are gravelly and stony and are strongly dissected. The lower two-thirds is convex, and gradients are about 8 to 40 percent. The upper third is a series of steep escarpments and less sloping benches. Gradients are 12 to 40 percent. The mountaintops are mainly gently sloping, long, and winding and are 500 feet to 2 miles wide. Most are at an elevation of about 1,700 to 2,000 feet. A few are 2,200 feet above sea level. Some are rimmed with a prominent bedrock escarpment.

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, narrow, winding ridges and rolling to steep side slopes having gradients of 12 to 50 percent. The side slopes form V-shaped valleys. Elevations are about 1,000 to 1,250 feet. There is a broad, nearly level to gently sloping upland area at Bergman. Another one is south of Harrison and Bellefonte. Both have gradients of mostly 1 to 8 percent.

The Salem Plateau is adjacent to the Springfield Plateau but is lower in elevation. Elevations are about 650 to 1,000 feet above sea level. This is an area of gently sloping to steep stony mountainsides and outcrops of limestone.

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

There are several small streams in the county, but no large ones. The natural drainage system consists of many streams in a dendritic pattern in the upper reaches of several watersheds. Springs, common in some areas, contribute substantially to summer and fall streamflow.

The north-central and northeastern part of the county drains into Bull Shoals Reservoir, which was formed from the White River. Bull Shoals Reservoir has a surface area of about 10,500 acres in Boone County. This major multiple-purpose reservoir is important for water-related recreation. The major streams flowing northward into Bull Shoals Reservoir are Bear Creek, West Sugar Loaf Creek, and Deshield Creek. The western part of the county is drained northwestward by Long Creek, which flows into Table Rock Reservoir. Table Rock is another major multiple-purpose reservoir, but only a small part is in Boone County. The southern part of the county drains in a general easterly direction mainly through Crooked Creek, Sugar Orchard Creek, and Clear Creek.

The main soils on the Springfield Plateau are Noark, Nixa, Clarksville, and Captina. Linker, Leadvale, Mountainburg, Nella, and Enders are the main soils in the Boston Mountains. Arkana and Moko are the main soils on the Salem Plateau. In the stream valleys and on terraces, Razort, Peridge, and Britwater are the dominant soils.

The supply of ground water is not adequate for large scale irrigation. A few of the larger streams furnish water for small scale sprinkler irrigation. Domestic water supplies come mainly from drilled and dug wells or in some places from springs. The incorporated towns of Alpena, Bellefonte, Bergman, Diamond City, Everton, Harrison, Lead Hill, Omaha, and Valley Springs have public water systems. Waterlines have been extended from Harrison into a few rural areas. The water supply for livestock is mainly from farm ponds and creeks.

Climate

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

Table 2 gives data on temperature and precipitation for the survey area as recorded at Harrison in the period 1951 to 1973. Table 3 shows probable dates of the first freeze in fall and the last freeze in spring. Table 4 provides data on length of the growing season.

In winter the average temperature is 39 degrees F, and the average daily minimum temperature is 27 degrees. The lowest temperature on record, which occurred at Harrison on February 2, 1951, is -14 degrees. In summer the average temperature is 77 degrees, and the average daily maximum temperature is 89 degrees. The highest recorded temperature, which occurred on July 14, 1954, is 110 degrees.

Growing degree days are shown in table 2. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (50 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is 43 inches. Of this, 25 inches, or 60 percent, usually falls in April through September, which includes the growing season for most crops. In 2 years out of 10, the rainfall in April through September is less than 19 inches. The heaviest 1-day rainfall during the period of record was 5.11 inches at Harrison on April 3, 1957. Thunderstorms occur on about 60 days each year, and most occur in summer.

Average seasonal snowfall is 14 inches. The greatest snow depth at any one time during the period of record was 14 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 50 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 70 percent of the time possible in summer and 50 percent in winter. The prevailing wind is from the northwest. Average windspeed is highest, 10 miles per hour, in March.

How this survey was made

Soil scientists made this survey to learn what soils are in the survey area, where they are, and how they can be used. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops; and the kinds of rock. They dug many holes to study soil profiles. A profile is the sequence of natural layers, or horizons, in a soil. It extends from the surface down into the parent material, which has been changed very little by leaching or by plant roots.

The soil scientists recorded the characteristics of the profiles they studied and compared those profiles with others in nearby counties and in more distant places. They classified and named the soils according to nationwide uniform procedures. They drew the boundaries of the soils on aerial photographs. These photographs show trees, buildings, fields, roads, and other details that help in drawing boundaries accurately. The soil maps at the back of this publication were prepared from aerial photographs.

The areas shown on a soil map are called map units. Most map units are made up of one kind of soil. Some are made up of two or more kinds. The map units in this survey area are described under "General soil map for broad land use planning" and "Soil maps for detailed planning."

While a soil survey is in progress, samples of some soils are taken for laboratory measurements and for engineering tests. All soils are field tested to determine their characteristics. Interpretations of those characteristics may be modified during the survey. Data are assembled from other sources, such as test results, records, field experience, and state and local specialists. For example, data on crop yields under defined management are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it can be used by farmers, rangeland and woodland managers, engineers, planners, developers and builders, home buyers, and others.

General soil map for broad land use planning

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. Soil potential ratings are based on the practices commonly used in the survey area to overcome soil limitations. These ratings reflect the ease of overcoming the limitations. They also reflect the problems that will persist even if such practices are used.

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

Descriptions of map units

Areas dominated by deep, moderately deep, and shallow, gently sloping to steep soils; on mountainsides, hillsides, and ridgetops

These map units make up 58 percent of the county. They are in the northern, southwestern, and central parts of the county. Map units 1 and 3 are in the Ozark Highlands, and map unit 2 is in the Boston Mountains. These units consist of loamy soils that are cherty or stony. Slopes are mostly steep, but range to gently sloping.

1. Arkana-Moko

Moderately deep and shallow, gently sloping to steep, well drained cherty and stony soils formed in residuum from limestone

This map unit is mostly in the northern part of the county, on mountainsides and ridgetops in the Salem Plateau. It makes up about 26 percent of the county. It is about 38 percent Arkana soils, 26 percent Moko soils, and 36 percent soils of minor extent.

Arkana and Moko soils are usually intermingled on the same landscape and are well drained. Arkana soils are moderately deep, and Moko soils are shallow. Arkana soils have a surface layer of very dark grayish brown cherty or very cherty silt loam. The subsoil is yellowish red and yellowish brown clay and cherty clay. The underlying material is hard limestone. Moko soils are black very stony silt loams about 11 inches thick over hard limestone.

Minor in this unit are the very cherty Clarksville, Nixa, and Noark soils on hillsides and ridgetops at higher elevations. Also minor are intermingled areas of Rock outcrop and Gassville soils on a similar landscape as the Arkana and Moko soils.

Most of this unit is woodland of redcedar and low grade hardwoods. Some moderately sloping and moderately steep areas are pasture. Most of the acreage was originally an open stand of hardwoods and redcedar with prairie plants in the openings. The depth to rock, stones, and slope are the main limitations for farming and for most other uses.

This unit is not suited to cultivated crops. The potential is fair to poor for pasture. The potential is poor for woodland. Because the low strength, slopes, and depth to rock are severe limitations that are difficult to overcome, the potential is poor for residential and other community development (fig. 1).

2. Enders-Nella-Mountainburg

Deep and shallow, gently sloping to steep, well drained stony soils formed in residuum from shale, colluvium from sandstone, and residuum from sandstone

This map unit is in the southwestern part of the county, on mountainsides in the Boston Mountains. It makes up about 7 percent of the county. It is about 42 percent Enders soils, 30 percent Nella soils, 15 percent Mountainburg soils, and 13 percent soils of minor extent (fig. 2).

Enders, Nella, and Mountainburg soils are well drained and have a stony surface layer. Enders soils are deep. The surface layer is dark brown stony loam, and the subsoil is yellowish red and red mottled silty clay and clay. Nella soils are deep. The surface layer is brown stony loam, and the subsoil is red stony clay loam that is mottled in the lower part. Mountainburg soils are shallow. The surface layer is very stony fine sandy loam that is very dark grayish brown. The subsoil is very stony loam that is yellowish brown in the upper part and strong brown in the lower part.

Minor in this unit are the gently sloping to moderately sloping Linker soils on mountaintops and ridgetops and the nearly level to gently sloping Leadvale soils on plateaus and mountaintops. Also minor is Rock outcrop, some of which forms prominent bluffs.

Most of this unit is woodland of low grade hardwoods that provides wildlife habitat. Some of the less sloping areas are pasture. Originally, Enders and Mountainburg soils supported an open stand of hardwoods with prairie plants in the openings, and Nella soils supported a dense stand of hardwoods. Most of the best trees have been cut. The harvesting left a stand of undesirable species and young trees. Stones, slopes, the depth to rock, and the clayey subsoil are the main limitations for farming and for most other uses.

For the most part, this unit is not suited to cultivated crops. The potential is fair to poor for pasture and woodland. Because the low strength, high shrink-swell potential, slopes, stones, and depth to bedrock are severe limitations that are difficult to overcome, the potential is poor for residential and other community development.

3. Clarksville-Nixa-Noark

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

This map unit is mostly in an area that extends from the northwestern part of the county to the east-central part. It is on hillsides and ridgetops on a highly dissected plateau in the Springfield Plateau (fig. 3).

This unit makes up about 25 percent of the county. It is about 40 percent Clarksville soils, 25 percent Nixa soils, 25 percent Noark soils, and 10 percent soils of minor extent (fig. 4).

This unit is very cherty and is underlain by cherty limestone. Clarksville soils are on steep hillsides and are somewhat excessively drained. The surface layer is dark brown very cherty silt loam. The subsoil is yellowish brown, strong brown, and light brown very cherty silt loam. Nixa soils are on ridgetops and are moderately well drained. The surface layer is dark grayish brown very cherty silt loam. The upper part of the subsoil is yellowish brown very cherty silt loam. The lower part is a compact and brittle fragipan. The pan is mottled strong brown and pale brown very cherty silt loam. Noark soils are on ridgetops and are well drained. The surface layer is dark grayish brown very cherty silt loam. The subsoil is yellowish red, red, and dark red very cherty clay.

Minor in this unit are the Arkana and Moko soils on slightly lower elevations and the Razort and Britwater soils along flood plains and stream terraces.

Most of the moderately sloping and moderately steep areas of this unit are used for pasture, and most steep areas are woodland of mixed hardwoods. Most of the acreage was originally mixed hardwoods. Slope and high chert content are the main limitations for farming and for most other uses.

This unit has poor potential for cultivated crops and fair to poor potential for pasture. The potential is fair for woodland. Clarksville soils have poor potential for residential and other community development because of slope. Nixa soils have fair potential for residential and community development because of slope and small stones. Noark soils have fair to poor potential for residential and other community development because of the slope, small stones, and the low strength.

Areas dominated by deep, moderately deep, and shallow, nearly level to moderately steep soils; on hillsides, ridgetops, mountains, and broad uplands and plateaus

These soil units make up 40 percent of the county. They are in the southern, central, and northwestern parts of the county. Map units 4, 5, and 7 are in the Ozark Highlands, and map units 6 and 8 are in the Boston Mountains. These map units consist of loamy soils that are gravelly, cherty, or stony in places. They are nearly level to moderately steep.

4. Noark-Nixa

Deep, gently sloping to moderately steep, well drained and moderately well drained very cherty soils formed in residuum from cherty limestone

This map unit extends through the county from the northwest to southwest and is on ridgetops and hillsides on the Springfield Plateau. It makes up about 21 percent of the county. It is about 50 percent Noark soils, 40 percent Nixa soils, and 10 percent soils of minor extent.

Noark soils are well drained and moderately permeable. The surface layer is dark grayish brown very cherty silt loam. The subsoil is yellowish red, red, and dark red very cherty clay. Nixa soils are moderately well drained and very slowly permeable. The surface layer is dark grayish brown very cherty silt loam. The upper part of the subsoil is yellowish brown very cherty silt loam. The lower part is a compact and brittle fragipan. The pan is mottled strong brown and pale brown very cherty silt loam. Noark and Nixa soils are underlain by cherty limestone.

Minor in this unit are the somewhat excessively drained, steep Clarksville soils, the Arkana and Moko soils on lower elevations, and the Razort, Britwater, and Peridge soils on flood plains and stream terraces.

Most of this unit is used for pasture, hay, and urban development. Some areas are used as woodland and wildlife habitat. Most of the acreage was originally in hardwoods. The slope, high chert content, and slow permeability are moderate limitations for farming and for most other uses.

This unit has poor to fair potential for cultivated crops and fair potential for pasture and hay. It has fair potential for woodland. Because the high chert content, slope, and low strength are moderate limitations that can usually be overcome, the potential is fair for residential and other community development.

5. Captina-Nixa

Moderately deep and deep, nearly level to gently sloping, moderately well drained loamy and very cherty soils formed in loamy material over limestone and residuum from limestone

This map unit is in a single area near the central part of the county, on a broad upland on the Springfield Plateau.

This unit makes up about 1 percent of the county. It is about 63 percent Captina soils, 25 percent Nixa soils, and 12 percent soils of minor extent.

These soils are moderately well drained. Captina soils are moderately deep and deep. The surface layer is dark grayish brown silt loam. The upper part of the subsoil is strong brown silty clay loam. The lower part is a compact and brittle fragipan. The pan is mottled silty clay loam. Nixa soils are deep. The surface layer is dark grayish brown very cherty silt loam. The upper part of the subsoil is yellowish brown very cherty silt loam. The lower part is a compact and brittle fragipan. The pan is mottled strong brown and pale brown very cherty silt loam. The underlying material is cherty limestone.

Of minor extent in this unit are the very cherty Noark and Clarksville soils. Noark soils are well drained and are on gently sloping to moderately steep hillsides and ridgetops. The Clarksville are somewhat excessively drained soils on steep hillsides.

Most of this unit is used for pasture and hay. Originally, most of the acreage was in hardwoods. The slope and chert content are moderate limitations for farming and for most other uses.

The Captina soils have fair to good potential for cultivated crops, and Nixa soils have fair potential because of the high chert content and slopes. This unit has fair potential for woodland, and fair to good potential for pasture and hay. Because the depth to rock, low strength, and high chert content are moderate limitations that can usually be overcome, the potential is fair for residential and other community development.

6. Mountainburg-Linker-Leadvale

Shallow, moderately deep, and deep, gently sloping to moderately steep, well drained and moderately well drained loamy soils formed in residuum from sandstone and siltstone

This map unit is mostly in the southwestern part of the county, in the Boston Mountains. One area is on a

mountaintop, and the other areas are at lower elevations.

This unit makes up about 9 percent of the county. It is about 38 percent Mountainburg soils, 18 percent Linker soils, 8 percent Leadvale soils, and 36 percent soils of minor extent.

Mountainburg soils are shallow and well drained. The surface layer is very dark grayish brown fine sandy loam that is very gravelly or very stony. The subsoil is yellowish brown or strong brown very stony loam. Linker soils are moderately deep and well drained. The surface layer is dark grayish brown fine sandy loam that is gravelly or stony in places. The subsoil is yellowish red sandy clay loam that is mottled in the lower part. Leadvale soils are deep and moderately well drained. The surface layer is brown silt loam. The upper part of the subsoil is yellowish brown and strong brown silt loam and silty clay loam. The lower part is a mottled, compact and brittle silty clay loam fragipan.

Minor in this unit are the Cane soils on similar landscapes, the very slowly permeable Enders soils on ridges and hillsides, the deep, stony Nella soils on hillsides, and the very cherty Noark soils on hillsides and ridgetops.

Most of this unit is now used for pasture and hay. Some areas are woodland of low grade hardwoods. Most of the less sloping, gravel free areas, however, were cultivated for 40 to 80 years. Most of the acreage was originally hardwood forest and small intermingled areas of prairie vegetation. Depth to rock is a severe limitation for farming and most other uses on Mountainburg soils. The slope is a moderate limitation for farming and most other uses on Linker and Leadvale soils.

The Mountainburg soils are not suited to cultivated crops. Surface stones, droughtiness, and the very severe erosion hazard are the main limitations. Linker soils have fair or poor potential for cultivated crops because of the severe to very severe erosion hazard and the gravelly and stony surfaces. Leadvale soils have fair potential for cultivated crops because of the severe erosion hazard. This unit has good to poor potential for pasture and hay. It has fair to poor potential for woodland. The potential for residential and community development is poor in Mountainburg soils because of stones and depth to rock and is fair in Linker and Leadvale soils.

7. Boden-Portia

Deep, gently sloping to moderately steep, well drained loamy and stony soils formed mostly in residuum from sandstone

These steep soils are in the southeastern part of the county, on hillsides on the Springfield Plateau.

This map unit makes up about 4 percent of the county. It is about 60 percent Boden soils, 15 percent Portia soils, and 25 percent soils of minor extent.

Boden and Portia soils are well drained. Boden soils have a surface layer of dark grayish brown stony sandy loam. The subsoil is mostly red and mottled red and strong brown sandy clay and clay. Portia soils have a brown sandy loam surface layer. The subsoil is mostly red sandy clay loam.

Minor in this unit are the cherty Arkana soils on hillsides and the stony, shallow Moko soils on ridges and hillsides. Also minor are the Razort soils on flood plains and the Britwater soils on stream terraces.

Most of this unit is used for pasture, hay, and hardwoods. Most of the acreage was originally in mixed hardwoods. Slopes, stones, and erosion are the main limitations for farming and for most other uses.

Boden soils have poor potential for cultivated crops and fair potential for pasture and hay. The potential is fair for woodland, and for most residential and community development. Portia soils have fair to poor potential for cultivated crops, fair potential for woodland, and good potential for pasture and hay. Potential is fair to good for most residential and community development.

8. Cane-Leadvale-Linker

Deep and moderately deep, nearly level to moderately sloping, well drained and moderately well drained loamy soils formed in residuum from sandstone and siltstone

This map unit is in the southern part of the county, on a broad plateau in the Boston Mountains (fig. 5).

This map unit makes up about 5 percent of the county. It is about 35 percent Cane soils, 16 percent Leadvale soils, 12 percent Linker soils, and 37 percent soils of minor extent.

Cane soils are deep and well drained. The surface layer is dark brown loam. The upper part of the subsoil is yellowish red clay loam. The lower part is a compact and brittle fragipan. The pan is mottled clay loam. Leadvale soils are deep and moderately well drained. The surface layer is brown silt loam. The upper part of the subsoil is yellowish brown and strong brown silt loam and silty clay loam. The lower part is a mottled, compact and brittle silty clay loam fragipan. Linker soils are moderately deep and well drained. The surface layer is dark grayish brown fine sandy loam. The subsoil is yellowish red sandy clay loam that is mottled in the lower part.

Minor in this unit are the shallow Mountainburg soils, the deep silty Peridge soils, the very cherty Noark soils, the very slowly permeable Enders soils, and the Razort soils on narrow flood plains.

Most of this unit is now used for pasture and hay, but it was cultivated for 40 to 80 years. Most of the acreage was originally a stand of hardwoods. Slopes, wetness, and the moderate depth to rock in places are moderate limitations for farming and for most other uses.

Cane soils have fair or poor potential for cultivated crops because of the severe or very severe erosion hazard. Leadvale soils have fair or good potential for

cultivated crops because of the severe erosion hazard. Linker soils have fair potential for cultivated crops because of the severe erosion hazard. The potential is fair to good for pasture and hay. It is fair for woodland. Because the low strength, wetness, and moderate depth to rock are moderate limitations that can usually be overcome, the potential is fair for residential and other community development.

Areas dominated by deep, level to gently sloping soils; on flood plains and stream terraces

This map unit makes up 2 percent of the county. It is along Crooked Creek in the south-central part of the county and along Long Creek in the west-central part of the county. This unit consists of loamy soils in the Ozark Highlands. It is level to gently sloping.

9. Razort-Peridge

Deep, level to gently sloping, well drained loamy soils formed in loamy alluvium and old alluvium or residuum from limestone

This map unit is on flood plains, stream terraces, and uplands along Crooked Creek and Long Creek. It makes up about 2 percent of the county. It is about 50 percent Razort soils, 35 percent Peridge soils, and 15 percent soils of minor extent.

Razort soils are on flood plains. The surface layer is dark brown loam. The subsoil is dark brown silt loam and gravelly silt loam. Peridge soils are on stream terraces and uplands. The surface layer is dark brown silt loam. The subsoil is mottled yellowish red and yellowish brown silt loam, silty clay loam, and silty clay.

Of minor extent in this unit are the gravelly Britwater soils on stream terraces, gravel bars, and sandy and gravelly overwash.

Most of this unit is now used for pasture and hay (fig. 6), but it was cultivated for 60 to 90 years. Most of the acreage was originally a dense stand of mixed hardwoods. Flooding and erosion are the main limitations for farming and for most other uses.

This unit has good potential for pasture and hay, and fair to good potential for woodland. Because of the flood hazard, Razort soils have poor potential for cultivated crops and most residential and community development. Peridge soils have fair to good potential for cultivated crops and fair potential for most residential and community development.

Broad land use considerations

The map units in the county vary widely in their potential for the main land uses. The ratings of soil potential reflect the cost of measures needed to overcome limitations, problems that occur after those measures have been taken, and limitations that are impractical to overcome, such as poor potential for tree growth. The ratings do not consider the location as related to existing roads and other facilities.

Each map unit is rated for cultivated crops, pasture, woodland, and urban use. Only a small acreage of cultivated crops is grown in the county. The ratings for cultivated crops indicate the potential for crops, home gardens, orchards, lawns, flowers, and shrubs. Pasture is land in improved grasses, such as tall fescue or bermudagrass. Woodland is land supporting a stand of trees. Urban use includes residential, commercial, and industrial land use.

Parts of the Captina-Nixa, Mountainburg-Linker-Leadvale, Razort-Peridge, and Cane-Leadvale-Linker map units have good potential for cultivated crops if erosion is controlled. The rest of the county has mostly poor potential for cultivated crops, except for scattered small areas throughout the county that have fair or good potential. Steep slopes, coarse fragments, and depth to bedrock are the main limiting factors for cultivated crops. All of the Razort-Peridge unit and part of the Captina-Nixa, Mountainburg-Linker-Leadvale, Boden-Portia, and Cane-Leadvale-Linker units have good potential for pasture. The rest of the county has fair to poor potential for pasture, mostly because of steep slopes, coarse fragments, and shallowness over bedrock.

Part of the Razort-Peridge unit has good potential for woodland. The Arkana-Moko unit has poor potential. The rest of the county has fair to poor potential. Slope and stones limit the use of equipment in many areas. In some areas tree growth is slow because of low water holding capacity caused by the shallowness over bedrock, coarse fragments, or plastic clay subsoil.

About 14,067 acres has been developed for urban use in Boone County (*12*). Part of the Boden-Portia and Razort-Peridge units has good potential for urban use. The rest of the county has fair to poor potential. Most of the limitations are caused by shallowness over bedrock, low strength, high shrink-swell potential, flood hazard, and slope. Generally, the soils that have good potential for urban use also have good potential for cultivated crops and other agricultural use. Proper engineering design can overcome many limitations for urban development.

Soil maps for detailed planning

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. And they 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, a brief description of the soil profile, and a listing of the principal hazards and limitations to be considered in planning management.

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 horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Noark very cherty silt loam, 8 to 20 percent slopes, is one of several phases in the Noark series.

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

A *soil complex* consists of two or more soils in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Arkana-Moko complex, 3 to 8 percent slopes, is an example.

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

Not all units in this survey area have been mapped with the same degree of detail. Broadly defined units are likely to be larger and to vary more in composition than units mapped in greater detail. Composition has been controlled well enough, however, for the expected use of the soils. The broadly defined units are indicated by an asterisk that follows the map unit name on the soil legend.

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

Table 5 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

Soil descriptions

1—Arkana cherty silt loam, 3 to 8 percent slopes. This moderately deep, well drained, gently sloping soil is on uplands. Slopes are smooth and convex. Individual areas range from about 5 to 30 acres.

Typically the surface layer is very dark grayish brown cherty silt loam about 3 inches thick. The next layer is dark brown very cherty silt loam to a depth of about 6 inches. The subsoil is yellowish red cherty clay to a depth of about 10 inches, yellowish red clay to 18 inches, and yellowish brown clay to 28 inches. Below this is hard level-bedded limestone.

Included in mapping are areas of similar soils that have lighter colors, have less chert in the surface layer, and are deeper than 45 inches to bedrock. Also included are small areas of Moko and Gassville soils.

This soil is moderate in natural fertility and organic matter content. It is medium acid to mildly alkaline in the surface layer and strongly acid to moderately alkaline in the subsoil. Permeability is very slow, and the available water capacity is low. Tilth is good, but the cherty surface limits the use of some farming implements. The root zone is moderately deep and can be penetrated to the clayey subsoil, which somewhat restricts further penetration.

This soil has poor potential for cultivated crops. The main use is pasture. Runoff is medium to rapid. Erosion is a very severe hazard if cultivated crops are grown. Under good management that includes minimum tillage and contour cultivation and terraces, clean tilled crops that leave large amounts of residue can be grown occasionally. A cropping system that keeps a close growing cover crop on the soil most of the time is essential. Potential is fair for hay and pasture. Suitable pasture plants are tall fescue, bermudagrass, lespedeza, and white clover.

This soil has poor potential for woodland. Equipment limitations and seedling mortality are moderate.

The potential is poor for most urban use. Low strength and shrink-swell potential are severe limitations for dwellings, roads and streets, and light industry. These limitations can usually be overcome by proper engineering design and installation procedures. Very slow permeability and depth to bedrock are severe limitations for septic tank absorption fields. These limitations are difficult or impractical to overcome.

The capability unit is IVe-2. The woodland suitability group is 5c8.

2—Arkana very cherty silt loam, 8 to 12 percent slopes. This moderately deep, well drained, moderately

sloping soil is on uplands. Slopes are smooth and convex. Individual areas range from about 5 to 30 acres.

Typically the surface layer is very dark grayish brown very cherty silt loam about 3 inches thick. The next layer is dark brown very cherty silt loam to a depth of about 5 inches. The subsoil is yellowish red cherty clay to a depth of about 10 inches and yellowish red clay to 28 inches. Below this is hard level-bedded limestone.

Included in mapping are areas of similar soils that have lighter colors, have less chert in the surface layer, and are deeper than 45 inches to bedrock. Also included are small areas of Moko and Gassville soils.

This soil is moderate in natural fertility and organic matter content. It is medium acid to mildly alkaline in the surface layer and strongly acid to moderately alkaline in the subsoil. Permeability is very slow, and the available water capacity is low. Tilth is good, but the very cherty surface limits the use of some farming implements. The root zone is moderately deep and can be penetrated to the clayey subsoil, which somewhat restricts further penetration.

This soil is not suited to cultivated crops. It is now mostly pasture, for which the potential is fair. Suitable pasture plants are tall fescue, bermudagrass, lespedeza, and white clover.

Potential is poor for woodland. Equipment limitations and seedling mortality are moderate.

This soil has poor potential for most urban use. The low strength and shrink-swell potential are severe limitations for dwellings, roads and streets, and light industry. These limitations can usually be overcome by proper engineering design and installation. Very slow permeability and depth to bedrock are severe limitations for septic tank absorption fields. These limitations are difficult or impractical to overcome.

The capability unit is VIe-1. The woodland suitability group is 5c8.

3—Arkana-Moko complex, 3 to 8 percent slopes. This map unit consists of areas of Arkana and Moko soils so small and intermingled that they could not be mapped separately. It occurs as small areas of about 10 to 50 acres on ridges and side slopes. Slopes are uneven and convex. Individual areas of each soil are about one-half acre to 4 acres.

The Arkana soil makes up about 55 percent of each mapped area. Typically the surface layer is very dark grayish brown very cherty silt loam about 3 inches thick. The next layer is dark brown very cherty silt loam to a depth of about 6 inches. The subsoil is yellowish red cherty clay to a depth of about 10 inches, yellowish red clay to 18 inches, and yellowish brown clay to 28 inches. Below this is hard level-bedded limestone.

The Arkana soil is moderate in natural fertility and organic matter content. It is medium acid to mildly alkaline in the surface layer and strongly acid to moderately alkaline in the subsoil. Permeability is very slow, and available water capacity is low. Tilth is good, but the very cherty surface layer limits the use of farming implements. The root zone is moderately deep and can be penetrated to the clayey subsoil, which somewhat restricts further penetration.

The Moko soil makes up about 40 percent of each mapped area. Typically it is black very stony silt loam about 11 inches thick over hard limestone.

The Moko soil is moderate in natural fertility and organic matter content. It is neutral or mildly alkaline throughout. Permeability is moderate, and available water capacity is very low.

The remaining 5 percent of this unit consists of Rock outcrop and soils that are deeper than 45 inches to bedrock but are otherwise similar to the Arkana soils.

These soils are not suited to cultivated crops. They are mainly woodland of low grade hardwoods and cedar. Some areas are pasture. The Arkana soil has fair potential for pasture. Suitable pasture plants are tall fescue, bermudagrass, lespedeza, and white clover. The Moko soil is not suited to pasture and should not be cleared of native vegetation because of the very severe erosion hazard.

The Arkana soil has poor potential for woodland. Equipment limitations and seedling mortality are moderate.

The Moko soil has poor potential for woodland. Equipment limitations are severe, and seedling mortality and erosion hazard are moderate.

The Arkana soil has poor potential for most urban use. Low strength and shrink-swell potential are severe limitations for dwellings, roads and streets, and light industry. These limitations can usually be overcome by proper engineering design and installation. Very slow permeability and depth to rock are severe limitations for septic tank absorption fields. These limitations are difficult or impractical to overcome. The Moko soil has poor potential for most urban use. Depth to rock and large stones are severe limitations for dwellings, industrial sites, local roads and streets, and septic tank absorption fields. These limitations are difficult or impractical to overcome.

The capability unit is VIs-1. The woodland suitability group is 5c8 for Arkana soil and 5x3 for Moko soil.

4—Arkana-Moko complex, 8 to 20 percent slopes. This map unit consists of areas of Arkana and Moko soils so small and intermingled that they could not be mapped separately. It occurs as large areas of about 20 to 200 acres on ridges and hillsides. Slopes are uneven and convex and include rock ledges. Individual areas of each soil are about 1 to 4 acres.

The Arkana soil makes up about 50 percent of each mapped area. Typically the surface layer is very dark grayish brown very cherty silt loam about 3 inches thick. The next layer is dark brown very cherty silt loam to a depth of about 6 inches. The subsoil is yellowish red cherty clay to a depth of about 10 inches, yellowish red

clay to 18 inches, and yellowish brown clay to 28 inches. Below this is hard level-bedded limestone.

The Arkana soil is moderate in natural fertility and organic matter content. It is medium acid to mildly alkaline in the surface layer and strongly acid to moderately alkaline in the subsoil. Permeability is very slow, and available water capacity is low. The soils have good tilth, but the very cherty surface layer limits the use of tillage implements. The root zone is moderately deep and can be penetrated to the clayey subsoil, which somewhat restricts further penetration.

The Moko soil makes up about 40 percent of each mapped area. Typically, it is black very stony silt loam about 11 inches thick over hard limestone.

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

The remaining 10 percent of this unit consists of areas of Clarksville and Noark soils, Rock outcrop, and soils that are similar to Arkana soils, except that they are deeper than 45 inches to bedrock.

These soils are not suited to cultivated crops. They are mainly woodland of low grade hardwoods and cedar. Some areas are pasture. The Arkana soil has fair potential for pasture. Adapted pasture plants include tall fescue, bermudagrass, lespedeza, and white clover. The Moko soil is not suited to pasture and should not be cleared of native vegetation because of the very severe erosion hazard.

The Arkana soil has poor potential for woodland. Equipment limitations and seedling mortality are moderate. The Moko soil has poor potential for woodland. Equipment limitations and the erosion hazard are severe, and seedling mortality is moderate.

The Arkana soil has poor potential for most urban use. The low strength and shrink-swell potential are severe limitations for dwellings, roads and streets, and light industry. Slope is also a severe limitation for light industry. These limitations can usually be overcome by proper engineering design and installation. Very slow permeability and depth to rock are severe limitations for septic tank absorption fields. These limitations are difficult or impractical to overcome.

The Moko soil has poor potential for most urban use. Depth to rock and large stones are severe limitations for dwellings, light industry, local roads and streets, and septic tank absorption fields. Slope is also a severe limitation for light industry. These limitations are difficult or impractical to overcome.

The capability unit is VIIs-1. The woodland suitability group is 5c9 for Arkana soils and 5x3 for Moko soils.

5—Arkana-Moko complex, 20 to 40 percent slopes. This map unit consists of areas of Arkana and Moko soils so small and intermingled that they could not be mapped separately. Areas are long and narrow and about 15 to 90 acres on hillsides. Slopes are uneven and convex and include rock ledges. Individual areas of each soil are about 3 to 5 acres.

The Arkana soil makes up about 55 percent of each mapped area. Typically the surface layer is very dark grayish brown very cherty silt loam about 3 inches thick. The next layer is dark brown very cherty silt loam to a depth of about 6 inches. The subsoil is yellowish red cherty clay to a depth of about 10 inches, yellowish red clay to 18 inches, and yellowish brown clay to 28 inches. Below this is hard, level-bedded limestone.

The Arkana soil is moderate in natural fertility and organic matter content. It is medium acid to mildly alkaline in the surface layer and strongly acid to moderately alkaline in the subsoil. Permeability is very slow, and available water capacity is low. The soils have good tilth, but the very cherty surface layer and slopes limit the use of some farming implements. The root zone is moderately deep and can be penetrated to the clayey subsoil, which somewhat restricts further penetration.

The Moko soil makes up about 35 percent of each mapped area. Typically it is black very stony silt loam about 11 inches thick over hard limestone.

The Moko soil is moderate in natural fertility and organic matter content. It is neutral or mildly alkaline throughout. Permeability is moderate, and available water capacity is very low.

The remaining 10 percent of this unit consists of areas of Clarksville and Noark soils, Rock outcrop, and soils that are deeper than 45 inches to bedrock but are otherwise similar to Arkana soils.

These soils are not suited to cultivated crops. They are mainly woodland of low grade hardwoods and cedar. They also provide wildlife habitat.

These soils are not suited to pasture. They should not be cleared of native vegetation because of the very severe erosion hazard.

The Arkana soil has poor potential for woodland. Equipment limitations and seedling mortality are severe, and erosion hazard is moderate. The Moko soil has poor potential for woodland. Equipment limitations and erosion hazard are severe, and seedling mortality is moderate.

The Arkana soil has poor potential for most urban use. The slope, low strength, and shrink-swell potential are severe limitations for dwellings, light industry, and roads and streets. The very slow permeability, depth to rock, and slope are severe limitations for septic tank absorption fields. These limitations are difficult or impractical to overcome.

The Moko soil has poor potential for most urban use. Depth to rock, large stones, and slope are severe limitations for dwellings, light industry, local roads and streets, and septic tank absorption fields. These limitations are difficult or impractical to overcome.

The capability unit is VIIs-1. The woodland suitability group is 5x3.

6—Boden stony sandy loam, 8 to 20 percent slopes. This deep, well drained, moderately sloping to moderately steep soil is on hillsides. It occurs as long, narrow areas paralleling streams. Slopes are short, uneven, and convex. Individual areas range from about 20 to 200 acres.

Typically the surface layer is dark grayish brown stony sandy loam about 3 inches thick. The subsurface layer is brown stony sandy loam to a depth of about 8 inches. The subsoil is yellowish red sandy clay loam to a depth of about 12 inches, red sandy clay to 28 inches, and red, strong brown, and grayish brown mottled clay that extends to 48 inches. Below this is hard level-bedded sandstone.

Included in mapping are small areas of Noark, Portia, Boden Variant, Moko, and Razort soils. Also included are Rock outcrop and small areas where bedrock is more than 60 inches deep.

This soil is low in natural fertility and organic matter content. Unless limed, it is very strongly acid or strongly acid throughout. Permeability is moderately slow, and the available water capacity is medium. The root zone is moderately deep and is easily penetrated.

The potential for cultivated crops is poor. Tillage equipment is difficult to use because of surface stones and slopes. Most areas are woodland of low grade hardwoods. The potential for pasture is fair. This soil is best suited to pasture, woodland, and wildlife habitat. Runoff is rapid and the erosion hazard is severe. Suitable pasture plants include tall fescue, white clover, and lespedeza.

This soil has fair potential for red oak, white oak, shortleaf pine, and loblolly pine. The equipment limitation and the erosion hazard are moderate.

The potential is poor for most urban use. Low strength is a severe limitation for dwellings and roads and streets. Low strength and slope are severe limitations for light industry. These limitations can be overcome with proper engineering design and careful installation. The depth to rock and moderately slow permeability are severe limitations for septic tank absorption fields. These limitations are difficult or impractical to overcome.

The capability unit is VIs-2. The woodland suitability group is 4x8.

7—Boden Variant-Rock outcrop complex, 20 to 40 percent slopes. This map unit consists of areas of Boden Variant soil and Rock outcrop so intermingled that they could not be mapped separately. It occurs as long, narrow areas of 20 to 120 acres on hillsides paralleling streams. Slopes are short, uneven, and convex. Individual areas of each soil are about one-fourth acre to 4 acres.

The Boden Variant soil makes up about 65 percent of each mapped area. Typically the surface layer is dark grayish brown stony sandy loam about 2 inches thick. The subsurface layer is brown stony sandy loam to a depth of about 9 inches. The subsoil is strong brown sandy clay loam to a depth of about 12 inches, yellowish red sandy clay to 26 inches, and yellowish red and strong brown sandy clay to 32 inches. Below this is hard sandstone.

The Boden Variant soil is low in natural fertility and organic matter content. It is very strongly acid or strongly acid throughout, unless the surface layer has been limed. Permeability is moderately slow, and the available water capacity is low. The root zone is moderately deep and is easily penetrated.

Rock outcrop makes up about 20 percent of each mapped area. Typically it is exposed sandstone or limestone covered in places with 1 to 3 inches of sandy loam.

The remaining 15 percent of this unit consists of small areas of Noark, Portia, Boden, Moko, and Razort soils.

Borden Variant and Rock outcrop are not suited to cultivated crops. They are mainly woodland of low grade hardwoods and redcedar. Potential is poor for pasture and hay. Surface stones and the slope limit the use of tillage equipment. Suitable pasture plants are tall fescue, lespedeza, and white clover.

Potential is fair for red oak, white oak, shortleaf pine, and loblolly pine. The main concerns in woodland use and management are severe equipment limitations and the erosion hazard.

The potential is poor for most urban use. Low strength and slope are severe limitations for dwellings, roads and streets, and light industry. The depth to rock, moderately slow permeability, and slope are severe limitations for septic tank absorption fields. These limitations are difficult or impractical to overcome.

The capability unit is VIIs-1. The woodland suitability group is 4x8.

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

Typically the surface layer is brown gravelly silt loam about 7 inches thick. The subsoil is reddish brown gravelly silt loam to a depth of about 12 inches, yellowish red gravelly silty clay loam to 34 inches, and red very gravelly clay loam or very gravelly silty clay that extends to 72 inches or more.

Included in mapping are small areas of Peridge and Razort soils and narrow escarpments.

Natural fertility and organic matter content are moderate. This soil is medium acid or strongly acid throughout. Permeability is moderate, and the available water capacity is medium. Tilth is good, and the soil can be worked throughout a wide range of moisture content. Gravel is a slight hindrance in tillage. The root zone is deep and is easily penetrated.

This soil has fair potential for cultivated crops. Suitable crops are corn, soybeans, and small grain. The severe erosion hazard is the main limitation when cultivated

crops are grown. This soil is mainly used for pasture and hay, for which it has good potential. Suitable pasture plants include bermudagrass, tall fescue, white clover, and lespedeza. With good management that includes terraces and contour cultivation, clean tilled crops that leave large amounts of residue can be safely grown year after year on the less sloping parts. Management will need to be intensified as slope length and gradient increase.

Potential is fair for growing shortleaf pine, loblolly pine, red oak, and eastern redcedar. There are no significant limitations for woodland use and management.

This soil has fair potential for most urban use. There are no significant limitations for dwellings and local roads and streets. Slope is a moderate limitation for light industry. This limitation can be overcome by proper engineering design and careful installation. Moderate permeability is a moderate limitation for septic tank absorption fields. This limitation can be overcome through expanding the size of the absorption field.

The capability unit is IIIe-2. The woodland suitability group is 3o7.

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

Typically the surface layer is brown gravelly silt loam about 7 inches thick. The subsoil is reddish brown gravelly silt loam to a depth of about 12 inches, yellowish red gravelly silty clay loam to 34 inches, and red very gravelly clay loam or very gravelly silty clay that extends to 72 inches or more.

Included in mapping are areas of Noark soils, small areas similar to Britwater soils that are less than 5 feet deep to bedrock, a few shallow gullies, areas where plowing has mixed the surface layer and subsoil material, and narrow escarpments.

Natural fertility and organic matter content are moderate. This soil is medium acid or strongly acid throughout. Permeability is moderate, and available water capacity is medium. Tilth is good, and the soil can be worked throughout a wide range of moisture content. Gravel is a slight hindrance to tillage operations. The root zone is deep and is easily penetrated.

This soil has poor potential for cultivated crops because of the slope, medium runoff, and very severe erosion hazard. Suitable crops include small grain. This soil is mainly used for pasture and hay, for which it has good potential. Suitable pasture plants include bermudagrass, tall fescue, lespedeza, white clover, and bahiagrass. Under good management that includes terraces and contour cultivation, sown crops can be grown occasionally in a cropping system that includes close growing cover most of the time. Management will need to be intensified as slope length and gradient increase.

Potential is fair for shortleaf pine, loblolly pine, red oak, and eastern redcedar. There are no significant limitations for woodland use and management.

This soil has fair potential for most urban use. The slope is a moderate limitation for dwellings and roads and streets. It is a severe limitation for light industry. This limitation can be overcome by proper engineering design and careful installation. Slope and moderate permeability are moderate limitations for septic tank absorption fields, but these limitations can be overcome by good design.

The capability unit is IVe-1. The woodland suitability group is 3o7.

10—Cane loam, 3 to 8 percent slopes. This deep, moderately well drained, gently sloping soil is on broad uplands. Slopes are smooth and convex. Individual areas range from about 30 to a few hundred acres.

Typically the surface layer is dark brown loam about 8 inches thick. The subsoil is yellowish brown loam to a depth of about 16 inches, yellowish red clay loam to 43 inches, and a compact and brittle fragipan to 72 inches. The pan is mottled red, dark red, and gray clay loam.

Included in mapping are areas similar to Cane soils that are less than 60 inches or more than 90 inches deep over bedrock, and gravelly spots. Also included are areas of Linker and Noark soils, gullies, and eroded spots where plowing mixes the surface layer and subsoil.

Natural fertility and organic matter content are low. Except in areas that have been limed, this soil is slightly acid or medium acid in the surface layer and strongly acid or very strongly acid in the subsoil. Permeability is moderate above the fragipan and slow in the fragipan. The available water capacity is medium. This soil has good tilth and can be worked throughout a wide range of moisture content. Roots and water easily penetrate to the fragipan, which restricts further penetration.

This soil has fair potential for cultivated crops. Severe erosion is the main limitation when cultivated crops are grown. Suitable crops include corn, soybeans, small grain, and truck crops. The soil is mainly used for hay and pasture, for which the potential is fair. Suitable pasture plants include tall fescue, white clover, lespedeza, and bermudagrass. With good management that includes contour cultivation and terraces, clean tilled crops that leave large amounts of residue can be safely grown year after year in the less sloping areas. Management will need to be intensified as slope length and gradient increase.

Potential is fair for shortleaf pine, loblolly pine, and sweetgum. There are no significant limitations for woodland use and management.

This soil has fair potential for most urban use. Wetness is a moderate limitation for dwellings. Wetness and slope are moderate limitations for light industry. Low strength is a moderate limitation for local roads and streets. These limitations can be overcome by proper engineering design and careful installation and by drain-

age projects where needed. Slow permeability in the fragipan is a severe limitation for septic tank absorption fields. This limitation can usually be overcome by increasing the size of the absorption area.

The capability unit is IIIe-3. The woodland suitability group is 3o7.

11—Cane loam, 8 to 12 percent slopes. This deep, moderately well drained, moderately sloping soil is on broad uplands. Slopes are smooth and convex. Individual areas range from about 10 to 80 acres.

Typically the surface layer is dark brown loam about 8 inches thick. The subsoil is yellowish brown loam to a depth of about 16 inches, yellowish red clay loam to 43 inches, and a compact and brittle fragipan to 72 inches. The pan is mottled red, dark red, and gray clay loam.

Included in mapping are areas similar to Cane soils that are less than 60 inches or more than 90 inches deep over bedrock, and gravelly spots. Also included are areas of Linker, Noark, and Mountainburg soils, gullies, and eroded spots where plowing mixes the surface layer and subsoil.

Natural fertility and organic matter content are low. Unless limed, this soil is slightly acid or medium acid in the surface layer and strongly acid or very strongly acid in the subsoil. Permeability is moderate above the fragipan and slow in the fragipan. The available water capacity is medium. This soil has good tilth and can be worked throughout a wide range of moisture content. Roots and water easily penetrate to the fragipan, which restricts further penetration.

This soil has poor potential for cultivated crops because of the slope and very severe erosion hazard. Suitable crops include corn, soybeans, and small grain. This soil is mainly used for hay and pasture, for which the potential is fair. Suitable pasture plants include tall fescue, white clover, lespedeza, and bermudagrass. Erosion is a very severe hazard if cultivated crops are grown. Sown crops can be safely grown occasionally if the soil is in close growing cover most of the time.

Potential is fair for shortleaf pine, loblolly pine, and sweetgum. There are no significant limitations for woodland use and management.

This soil has fair potential for most urban use. Wetness and slope are moderate limitations for dwellings. Slope is a severe limitation for light industry. Low strength and slope are moderate limitations for local roads and streets. These limitations can be overcome by proper engineering design and careful installation and by drainage projects where needed. Slow permeability in the fragipan is a severe limitation for septic tank absorption fields, but it can be overcome by increasing the size of the absorption area or by modifying the absorption field.

The capability unit is IVe-3. The woodland suitability group is 3o7.

12—Captina silt loam, 1 to 3 percent slopes. This moderately deep and deep, moderately well drained, nearly level soil is on broad uplands and stream terraces. Slopes are smooth and convex. Individual areas range from about 6 to 100 acres.

Typically the surface layer is dark grayish brown silt loam about 7 inches thick. The subsoil is strong brown silty clay loam to a depth of about 20 inches and a compact and brittle fragipan to 40 inches. The pan is mottled strong brown, gray, and red silty clay loam. Below this is fractured cherty limestone bedrock that has yellowish brown and yellowish red silty clay loam in the cracks and crevices.

Included in mapping are small areas of Nixa, Peridge, and Noark soils, a few small eroded areas, and areas that have a cherty silt loam surface layer.

This soil is low in natural fertility and organic matter content. It is strongly acid to slightly acid in the surface layer and extremely acid to strongly acid in the subsoil. Permeability is slow, and the available water capacity is medium. Tilth is good, and the soil can be worked throughout a wide range of moisture content. The fragipan restricts root penetration and slows the movement of water through the soil.

This soil has good potential for cultivated crops. Suitable crops include corn, soybeans, small grain, and truck crops. Most areas are cleared and used for hay and pasture, for which they have good potential. Erosion is a moderate hazard if cultivated crops are grown. With good management that includes contour cultivation and terraces on long slopes, clean tilled crops that leave large amounts of residue can be safely grown year after year.

Potential is fair for shortleaf pine, red oak, and eastern redcedar. There are no significant limitations for woodland use and management.

This soil has fair potential for most urban use. Low strength and wetness are moderate limitations for dwellings and light industry. Low strength is a moderate limitation for local roads and streets. These limitations can be overcome with proper engineering design and drainage. Slow permeability is a severe limitation for septic tank absorption fields. This limitation can be overcome by increasing the size of the absorption area.

The capability unit is IIe-2. The woodland suitability group is 4o7.

13—Captina silt loam, 3 to 8 percent slopes. This moderately deep and deep, moderately well drained, gently sloping soil is on broad upland ridges and stream terraces. Slopes are smooth and convex. Individual areas range from about 5 to 80 acres.

Typically the surface layer is dark grayish brown silt loam about 7 inches thick. The subsoil is strong brown silty clay loam to a depth of about 20 inches and a compact and brittle fragipan to 40 inches. The pan is mottled strong brown, gray, and red silty clay loam.

Below this is fractured cherty limestone that has yellowish brown and yellowish red silty clay loam in the cracks and crevices.

Included in mapping are small areas of Nixa and Noark soils, a few small eroded areas, and cherty areas.

This soil is low in natural fertility and organic matter content. It is strongly acid to slightly acid in the surface layer and extremely acid to strongly acid in the subsoil. Permeability is slow, and the available water capacity is medium. Tilth is good, and the soil can be worked throughout a wide range of moisture content. The fragipan restricts root penetration and slows the movement of water through the soil.

This soil has fair potential for cultivated crops. Most areas are cleared and used for hay and pasture, for which the potential is good. Erosion is a severe hazard if cultivated crops are grown. With good management that includes contour cultivation and terraces, clean tilled crops that leave large amounts of residue can be safely grown year after year on less sloping areas. Management will need to be intensified as slope length and gradient increase.

Potential is fair for shortleaf pine, red oak, and eastern redcedar. There are no significant limitations for woodland use and management.

This soil has fair potential for most urban use. Low strength is a moderate limitation for local roads and streets. Low strength, wetness, and slope are moderate limitations for light industry. Low strength and wetness are moderate limitations for dwellings. These limitations can be overcome by proper engineering design and drainage. Slow permeability is a severe limitation for septic tank absorption fields. This limitation can be overcome by increasing the size of the absorption area.

The capability unit is IIIe-3. The woodland suitability group is 4o7.

14—Clarksville very cherty silt loam, 20 to 50 percent slopes. This deep, very cherty, somewhat excessively drained, steep soil is on hillsides. Individual areas range from about 20 to 500 acres.

Typically the surface layer is dark brown very cherty silt loam about 2 inches thick. The subsurface layer is brown very cherty silt loam to a depth of about 11 inches. The subsoil is yellowish brown very cherty silt loam to a depth of about 18 inches, strong brown very cherty silt loam to 42 inches, and light brown very cherty silt loam that extends to 72 inches or more.

Included in mapping are areas of Nixa, Noark, Moko, and Arkana soils, soils on very narrow flood plains, small areas of Rock outcrop, and small areas where cherty limestone is within 3 feet of the surface.

This soil is low in natural fertility and organic matter content. Unless the surface layer has been limed, reaction is strongly acid or very strongly acid in the surface layer and in the subsoil. Permeability is moderately rapid. Because of the high content of chert, the available water capacity is low and the soil is droughty.

This soil is not suited to cultivated crops or to pasture. Steep slopes and the high content of chert fragments severely restrict the use of farm equipment. The soil is subject to very severe erosion if cleared.

Potential is fair for white oak and shortleaf pine. Equipment limitations and seedling mortality are severe limitations for woodland use or management.

This soil has poor potential for most urban use and for septic tank absorption fields. The steep slopes are a severe limitation. This limitation is difficult or impractical to overcome.

The capability unit is VIIs-2. The woodland suitability group is 4f9.

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

Typically the surface layer is brown gravelly loam about 6 inches thick. The subsoil is yellowish red silty clay to a depth of about 9 inches, red clay to 22 inches, and mottled red, yellowish brown, and pale brown clay to 47 inches. The underlying material is dark gray weathered, rippable shale to a depth of about 53 inches. Below this is dark gray, rippable shale.

Included in mapping are some eroded spots, areas of soils similar to Enders soils with bedrock at depths of less than 36 inches, and areas of Linker, Mountainburg, and Leadvale soils.

This soil is low in natural fertility and organic matter content. It ranges from strongly acid to extremely acid throughout, unless the surface layer has been limed. Permeability is very slow, and the available water capacity is medium. The surface layer is thin and root penetration is restricted in the clayey subsoil.

The potential is poor for cultivated crops. Runoff is medium to rapid. Erosion is a very severe hazard if cultivated crops are grown. Under good management that includes minimum tillage, contour cultivation, and terraces, clean tilled crops that leave large amounts of residue can be grown occasionally in a cropping system that keeps close growing cover on the soil most of the time. This soil is mainly used for hay and pasture, for which the potential is fair. Suitable pasture plants include bermudagrass, tall fescue, lespedeza, and white clover.

Potential is fair for loblolly pine, shortleaf pine, and red oak. There are no significant limitations for woodland use and management.

This soil has poor potential for most urban use. The low strength and high shrink-swell potential are severe limitations for dwellings, light industry, and local roads and streets. These limitations can usually be overcome by good engineering design and careful installation. 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 area.

The capability unit is IVe-2. The woodland suitability group is 4o1.

16—Enders-Nella complex, 8 to 20 percent slopes. This map unit consists of Enders and Nella soils so intermingled that they could not be mapped separately. It occurs as broad areas of about 20 to several hundred acres, on lower and middle slope positions on mountainsides. Individual areas of each soil are about one-half acre to 4 acres.

Enders stony loam makes up about 55 percent of each mapped area. Typically the surface layer is dark brown stony loam about 2 inches thick. The subsurface layer is brown stony loam to a depth of about 6 inches. The subsoil is yellowish red silty clay to a depth of about 9 inches, red clay to 22 inches, and mottled red, yellowish brown, and pale brown clay to 47 inches. The underlying material is dark gray weathered, rippable shale to a depth of about 53 inches. Below this is dark gray, rippable shale.

Enders soils are low in natural fertility and organic matter content. They are strongly acid to extremely acid throughout, unless the surface layer has been limed. Permeability is very slow, and the available water capacity is medium. Root penetration is restricted in the clayey subsoil.

Nella stony loam makes up about 30 percent of each mapped area. Typically the surface layer is brown stony loam about 1 inch thick. The subsurface layer is yellowish brown stony loam to a depth of about 9 inches. The subsoil is strong brown stony loam to a depth of about 15 inches, red stony clay loam to 29 inches, mottled yellowish red, strong brown, and red stony clay loam to 44 inches, and mottled dark red, strong brown, and light brownish gray stony clay loam to 72 inches.

Nella soils are low in natural fertility and organic matter content. They are very strongly acid or strongly acid throughout except for surface layers that have been limed. Permeability is moderate, and the available water capacity is medium. The root zone is deep and is easily penetrated.

The remaining 15 percent is included areas of soils that have shale or sandstone near the surface. Also included are soils similar to the Nella soils that are bouldery, have a dark colored surface, or have a strong brown subsoil.

These soils are not suited to cultivated crops. They are used mostly for woodland of low grade hardwoods. Some areas are in pasture, for which the potential is poor. Suitable pasture plants include tall fescue, lespedeza, and white clover. Surface stones limit the use of farm equipment. The erosion hazard is very severe if pasture is overgrazed.

Potential is fair for shortleaf pine, loblolly pine, and red oak. Equipment limitations are moderate. The erosion hazard and seedling mortality are slight.

Enders soils have poor potential for most urban use. The low strength, high shrink-swell potential, and large stones are severe limitations for dwellings and roads and streets. The slope, shrink-swell potential, and low strength are severe limitations for light industry. All can be overcome by proper engineering design and careful installation. Very slow permeability and large stones are severe limitations for septic tank absorption fields.

Nella soils have fair to poor potential for most urban use. The low strength, slope, and large stones are moderate limitations for dwellings. Low strength is a severe limitation for roads and streets. Slope is a severe limitation for light industry. These limitations can be overcome by proper engineering design and careful installation. Nella soils have moderate limitations for septic tank absorption fields because of slope and large stones. These limitations are difficult and expensive to overcome.

The capability unit is VIIs-3. The woodland suitability group is 4x8.

17—Enders-Nella complex, 20 to 40 percent slopes. This map unit consists of Enders and Nella soils so intermingled that they could not be mapped separately. It occurs as broad areas of about 15 to a few hundred acres, on lower and mid slope positions on mountainsides. Individual areas of each soil are one-half acre to 4 acres.

Enders stony loam makes up about 50 percent of each mapped area. Typically the surface layer is dark brown stony loam about 2 inches thick. The subsurface layer is brown stony loam to a depth of about 6 inches. The subsoil is yellowish red silty clay to a depth of about 9 inches, red clay to 22 inches, and mottled red, yellowish brown, and pale brown clay to 47 inches. The underlying material is dark gray weathered, rippable shale to a depth of about 53 inches. Below this is dark gray, rippable shale.

Enders soils are low in natural fertility and organic matter content. They are strongly acid to extremely acid throughout, unless the surface layer has been limed. Permeability is very slow, and the available water capacity is medium. Root penetration is restricted in the clayey subsoil.

Nella stony loam makes up about 35 percent of each mapped area. Typically the surface layer is brown stony loam about 1 inch thick. The subsurface layer is yellowish brown stony loam to a depth of about 9 inches. The subsoil is strong brown stony loam to a depth of about 15 inches, red stony clay loam to 29 inches, mottled yellowish red, strong brown, and red stony clay loam to 44 inches, and mottled dark red, strong brown, and light brownish gray stony clay loam to 72 inches.

Nella soils are low in natural fertility and organic matter content. They are very strongly acid or strongly

acid throughout, unless the surface layer has been limed. Permeability is moderate, and the available water capacity is medium. The root zone is deep and is easily penetrated.

The remaining 15 percent is included areas of soils that have shale or sandstone near the surface. Also included are soils similar to Nella soils that are bouldery, have a dark colored surface, or have a strong brown subsoil.

These soils are not suited to cultivated crops and to pasture. They are used mostly for woodland of low grade hardwood. Surface stones and slopes severely limit the use of farm equipment. The erosion hazard is very severe.

Enders soils have poor potential for woodland. Equipment limitations are severe. The erosion hazard and seedling mortality are moderate. Nella soils have fair potential for shortleaf pine, loblolly pine, and red oak. The erosion hazard and equipment limitations are moderate.

Enders soils have poor potential for most urban use. The low strength, shrink-swell potential, and slope are severe limitations for dwellings and light industry. The slope, shrink-swell potential, and large stones are severe limitations for roads and streets. These limitations are difficult and expensive to overcome. Large stones, very slow permeability, and slopes are severe limitations for septic tank absorption fields. These limitations are difficult or impractical to overcome.

Nella soils have poor potential for most urban use. Slope is a severe limitation for dwellings and light industry. Slope and low strength are severe limitations for roads and streets. These limitations are difficult and expensive to overcome. Slope is a severe limitation for septic tank absorption fields. This limitation is difficult or impractical to overcome.

The capability unit is VIIs-3. The woodland suitability group is 5r9 for Enders soils and 4x8 for Nella soils.

18—Gassville very cherty silt loam, 3 to 8 percent slopes. This moderately deep, well drained, gently sloping soil is on ridges. Slopes are smooth and convex. Individual areas range from about 1 to 60 acres.

Typically the surface layer is dark brown very cherty silt loam about 10 inches thick. The subsoil is yellowish red cherty clay to a depth of about 17 inches, yellowish red clay to 28 inches, and mottled red, yellowish red, and strong brown clay that extends to 38 inches. The underlying material is siltstone that is rippable to a depth of about 50 inches. Below this is hard siltstone.

Included in mapping are small areas of soil that is less than 40 inches or more than 60 inches deep to bedrock but is otherwise similar to Gassville soils. Also included are small areas of Nixa, Arkana, and Moko soils.

Natural fertility and organic matter content are low. This soil is strongly acid to slightly acid in the surface layer and very strongly acid or strongly acid in the subsoil. Permeability is very slow, and the available water capacity is low to medium. Surface chert limits the use of some farm equipment. The root zone is moderately deep. The clay subsoil slows root penetration. Runoff is medium to rapid, and the erosion hazard is severe.

This soil is not suited to cultivated crops because of the very cherty surface and very severe erosion hazard. It is better suited to hay, pasture, range, woodland, and wildlife habitat. It is mainly used for pasture and hay, for which the potential is fair. Adapted pasture plants include bermudagrass, tall fescue, white clover, and bahiagrass.

Potential is fair for shortleaf pine, eastern redcedar, and red oak. There are no significant limitations for woodland use or management.

This soil has poor potential for most urban use. Low strength is a severe limitation for dwellings, light industry, and local roads and streets. This limitation can be overcome by proper engineering design and careful installation. Very slow permeability and depth to rock are severe limitations for septic tank absorption fields. These limitations are difficult or impractical to overcome.

The capability unit is VIs-3. The woodland suitability group is 4o7.

19—Gassville very cherty silt loam, 8 to 20 percent slopes. This moderately deep, well drained, moderately sloping to moderately steep soil is on ridges and hillsides. Slopes are uneven and convex. Individual areas range from about 15 to 75 acres.

Typically the surface layer is dark brown very cherty silt loam about 10 inches thick. The subsoil is yellowish red cherty clay to a depth of about 17 inches, yellowish red clay to 28 inches, and mottled red, yellowish red, and strong brown clay that extends to 38 inches. The underlying material is siltstone that is rippable to a depth of about 50 inches. Below this is hard siltstone.

Included in mapping are small areas of soils similar to the Gassville soils that are less than 40 inches or more than 60 inches deep to bedrock. Also included are small areas of Arkana, Moko, and Nixa soils.

Natural fertility and organic matter content are low. This soil is strongly acid to slightly acid in the surface layer and very strongly acid or strongly acid in the subsoil. Permeability is very slow, and the available water capacity is low to medium. Surface chert and slope limit the use of farm equipment. The root zone is moderately deep, and the clay subsoil slows root penetration. Runoff is medium to rapid, and the erosion hazard is severe.

This soil is not suited to cultivated crops because of the very cherty surface and the very severe erosion hazard. It is better suited to range, woodland, and wildlife habitat. Potential is poor for pasture and hay. Suitable pasture plants include tall fescue, white clover, and bahiagrass.

Potential is fair for shortleaf pine, eastern redcedar, and red oak. There are no significant limitations for woodland use or management.

This soil has poor potential for most urban use. Low strength is a severe limitation for dwellings and roads and streets. Low strength and slope are severe limitations for industrial sites. These limitations can be overcome with proper engineering design and careful installation. Very slow permeability and depth to rock are severe limitations for septic tank absorption fields. These limitations are difficult or impractical to overcome.

The capability unit is VIIs-4. The woodland suitability group is 4o7.

20—Leadvale silt loam, 1 to 3 percent slopes. This deep, moderately well drained, nearly level soil is on plateaus and mountaintops. Individual areas range from about 10 to 50 acres.

Typically the surface layer is brown silt loam about 7 inches thick. The subsoil is yellowish brown silt loam to a depth of about 14 inches, strong brown silty clay loam to 21 inches, and a firm, brittle fragipan to 50 inches. The pan is mottled strong brown, yellowish red, red, dark red, and grayish brown silty clay loam. Below this is siltstone.

Included in mapping are areas that are poorly drained. Also included are small areas of Linker and Mountainburg soils.

Natural fertility and organic matter content are low. This soil is strongly acid or very strongly acid throughout, unless the surface layer has been limed. Permeability is slow, and the available water capacity is medium. Roots and moisture easily penetrate to the fragipan, which restricts further penetration. A perched water table occurs late in winter and early in spring.

This soil has good potential for cultivated crops. Suitable crops include corn, soybeans, small grain, and truck crops. This soil is mainly used for hay and pasture, for which the potential is good. Suitable pasture plants include tall fescue, bermudagrass, white clover, and lespedeza. Erosion is a moderate hazard if cultivated crops are grown. With good management that includes contour cultivation and terraces on long slopes, clean tilled crops that leave large amounts of residue can be safely grown year after year.

Potential is fair for loblolly pine, shortleaf pine, and white oak. There are no significant limitations for woodland use and management.

This soil has fair potential for most urban use. Wetness and low strength are moderate limitations for dwellings. Low strength is a moderate limitation for light industry and a severe limitation for local roads and streets. This limitation can be overcome by proper engineering design and careful installation procedures. Slow permeability and wetness are severe limitations for septic tank absorption fields. These limitations are difficult to overcome.

The capability unit is IIe-2. The woodland suitability group is 3o7.

21—Leadvale silt loam, 3 to 8 percent slopes. This deep, moderately well drained, gently sloping soil is on plateaus and mountaintops. Individual areas range from about 5 to 50 acres.

Typically the surface layer is brown silt loam about 7 inches thick. The subsoil is yellowish brown silt loam to a depth of about 14 inches, strong brown silty clay loam to 21 inches, and a firm, brittle fragipan to a depth of about 50 inches. The pan is mottled strong brown, yellowish red, red, dark red, and grayish brown silty clay loam. Below this is siltstone.

Included in mapping are gravelly areas and small areas of Cane, Linker, and Mountainburg soils.

Natural fertility and organic matter content are low. This soil is strongly acid or very strongly acid throughout unless the surface layer has been limed. Permeability is slow, and the available water capacity is medium. Roots and moisture easily penetrate to the fragipan, which restricts further penetration. A perched water table occurs in late winter and early spring.

This soil has fair potential for cultivated crops because of the severe erosion hazard. Suitable crops include corn, soybeans, and small grain. This soil is used mainly for hay and pasture, for which the potential is good (fig. 7). Suitable pasture plants include tall fescue, bermudagrass, white clover, and lespedeza. Erosion is a severe hazard if cultivated crops are grown. With good management that includes contour cultivation and terraces, clean tilled crops that leave large amounts of residue can be safely grown year after year on the less sloping areas. Management will need to be intensified as slope length and gradient increase.

Potential is fair for loblolly pine, shortleaf pine, and white oak. There are no significant limitations for woodland use and management.

This soil has fair potential for most urban use. The wetness and low strength are moderate limitations for dwellings. Low strength and slope are moderate limitations for light industry. Low strength is a severe limitation for local roads and streets. These limitations can be overcome by proper engineering design and careful installation. Slow permeability and wetness are severe limitations for septic tank absorption fields. These limitations are difficult to overcome.

The capability unit is IIIe-3. The woodland suitability group is 3o7.

22—Linker fine sandy loam, 3 to 8 percent slopes. This moderately deep, well drained, gently sloping soil is on mountaintops and ridgetops. Slopes are smooth and convex. Individual areas range from about 6 to 60 acres.

Typically the surface layer is dark grayish brown fine sandy loam about 4 inches thick. The subsurface layer is brown fine sandy loam to a depth of about 10 inches.

The subsoil is yellowish red sandy clay loam to a depth of about 27 inches and mottled yellowish red, strong brown, red, and pale brown sandy clay loam to 32 inches. Below this is acid sandstone that is rippable to a depth of about 40 inches, below which is hard sandstone.

Included in mapping are gravelly areas and areas of soils similar to Linker soils where the bedrock is deeper than 40 inches or is rippable to a depth of 5 to 8 feet. Also included are small areas of Leadvale and Mountainburg soils.

Natural fertility and organic matter content are low. This soil is strongly acid to extremely acid throughout, unless the surface layer has been limed. Permeability is moderate, and the available water capacity is low. Tilth is good, and the soil can be worked throughout a wide range of moisture content. The root zone is moderately deep and is easily penetrated.

This soil has fair potential for cultivated crops because of a severe erosion hazard. Suitable crops include corn, soybeans, and small grains. This soil is mainly used for hay and pasture, for which the potential is fair. Suitable pasture plants include bermudagrass, tall fescue, white clover, and lespedeza. Erosion is a severe hazard if cultivated crops are grown. With good management that includes contour cultivation and terraces, clean tilled crops that leave large amounts of residue can be safely grown year after year on the less sloping areas. Management will need to be intensified as slope length and gradient increase.

Potential is fair for shortleaf pine, loblolly pine, and eastern redcedar. There are no significant limitations for woodland use and management.

This soil has fair potential for most urban use. Depth to bedrock is a moderate limitation for dwellings and local roads and streets. The slope, low strength, and depth to bedrock are moderate limitations for light industry. These limitations can be overcome by proper engineering design and careful installation. Depth to bedrock is a severe limitation for septic tank absorption fields. This limitation is difficult or impractical to overcome.

The capability unit is IIIe-1. The woodland suitability group is 4o1.

23—Linker gravelly fine sandy loam, 3 to 8 percent slopes. This moderately deep, well drained, gently sloping soil is on mountaintops and ridgetops. Slopes are smooth and convex. Individual areas range from about 5 to 90 acres.

Typically the surface layer is dark grayish brown gravelly fine sandy loam about 4 inches thick. The subsurface layer is brown gravelly fine sandy loam to a depth of about 10 inches. The subsoil is yellowish red sandy clay loam to a depth of about 27 inches and mottled yellowish red, strong brown, red, and pale brown sandy clay loam to 32 inches. Below this is acid sandstone that is rippable to a depth of about 40 inches, below which is hard sandstone.

Included in mapping are areas of nongravelly soils and areas of soils similar to Linker soils where the bedrock is deeper than 40 inches or is rippable to a depth of 5 to 8 feet. Also included are small areas of Leadvale and Mountainburg soils.

Natural fertility and organic matter content are low. This soil is strongly acid to extremely acid throughout, unless the surface layer has been limed. Permeability is moderate, and the available water capacity is low. Gravel is a moderate limitation to cultivation. The root zone is moderately deep and is easily penetrated.

This soil has fair potential for cultivated crops because of the gravelly surface layer and severe erosion hazard. Suitable crops include corn, soybeans, and small grain. This soil is mainly used for hay and pasture, for which the potential is fair. Suitable pasture plants include bermudagrass, tall fescue, white clover, and lespedeza. Erosion is a severe hazard if cultivated crops are grown. With good management that includes contour cultivation and terraces, clean tilled crops that leave large amounts of residue can be safely grown year after year on the less sloping areas. Management will need to be intensified as slope length and gradient increase.

Potential is fair for shortleaf pine, loblolly pine, and eastern redcedar. There are no significant limitations for woodland use and management.

This soil has fair potential for most urban use. Depth to bedrock is a moderate limitation for dwellings and local roads and streets. The slope, low strength, and depth to bedrock are moderate limitations for light industry. These limitations can be overcome by proper engineering design and careful installation. Depth to bedrock is a severe limitation for septic tank absorption fields. This limitation is difficult or impractical to overcome.

The capability unit is IIIe-2. The woodland suitability group is 4o1.

24—Linker-Mountainburg complex, 8 to 20 percent slopes. This map unit consists of Linker and Mountainburg soils so intermingled that they could not be mapped separately. It occurs as broad areas of about 20 to a few hundred acres, on uplands. Individual areas of each soil are about one-half acre to 4 acres.

Linker stony fine sandy loam makes up about 50 percent of each mapped area. Slopes are 8 to 15 percent. Typically the surface layer is brown stony loam about 9 inches thick. The subsoil is yellowish red sandy clay loam to a depth of about 27 inches and mottled yellowish red, strong brown, red, and pale brown sandy clay loam to 32 inches. Below this is acid sandstone that is rippable to a depth of about 40 inches, below which is hard sandstone.

Linker soils are low in natural fertility and organic matter content. They are strongly acid to extremely acid throughout, unless the surface layer has been limed.

Permeability is moderate, and the available water capacity is low. The stony surface layer limits the use of tillage equipment. The root zone is moderately deep and is easily penetrated.

Mountainburg very stony fine sandy loam makes up about 40 percent of each mapped area. Slopes are 8 to 20 percent. Typically the surface layer is very dark grayish brown very stony fine sandy loam about 1 inch thick. The subsurface layer is brown very stony fine sandy loam to a depth of about 7 inches. The subsoil is yellowish brown very stony loam to a depth of about 12 inches and strong brown very stony loam to 17 inches. Below this is acid sandstone that is rippable in the upper 5 inches, below which is hard sandstone.

Mountainburg soils are low in natural fertility and organic matter content. They are strongly acid to medium acid in the surface layer and very strongly acid or strongly acid in the subsoil. Permeability is moderately rapid, and the available water capacity is low because of the shallow depth to bedrock and high stone content. Tillage is not practical because of the high stone content. The root zone is less than 20 inches deep and is easily penetrated.

The remaining 10 percent of this unit consists of small areas that are not stony and small areas of Enders soils.

These soils are not suited to cultivated crops. Present use is mainly woodland of low grade hardwoods or pasture. Linker soils have fair potential for pasture, and Mountainburg soils have poor potential for pasture. Adapted pasture plants include bermudagrass, tall fescue, lespedeza, and white clover.

Linker soils have fair potential for shortleaf pine, loblolly pine, and eastern redcedar. There are no significant limitations for woodland use or management. Mountainburg soils have poor potential for shortleaf pine, loblolly pine, and eastern redcedar. Equipment limitations are severe, and the erosion hazard and seedling mortality are moderate.

Linker soils have fair potential for most urban use. Depth to bedrock and slope are the main limitations, but these limitations can usually be overcome by good design and careful installation. Depth to bedrock is also a severe limitation for septic tank absorption fields. This limitation is difficult or impractical to overcome. Mountainburg soils have poor potential for most urban use. Depth to bedrock, large surface stones, and slope are severe limitations for most urban use and for septic tank absorption fields. These limitations are very difficult to overcome.

The capability unit is VIs-4. The woodland suitability group is 4o1 for Linker soils and 5x3 for Mountainburg soils.

25—Moko-Rock outcrop complex, 3 to 15 percent slopes. This map unit consists of Moko soils and Rock outcrop that are so intermingled that they could not be mapped separately. It occurs in areas of about 5 to 30 acres, on hilltops and side slopes. Individual areas of each member are about 1 to 4 acres.

Moko very stony silt loam makes up about 65 percent of each mapped area. Typically the soil is black very stony silt loam about 11 inches thick over hard limestone.

This soil is moderate in natural fertility and organic matter content. It is neutral or mildly alkaline throughout. Permeability is moderate, and available water capacity is very low.

Rock outcrop makes up about 25 percent of each mapped area. Typically this Rock outcrop is dolomitic limestone.

Included in mapping are small areas of Arkana soils, which make up about 10 percent of this unit.

Most of the Moko soils and Rock outcrop are in eastern redcedar and native prairie plants (fig. 8). They are not suited to cultivation or to pasture and hay. Limestone outcrop and shallow depth to bedrock are limitations that are very difficult to overcome. If the native vegetation is removed, the erosion hazard is very severe.

Potential for woodland is poor. Areas are better suited to wildlife habitat, range, cedar post production, or recreational use.

Potential is poor for most urban use and septic tank absorption fields. Depth to bedrock and large stones are severe limitations. Slope is also a severe limitation for light industry. These limitations are difficult or impossible to overcome.

The capability unit is VIs-5 for Moko soils. The woodland suitability group is 5x3.

26—Moko-Rock outcrop complex, 15 to 50 percent slopes. This map unit consists of Moko soils and Rock outcrop that are so intermingled that they could not be mapped separately. It occurs in areas of about 10 to 100 acres, mainly on hillsides. Individual areas of each member are about 1 to 4 acres.

Moko very stony silt loam makes up about 70 percent of each mapped area. Typically the soil is black very stony silt loam about 11 inches thick over hard limestone.

This soil is moderate in natural fertility and organic matter content. It is neutral or mildly alkaline throughout. Permeability is moderate, and available water capacity is very low.

Rock outcrop makes up about 20 percent of each mapped area. Typically this Rock outcrop is dolomitic limestone.

Included in mapping are small areas of Arkana soils, which make up about 10 percent of this unit.

Moko soils and Rock outcrop are not suited to cultivation. They are mostly in eastern redcedar and native prairie plants. They are not suited to pasture or hay. The limestone outcrop, shallow depth to rock, and moderately steep to very steep slopes are limitations that are very

difficult to overcome. If the native vegetation is removed, the erosion hazard is very severe.

Potential is poor for locally grown commercial trees. Areas are better suited to wildlife habitat, cedar post production, or extensive recreational use.

Potential is poor for most urban use and for septic tank absorption fields. Depth to bedrock, slope, and large stones are severe limitations. These limitations are difficult or impossible to overcome.

The capability unit is VIIs-5 for Moko soils. The woodland suitability group is 5x3.

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

Typically the surface layer is dark grayish brown very gravelly fine sandy loam to a depth of about 5 inches. The subsoil is yellowish brown very gravelly loam to a depth of about 12 inches and strong brown very gravelly loam to 17 inches. Below this is acid sandstone that is rippable in the upper 5 inches, below which is hard sandstone.

Included in mapping are stony areas and Rock outcrop. Also included are intermingled areas of Linker, Leadvale, Cane, and Enders soils.

Natural fertility and organic matter content are low. This soil is strongly acid or medium acid in the surface layer and very strongly acid or strongly acid in the subsoil. Permeability is moderately rapid, and the available water capacity is very low because of the shallow depth to bedrock and high gravel content. The root zone is less than 20 inches thick but is easily penetrated.

This soil is not suited to cultivated crops. Its potential is limited because of its shallow rooting depth, high content of gravel, and stony spots. It has poor potential for hay and pasture. Erosion is a severe hazard if cultivated crops are grown.

Potential is poor for woodland. Moderate seedling mortality is the main concern for woodland use and management.

This soil has poor potential for most urban use. Depth to rock is a severe limitation for dwellings, light industry, local roads and streets, and septic tank absorption fields. These limitations are difficult to overcome.

The capability unit is VIs-6. The woodland suitability group is 5d2.

28—Mountainburg very stony fine sandy loam, 3 to 8 percent slopes. This shallow, well drained, gently sloping soil is on the tops of hills and mountains. Individual areas range from about 5 to 100 acres.

Typically the surface layer is very dark grayish brown very stony fine sandy loam about 1 inch thick. The subsurface layer is brown very stony fine sandy loam to a depth of about 7 inches. The subsoil is yellowish brown very stony loam to a depth of about 12 inches and strong brown very stony loam to 17 inches. The underlying material is acid sandstone that is rippable in the upper 5 inches, below which is hard sandstone.

Included in mapping are small areas of Linker, Leadvale, and Enders soils, and a few areas of sandstone Rock outcrop.

Natural fertility and organic matter content are low. This soil is strongly acid or medium acid in the surface layer and very strongly acid or strongly acid in the subsoil. Permeability is moderately rapid, and the available water capacity is very low because of shallow depth to bedrock and high stone content. The root zone is less than 20 inches deep and is easily penetrated.

This soil is not suited to cultivated crops and has poor potential for pasture and hay. It is droughty. Erosion is a very severe hazard if it is cleared. Surface stones limit the use of farm equipment. The soil is best suited to native pasture, wildlife habitat, or recreational use. Most of the acreage is used for range or is idle. Some of it is open woodland of poor quality trees.

The potential is poor for woodland. Equipment limitations are severe, and seedling mortality is moderate.

This soil has poor potential for most urban use. Depth to bedrock and surface stones are severe limitations for dwellings, light industry, local roads and streets, and septic tank absorption fields. These limitations are very difficult to overcome.

The capability unit is VIs-7. The woodland suitability group is 5x3.

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

Typically the surface layer is very dark grayish brown very stony fine sandy loam about 1 inch thick. The subsurface layer is brown very stony fine sandy loam to a depth of about 7 inches. The subsoil is yellowish brown very stony loam to a depth of about 12 inches and strong brown very stony loam to 17 inches. The underlying material is acid sandstone that is rippable in the upper 5 inches, below which is hard sandstone.

Included in mapping are outcrops of sandstone, and small areas of Enders and Linker soils.

Natural fertility and organic matter content are low. This soil is strongly acid or medium acid in the surface layer and very strongly acid or strongly acid in the subsoil. Permeability is moderately rapid, and the available water capacity is very low because of the shallow depth to bedrock and high stone content. The root zone is less than 20 inches deep and is easily penetrated.

This soil is not suited to cultivated crops and has poor potential for pasture and hay. It is droughty. Surface stones and slope limit the use of farm equipment. The soil is best suited to native pasture, wildlife habitat, or recreational use. Most of the acreage is used for range

or is idle. Some of it is open woodland of poor quality trees.

The potential is poor for woodland. Equipment limitations are severe and erosion hazard and seedling mortality are moderate.

This soil has poor potential for most urban use. The depth to bedrock, large stones, and slope are severe limitations for dwellings, light industry, local roads and streets, and septic tank absorption fields. These limitations are difficult to overcome.

The capability unit is VIIs-6. The woodland suitability group is 5x3.

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

Typically the surface layer is very dark grayish brown very stony fine sandy loam about 1 inch thick. The subsurface layer is brown very stony fine sandy loam to a depth of about 7 inches. The subsoil is yellowish brown very stony loam to a depth of about 12 inches and strong brown very stony loam to 17 inches. The underlying material is acid sandstone that is rippable in the upper 5 inches, below which is hard sandstone.

Included in mapping are a few small areas of Enders and Nella soils, and sandstone ledges.

Natural fertility and organic matter content are low. This soil is strongly acid or medium acid in the surface layer and very strongly acid or strongly acid in the subsoil. Permeability is moderately rapid, and the available water capacity is very low because of the shallow depth to bedrock and large stones.

This soil is not suited for cultivated crops or improved pasture. It is droughty. Surface stones, rock ledges, and steep slopes severely restrict use of farm equipment. Erosion is a very severe hazard if the native vegetation is disturbed. The soil is best suited for native pasture and wildlife habitat.

Potential is poor for woodland. Equipment limitations and erosion hazard are severe and seedling mortality is moderate.

This soil has poor potential for most urban use. The depth to bedrock, large stones, and steep slopes are severe limitations for dwellings, light industry, local roads and streets, and septic tank absorption fields. These limitations are very difficult to overcome.

The capability unit is VIIs-6. The woodland suitability group is 5x3.

31—Nella-Mountainburg complex, 20 to 40 percent slopes. This map unit consists of Nella and Mountainburg soils that are so intermingled that they could not be mapped separately. It occurs on the upper part of mountainsides as long areas about 400 to 500 feet wide of about 40 acres to over 200 acres. Individual areas of each soil are about one-half acre to 5 acres and are mostly about 50 to 150 feet wide and several hundred feet long.

Nella stony loam makes up about 50 percent of each mapped area. Typically the surface layer is brown stony loam about 1 inch thick. The subsurface layer is yellowish brown stony loam to a depth of about 9 inches. The subsoil is strong brown stony loam to a depth of about 15 inches, red stony clay loam to 29 inches, mottled yellowish red, strong brown, and red stony clay loam to 44 inches, and mottled dark red, strong brown, and light brownish gray stony clay loam to 72 inches.

Nella soils are low in natural fertility and organic matter content. They are very strongly acid or strongly acid throughout, unless the surface layer has been limed. Permeability is moderate, and the available water capacity is medium. The root zone is deep and is easily penetrated.

Mountainburg very stony fine sandy loam makes up about 35 percent of each mapped area. Typically the surface layer is very dark grayish brown very stony fine sandy loam about 1 inch thick. The subsurface layer is brown very stony fine sandy loam to a depth of about 7 inches. The subsoil is yellowish brown very stony loam to a depth of about 12 inches and strong brown very stony loam to 17 inches. Below this is acid sandstone that is rippable in the upper 5 inches, below which is hard sandstone.

Mountainburg soils are low in natural fertility and organic matter content. They are strongly acid or medium acid in the surface layer and very strongly acid or strongly acid in the subsoil. Permeability is moderately rapid, and the available water capacity is very low because of the shallow depth to bedrock and stone content. The root zone is less than 20 inches deep and is easily penetrated.

The remaining 15 percent of this unit consists of prominent sandstone bluffs and soils that have a dark colored surface layer or a strong brown subsoil but are otherwise similar to Nella soils.

These soils are not suited to cultivated crops or to pasture. Most of the acreage is woodland of low grade hardwoods. Wooded areas also provide habitat for wildlife. Erosion is a very severe hazard if the land is cleared. The soils are better suited to woodland, wildlife habitat, or recreational use.

Nella soils have fair potential for shortleaf pine, loblolly pine, and red oak. They have moderate erosion hazard and equipment limitations. Mountainburg soils have poor potential for woodland. They have a severe erosion hazard and equipment limitations and moderate seedling mortality.

These soils have poor potential for most urban uses and for septic tank absorption fields. Shallow depth, steep slopes, and large stones are severe limitations for dwellings, light industry, and local roads and streets. These limitations are difficult to overcome.

The capability unit is VIIe-1. The woodland suitability group is 4x8 for Nella soils and 5x3 for Mountainburg soils.

32—Nixa very cherty silt loam, 3 to 8 percent slopes. This deep, moderately well drained, gently sloping soil is on ridgetops (fig. 9). Individual areas range from about 10 to 200 acres.

Typically the surface layer is dark grayish brown very cherty silt loam about 5 inches thick. The subsurface layer is grayish brown very cherty silt loam that extends to a depth of about 13 inches. The upper part of the subsoil is yellowish brown very cherty silt loam to a depth of about 18 inches. The lower part is a compact, brittle fragipan that extends to a depth of about 36 inches. The pan is mottled strong brown and pale brown very cherty silt loam. The underlying material is cherty limestone with mottled dark red and strong brown clay in cracks and crevices.

Included in mapping are small areas with slopes less than 3 percent and more than 8 percent. Also included are small areas of Captina, Noark, and Gassville soils.

This soil is low in natural fertility and organic matter content. It is strongly acid or very strongly acid unless the area has been limed. Permeability is very slow, and the available water capacity is low. The high content of chert fragments make the soil droughty and tillage difficult. The fragipan restricts root penetration and slows the movement of water through the soil.

This soil has fair potential for cultivated crops. Suitable crops include small grain. The main limitations are the high content of chert fragments, rooting depth, and severe erosion hazard. This soil is mostly cleared and used for hay (fig. 10) and pasture, for which the potential is fair. Suitable pasture plants include tall fescue, white clover, and bermudagrass. With good management that includes contour cultivation and terracing, crops that leave large amounts of residue can be grown year after year on the less sloping parts. Management will need to be intensified as slope length and gradient increase.

Potential is fair for shortleaf pine, loblolly pine, eastern redcedar, red oak, and white oak. Erosion hazard and equipment limitations are slight, and seedling mortality is moderate.

This soil has fair potential for most urban use. There are no significant limitations for dwellings, industrial sites, and local roads and streets. The very slow permeability and depth to bedrock are severe limitations for septic tank absorption fields. These limitations are difficult to overcome.

The capability unit is IIIs-1. The woodland suitability group is 4f8.

33—Nixa very cherty silt loam, 8 to 12 percent slopes. This deep, moderately well drained, moderately sloping soil is on long narrow ridgetops. Individual areas range from about 10 to 80 acres.

Typically the surface layer is dark grayish brown very cherty silt loam about 5 inches thick. The subsurface layer is grayish brown very cherty silt loam that extends to a depth of about 13 inches. The upper part of the subsoil is yellowish brown very cherty silt loam that extends to a depth of about 18 inches. The lower part is a compact, brittle fragipan that extends to a depth of about 36 inches. The pan is mottled strong brown and pale brown very cherty silt loam. The underlying material is cherty limestone with mottled dark red and strong brown clay in cracks and crevices.

Included in mapping are small areas with slopes less than 8 percent or more than 12 percent, and areas of Clarksville, Noark, and Gassville soils.

This soil is low in natural fertility and organic matter content. It is strongly acid or very strongly acid unless the area has been limed. Permeability is very slow, and the available water capacity is low. The high content of chert fragments make the soil droughty and tillage difficult. The fragipan restricts root penetration and slows the movement of water through the soil.

The potential is poor for cultivated crops. The main limitations are the high chert content, slopes, and very severe erosion hazard. Most areas are cleared and used for pasture, for which they have fair potential. Adapted pasture plants include tall fescue, white clover, lespedeza, and bermudagrass. Sown crops that leave a large amount of residue may be grown occasionally in a cropping system that includes close growing cover most of the time.

This soil has fair potential for shortleaf pine, loblolly pine, eastern redcedar, red oak, and white oak. The erosion hazard and equipment limitations are slight. Seedling mortality is moderate.

This soil has fair potential for most urban use. Slope is a moderate limitation for dwellings, light industry, and local roads and streets. These limitations can be overcome by proper engineering design and careful installation. Very slow permeability and depth to bedrock are severe limitations for septic tank absorption fields. These limitations are difficult to overcome.

The capability unit is IVs-1. The woodland suitability group is 4f8.

34—Noark very cherty silt loam, 3 to 8 percent slopes. This deep, well drained, gently sloping soil is on ridgetops. Individual areas range from about 10 to 80 acres.

Typically the surface layer is dark grayish brown very cherty silt loam about 3 inches thick. The subsurface layer is brown very cherty silt loam to a depth of about 14 inches. The subsoil is yellowish red very cherty silty clay loam to a depth of about 22 inches, red very cherty clay to 35 inches, and dark red, mottled very cherty clay to 72 inches or more.

Included in mapping are areas of soils that are similar to Noark soils that have chert or limestone at a depth of

less than 60 inches. Also included are small areas of Nixa, Captina, and Arkana soils.

Natural fertility and organic matter content are low. The surface layer is slightly acid to strongly acid, and the subsoil is strongly acid or very strongly acid. Permeability is moderate and the available water capacity is medium. This soil is difficult to till because of the high chert content. The root zone is deep and is easily penetrated.

This soil has fair potential for cultivated crops. Adapted crops include small grain. The potential is limited because of the high chert content, slopes, and severe erosion hazard. This soil is mostly cleared and used for pasture and hay, for which the potential is fair. Adapted pasture plants include tall fescue, bermudagrass, white clover, and lespedeza. With good management that includes contour cultivation and terraces, clean tilled crops that leave large amounts of residue can be safely grown year after year on the less sloping areas. Management will need to be intensified as slope length and gradient increase.

Potential is fair for shortleaf pine, eastern redcedar, red oak, and white oak. The erosion hazard is slight. Equipment limitations and seedling mortality are moderate.

This soil has fair potential for most urban use (fig. 11). Low strength is a moderate limitation for local roads and streets. Slope is a moderate limitation for light industry. This limitation can be overcome by good design and careful installation. It has a moderate limitation for septic tank absorption fields due to moderate permeability. This limitation can be overcome by proper engineering design.

The capability unit is IIIe-4. The woodland suitability group is 4f8.

35—Noark very cherty silt loam, 8 to 20 percent slopes. This deep, well drained, moderately sloping to moderately steep soil is on hillsides. Individual areas range from about 20 to 100 acres.

Typically the surface layer is dark grayish brown very cherty silt loam about 3 inches thick. The subsurface layer is brown very cherty silt loam to a depth of about 14 inches. The subsoil is yellowish red very cherty silty clay loam to a depth of about 22 inches, red very cherty clay to 35 inches, and dark red mottled very cherty clay to 72 inches or more.

Included in mapping are areas of soils that are similar to Noark soils that have chert or limestone at a depth of less than 60 inches and areas of Nixa, Clarksville, Arkana, and Moko soils.

This soil is low in natural fertility and organic matter content. The surface layer is slightly acid to strongly acid, and the subsoil is strongly acid or very strongly acid. Permeability is moderate, and the available water capacity is medium. The root zone is deep and is easily penetrated.

This soil has poor potential for cultivated crops because of the high chert content, slopes, rapid runoff, and very severe erosion hazard. It is mainly used for hay and pasture, for which the potential is fair. Adapted pasture plants include tall fescue, white clover, lespedeza, and bermudagrass.

Potential is fair for shortleaf pine, eastern redcedar, red oak, and white oak (fig. 12). Equipment limitations and seedling mortality are moderate.

This soil has fair potential for most urban use. Slope is a moderate limitation for dwellings. Slope is a severe limitation for light industry. Low strength and slope are moderate limitations for local roads and streets. These limitations can be overcome by proper engineering design. Slope and moderate permeability are moderate limitations for septic tank absorption fields, but these limitations can be overcome by good design and careful installation procedures.

The capability unit is VIe-2. The woodland suitability group is 4f8.

36—Noark very cherty silt loam, 20 to 40 percent slopes. This deep, well drained, steep soil is on hillsides. Individual areas range from about 10 to 100 acres.

Typically the surface layer is dark grayish brown very cherty silt loam about 3 inches thick. The subsurface layer is brown very cherty silt loam to a depth of about 14 inches. The subsoil is yellowish red very cherty silty clay loam to a depth of about 22 inches, red very cherty clay to 35 inches, and dark red, mottled very cherty clay to 72 inches or more.

Included in mapping are a few small areas of limestone outcrop and areas of soils that have bedrock at a depth of less than 60 inches but are otherwise similar to Noark soils. Also included are small areas of Clarksville, Boden Variant, Arkana, and Moko soils.

This soil is low in natural fertility and organic matter content. The surface layer is slightly acid to strongly acid, and the subsoil is strongly acid or very strongly acid. Permeability is moderate, and the available water capacity is medium. The root zone is deep and is easily penetrated.

This soil is not suited to cultivated crops and to pasture. The potential is severely limited because of the steep slopes. Erosion is a very severe hazard if the native vegetation is removed. This soil is mainly used for woodland and for wildlife habitat. It is best suited to these purposes.

The potential is fair for shortleaf pine, loblolly pine, eastern redcedar, red oak, and white oak. The erosion hazard is moderate. Equipment limitations are severe, and seedling mortality is moderate.

This soil has poor potential for most urban use and for septic tank absorption fields. Steep slopes are a severe limitation that is difficult or impractical to overcome.

The capability unit is VIIe-2. The woodland suitability group is 4r9.

37—Peridge silt loam, 1 to 3 percent slopes. This deep, well drained, nearly level soil is on stream terraces and broad uplands. Slopes are smooth and convex. Individual areas range from about 10 to 40 acres.

Typically the surface layer is dark brown silt loam about 6 inches thick. The subsoil is yellowish red silt loam to a depth of about 20 inches, mottled yellowish red, yellowish brown, and strong brown silty clay loam to 33 inches, and mottled red, pale brown, and yellowish red silty clay to 72 inches.

Included in mapping are eroded areas where plowing mixes the surface layer and subsoil material, a few shallow gullies, and areas of soils similar to Peridge soils that have bedrock at a depth of less than 60 inches. Also included are areas of Britwater, Captina, and Razort soils.

This soil is moderate in natural fertility and organic matter content. It is medium acid to very strongly acid throughout except for surface layers that have been limed. Permeability is moderate, and the available water capacity is high. Tilth is good, and the soil can be worked throughout a wide range of moisture content. The root zone is deep and is easily penetrated.

This soil has good potential for cultivated crops. Suitable crops include corn, soybeans, small grain, and truck crops. This soil has a moderate erosion hazard. This soil is mainly used for hay and pasture, for which the potential is good. Suitable pasture plants include tall fescue, white clover, bermudagrass, alfalfa, and lespedeza. With good management that includes contour cultivation and terraces on long slopes, clean tilled crops that leave large amounts of residue can be safely grown year after year.

Potential is fair for loblolly pine, shortleaf pine, red oak, white oak, black walnut, and white ash. There are no significant limitations for woodland use and management.

This soil has fair to good potential for most urban use. Low strength is a moderate limitation for dwellings and roads and streets. The low strength and shrink-swell potential are moderate limitations for light industry. These limitations can be overcome by proper engineering design and careful installation. 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 filter field.

The capability unit is IIe-1. The woodland suitability group is 3o7.

38—Peridge silt loam, 3 to 8 percent slopes. This deep, well drained, gently sloping soil is on stream terraces and broad uplands. Slopes are smooth and convex. Individual areas range from about 10 to 40 acres.

Typically the surface layer is dark brown silt loam about 6 inches thick. The subsoil is yellowish red silt loam to a depth of about 20 inches, mottled yellowish red, yellowish brown, and strong brown silty clay loam to 33 inches, and mottled red, pale brown, and yellowish red silty clay to 72 inches.

Included in mapping are eroded areas where plowing mixes the surface layer and subsoil material, a few shallow gullies, and areas of soils similar to the Peridge soils that have bedrock at a depth of less than 60 inches. Also included are areas of Britwater, Captina, and Razort soils.

This soil is moderate in natural fertility and organic matter content. It is medium acid to very strongly acid throughout unless the area has been limed. Permeability is moderate, and the available water capacity is high. Tilth is good, and the soil can be worked throughout a wide range of moisture content. The root zone is deep and is easily penetrated.

This soil has fair potential for cultivated crops. Suitable crops include corn, soybeans, small grain, and truck crops. The potential for cultivated crops is limited because of severe erosion hazard. This soil is mainly used for hay and pasture, for which the potential is good. Suitable pasture plants include tall fescue, white clover, bermudagrass, alfalfa, and lespedeza. With good management that includes contour cultivation and terraces, clean tilled crops that leave large amounts of residue can be safely grown year after year on the less sloping areas. Management will need to be intensified as slope length and gradient increase.

Potential is fair for loblolly pine, shortleaf pine, red oak, white oak, black walnut, and white ash. There are no significant limitations for woodland use and management.

This soil has fair potential for most urban use. Low strength is a moderate limitation for dwellings and roads and streets. The low strength, shrink-swell potential, and slope are moderate limitations for light industry. These limitations can be overcome by proper engineering design and careful installation. 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 filter field.

The capability unit is IIIe-1. The woodland suitability group is 3o7.

39—Portia sandy loam, 3 to 8 percent slopes. This deep, well drained, gently sloping soil is on uplands and foot slopes. Slopes are smooth and convex. Individual areas range from about 10 to 50 acres.

Typically the surface layer is brown sandy loam about 6 inches thick. The subsurface layer is yellowish brown sandy loam to a depth of about 12 inches. The subsoil is yellowish red loam to a depth of about 25 inches, and red sandy clay loam to 72 inches or more.

Included in mapping are stony areas, areas of soils that are similar to Portia soils that have bedrock at depths of less than 60 inches, and areas where the subsoil is brown sandy loam. Also included are occasion-

al shallow gullies and areas where plowing mixes the surface layer and subsoil material.

This soil is low in natural fertility and organic matter content. The surface layer is slightly acid to strongly acid, and the subsoil is strongly acid or 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 throughout a wide range of moisture content. The root zone is deep and is easily penetrated.

This soil has fair potential for cultivated crops. Suitable crops include corn, soybean, small grain, and truck crops. The potential is limited because of the severe erosion hazard. Most areas are cleared and are used for hay and pasture, for which the potential is good. Suitable pasture plants include tall fescue, white clover, bermudagrass, and lespedeza. Erosion is a severe hazard if cultivated crops are grown. With good management that includes contour cultivation and terraces, clean tilled crops that leave large amounts of residue can be safely grown year after year on the less sloping areas. Management will need to be intensified as slope length and gradient increase.

Potential is fair for shortleaf pine, loblolly pine, white oak, red oak, sweetgum, and eastern redcedar. There are no significant limitations for woodland use and management.

This soil has good potential for most urban use. The shrink-swell potential and low strength are moderate limitations for dwellings, roads and streets, and light industry. These limitations can be easily overcome by good design and careful installation. Moderately slow permeability is a moderate limitation for septic tank absorption fields, but this limitation can be overcome by increasing the size of the absorption field.

The capability unit is IIIe-1. The woodland suitability group is 3o7.

40—Portia sandy loam, 8 to 12 percent slopes. This deep, well drained, moderately sloping soil is on foot slopes and uplands. Slopes are smooth and convex. Individual areas range from about 10 to 30 acres.

Typically the surface layer is brown sandy loam about 6 inches thick. The subsurface layer is yellowish brown sandy loam to a depth of about 12 inches. The subsoil is yellowish red loam to a depth of about 25 inches and red sandy clay loam to 72 inches or more.

Included in mapping are stony areas and areas of soils that are similar to Portia soils that have bedrock at a depth of less than 60 inches. Also included are occasional gullies and areas where plowing mixes the surface layer and subsoil material.

This soil is low in natural fertility and organic matter content. The surface layer is slightly acid to strongly acid, and the subsoil is strongly acid or very strongly acid. Permeability is moderately slow and the available water capacity is medium to high. This soil has good tilth and can be worked throughout a wide range of moisture content. The root zone is deep and is easily penetrated.

This soil has poor potential for cultivated crops because of the slope and very severe erosion hazard. It is mostly cleared and used for hay and pasture, for which the potential is good. Suitable pasture plants include tall fescue, white clover, lespedeza, and bermudagrass. With good management that includes terraces and contour cultivation, sown crops can be grown occasionally in a cropping system that includes close growing cover most of the time. Management will have to be intensified as slope length and gradient increase.

Potential is fair for shortleaf pine, loblolly pine, red oak, and eastern redcedar. There are no significant limitations for woodland use and management.

This soil has fair potential for most urban use. The slope, shrink-swell potential, and low strength are moderate limitations for dwellings and local roads and streets. Slope is a severe limitation for light industry. These limitations can be overcome by good design and careful installation. Slope and moderately slow permeability are moderate limitations for septic tank absorption fields. These limitations can be overcome by good design and careful installation procedures.

The capability unit is IVe-4. The woodland suitability group is 3o7.

41—Razort soils, frequently flooded. This map unit of level or nearly level soils is on flood plains along streams. It is more variable than other map units in the area, but the frequency of flooding is a dominant factor in use and management. The unit consists of Razort loam and Razort gravelly silt loam, which are closely associated but occur in an irregular pattern. Some areas of these soils are large enough to be mapped separately, but because of present and predicted use, they were mapped as one unit. Many mapped areas contain both of these soils, but some areas contain only one. Slopes are 0 to 3 percent.

Typically Razort soils have a surface layer of dark brown loam about 10 inches thick. The subsoil is dark brown silt loam to a depth of about 49 inches and dark brown mottled gravelly silt loam to 60 inches. The underlying material is dark brown very gravelly clay loam.

Included in mapping is sandy overwash along streambanks, where it is several feet thick, and in spots away from the stream, where it is a few inches to 18 inches thick. Also included are built-up areas in the city of Harrison that are less subject to flooding and soils that have a thicker surface layer than Razort soils but are otherwise similar.

These soils are moderate in natural fertility and organic matter content. They are neutral or slightly acid in the surface layer and slightly acid or medium acid in the subsoil. Permeability is moderate, and available water capacity is high. Tilth is good, and the soil can be

worked throughout a wide range of moisture content. The root zone is deep and is easily penetrated.

Most areas of these soils are flooded more than once every 2 years. The flooding is of very brief duration but is fast-moving water that can cause severe damage in a brief period.

These soils have poor potential for cultivated crops because of the flood hazard. They are mostly cleared and used for pasture and hay, for which the potential is good (fig. 13). Suitable pasture plants include bermudagrass, tall fescue, alfalfa, white clover, and lespedeza.

These soils have good potential for loblolly pine, red oak, white oak, sweetgum, cottonwood, black walnut (fig. 14), and sycamore. There are no significant limitations for woodland use and management.

These soils have poor potential for most urban use. Flooding is a severe hazard for dwellings, light industry, local roads and streets, and septic tank absorption fields. Major flood control practices are needed.

The capability unit is Vw-1. The woodland suitability group is 2o7.

42—Samba silt loam, 0 to 1 percent slopes. This deep, poorly drained, level soil is on depressions and concave slopes on stream terraces and uplands. Individual areas range from about 10 to 20 acres, except one area north of Lead Hill that is about 140 acres.

Typically the surface layer is very dark gray silt loam about 9 inches thick. The subsurface layer is very dark grayish brown silt loam to a depth of about 13 inches. The subsoil is dark gray, mottled silty clay loam to a depth of about 20 inches, dark gray, mottled clay to 36 inches, grayish brown, mottled clay to 59 inches, and gray, mottled clay that extends to 72 inches or more.

Included in mapping are small areas of Captina and Razort soils.

This soil is moderate in natural fertility and organic matter content. It is slightly acid or medium acid in the surface layer and strongly acid to neutral in the subsoil. Permeability is very slow, and the available water capacity is high. The surface layer is friable and is easily tilled through a medium range of moisture conditions. The water table is seasonally high and is near the surface in late winter and early spring. The root zone is deep and is easily penetrated to a depth of approximately 20 inches. Below this depth, root penetration is slower because of the high clay content.

This soil has fair potential for cultivated crops. Suitable crops include soybeans and small grain. Runoff is very slow, and wetness is a severe limitation. Farming operations are delayed for several days after a rain unless a surface drainage system is installed. With good management that includes drainage, clean tilled crops that leave a large amount of residue can be safely grown year after year. Most areas of this soil are used for hay and pasture, for which the potential is good. Suitable pasture plants include tall fescue, white clover, bermudagrass, and lespedeza.

Potential is fair for shortleaf pine, loblolly pine, and sweetgum. Equipment limitations and seedling mortality are moderate.

This soil has poor potential for most urban use. The shrink-swell potential, low strength, and wetness are severe limitations for dwellings, light industry, and local roads and streets. These limitations are difficult and expensive to overcome. Wetness and slow percolation are severe limitations for septic tank absorption fields. These limitations are very difficult to overcome.

The capability unit is IIIw-1. The woodland suitability group is 4w8.

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, playgrounds, lawns, and trees and shrubs.

Crops and pasture

W. Wilson Ferguson, conservation agronomist, Soil Conservation Service, helped prepare this section.

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

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

In 1967 about 111,180 acres in the survey area was used for crops and pasture (*12*). Of this total, 51,180 acres was permanent pasture and 60,000 acres was in cultivated crops.

Most cleared areas in the county are used for pasture and hay. A small acreage is in commercial and home orchards and home gardens. The cash income from these enterprises is small but important. Most farm families and many families in urban areas can or freeze homegrown fruits and vegetables for home use. A small acreage is in silage crops.

Many field crops suited to the survey area are not commonly grown. Soybeans and small grain are examples.

These soils are low in nitrogen, potassium, phosphorus, calcium, and organic matter content. Many soils suited to crops are erodible. Many are poorly suited or not suited to intensive use because they are stony, are shallow over bedrock, and have a high content of coarse fragments.

Contour cultivation, vegetated waterways, and terraces are needed on sloping soils that are used for tilled crops.

Annual cover crops or grasses and legumes should be grown regularly in the cropping system if the hazard of erosion is severe or if crops leave only a small amount of residue. Crop residue should be shredded and spread evenly to provide protective cover and active organic matter. Minimum tillage is needed to the extent practical for the soil conditions and crop requirements.

The kinds and amounts of fertilizer applied are generally based on soil tests, kinds of crops to be grown, past experiences, productive capacity of the soil, and expected yields. On most soils, periodic applications of lime are beneficial. These applications according to needs indicated by soil tests are generally necessary for satisfactory production of such crops as alfalfa, white clover, and red clover.

If left bare, most soils tend to pack and crust over after heavy rains. Cover crops and crop residue help to maintain good tilth.

Tall fescue, a cool season perennial, is the main grass now grown in the county. Common bermudagrass and some hybrid bermudagrass are warm season grasses suited to many soils in the county. They should be propagated with sprigs because stands started with seeding are more susceptible to winterkill. Red clover and white clover are the most commonly grown legumes and are usually grown with grass. Alfalfa is suited to the Razort and Peridge soils.

Grazing management is essential for the production of high quality forage and for stand survival and erosion control. Management includes maintaining sufficient topgrowth during the growing season to provide for vigorous healthy growth. It also includes restricting grazing of tall fescue in summer. Brush control is essential, and weed control is often needed.

Grass pasture responds well to nitrogen fertilizer, and grass and legume pasture may require phosphate and potash fertilizers and lime at rates based on soil tests.

Yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 6. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

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

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

For yields of irrigated crops, it is assumed that the irrigation system is adapted to the soils and to the crops grown, that good quality irrigation water is uniformly applied as needed, and that tillage is kept to a minimum.

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

Crops other than those shown in table 6 are grown in the survey area, but estimated yields are not listed be-

cause 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.

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 slight 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-1 or IIIe-2.

The capability classification of each map unit is given in the section "Soil maps for detailed planning."

Woodland management and productivity

Paul I. Brown, forester, Soil Conservation Service, helped prepare this section.

Boone County was originally interspersed with woodland and savannas and with scattered prairies on some of the nearly level to gently sloping areas. During the late 1800's and early 1900's, many savannas reverted to low grade hardwood forest. This trend reached a peak during the 1940's and early 1950's when approximately 70 percent of the county was wooded. Since then the trend has been one of clearing and converting wooded areas to pasture of improved grasses. In 1970, trees covered about 52 percent, or 195,500 acres of Boone County (*13*). This acreage is almost entirely privately owned. The estimated current net annual growth for all species in the county is 3.3 million cubic feet.

Good to poor stands of commercial trees are produced in the county. Generally, the better stands are located on deep soils and on north-facing slopes of moderately deep soils. Broadleaf species are dominant. Scattered stands of needleleaf species, especially eastern redcedar, do occur.

The economic impact of wood products in Boone County is small, mainly as a result of clearing for pasture and mismanaging the woodland. Forest products produced in the county include lumber for furniture, crossties, fenceposts, and handles. The area benefits significantly, however, from the esthetic and recreational values of its forestland. The woodland also provides food and cover for wildlife and grazing for domestic animals.

This section explains how soils affect the growth of trees and management of timber resources in the county.

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

Only those soils suitable for wood crops are listed. The table lists the woodland suitability group symbol for each soil. Soils assigned the same symbol require the same general management and have about the same potential productivity.

The first part of the *woodland suitability group symbol*, 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 symbol, a letter, indicates the major kind of soil limitation. The letter *x* indicates stoniness or rockiness; *w*, excessive water in or on the soil; *t*, toxic substances in 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, t, d, c, s, f, and r.

The third part of the symbol, a numeral, indicates the kind of trees for which the soils in the group are best suited and the degree of 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. The numeral 0 indicates that the soils in the group are not suitable for the production of commercial wood crops.

In table 7, *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. Site index was calculated at age 30 years for eastern cottonwood, 35 years for American sycamore, and 50 years for all other species. Procedures used to determine site index are given in references (*3, 4, 5, 6,* and *9*). 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 8 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Suitability 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 8, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

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

Camp areas require site preparation such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils

have 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, horseback riding, and bicycling 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.

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 (fig. 15). Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

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

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be established, 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—soybeans, grain sorghum, brown top millet, and corn—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.

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. Grasses include panicgrass, paspalum, fescue, and bristlegrass; legumes include annual lespedeza, shrub lespedeza, and white clover.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Beggarweed, perennial lespedeza, pokeweed, cheatgrass, and wild bean are weeds. Other plants include bluestem grasses, grama grasses, and perennial forbs and legumes. 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.

Hardwood trees and the woody understory of shrubs and vines produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. These plants include oak, hickory, beech, cherry, dogwood, maple, grapes, honeysuckle, and greenbriar. 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.

Coniferous plants furnish browse, seeds, and cones. 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. Cedar, pine, juniper, and certain ornamental trees and shrubs are part of this plant group.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Examples of wet-

land plants are smartweed, wild millet, rushes, sedges, reeds, pond weeds, waterlily, and rice cutgrass. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness.

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 muskrat marshes, waterfowl feeding areas, wildlife watering developments, beaver ponds, and other wildlife ponds.

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

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 mourning dove.

Woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, ruffed grouse, woodcock, wood thrush, woodpeckers, great horned owls, squirrels, gray fox, raccoon, and white-tailed deer.

Wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are kingfishers, rails, ducks, geese, herons, muskrat, mink, and beaver.

Engineering

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

This section provides information about the use of soils for building sites, sanitary facilities, construction material, and water management. Among those who can benefit from this information are engineers, landowners, community planners, town and city managers, land developers, builders, contractors, and farmers and ranchers.

The ratings in the engineering tables are based on test data and estimated data in the "Soil properties" section. The ratings were determined jointly by soil scientists and engineers of the Soil Conservation Service using known relationships between the soil properties and the behavior of soils in various engineering uses.

Among the soil properties and site conditions identified by a soil survey and used in determining the ratings in this section were grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock that is within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure or aggregation, in-place soil density, and geologic origin of the soil material. Where pertinent, data about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of absorbed cations were also considered.

On the basis of information assembled about soil properties, ranges of values can be estimated for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, shear strength, compressibility, slope stability, and other factors of expected soil behavior in engineering uses. As appropriate, these values can be applied to each major horizon of each soil or to the entire profile.

These factors of soil behavior affect construction and maintenance of roads, airport runways, pipelines, foundations for small buildings, ponds and small dams, irrigation projects, drainage systems, sewage and refuse disposal systems, and other engineering works. The ranges of values can be used to (1) select potential residential, commercial, industrial, and recreational uses; (2) make preliminary estimates pertinent to construction in a particular area; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for location of sanitary landfills, onsite sewage disposal systems, and other waste disposal facilities; (5) plan detailed onsite investigations of soils and geology; (6) find sources of gravel, sand, clay, and topsoil; (7) plan farm drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; (8) relate performance of structures already built to the properties of the kinds of soil on which they are built so that performance of similar structures on the same or a similar soil in other locations can be predicted; and (9) predict the trafficability of soils for cross-country movement of vehicles and construction equipment.

Data presented in this section are useful for land-use planning and for choosing alternative practices or general designs that will overcome unfavorable soil properties and minimize soil-related failures. Limitations to the use of these data, however, should be well understood. First, the data are generally not presented for soil material below a depth of 5 or 6 feet. Also, because of the scale of the detailed map in this soil survey, small areas of soils that differ from the dominant soil may be included in mapping. Thus, these data do not eliminate the need for onsite investigations, testing, and analysis by personnel having expertise in the specific use contemplated.

The information is presented mainly in tables. Table 10 shows, for each kind of soil, the degree and kind of limitations for building site development; table 11, for sanitary facilities; and table 13, for water management. Table 12 shows the suitability of each kind of soil as a source of construction materials.

The information in the tables, along with the soil map, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations and to construct interpretive maps for specific uses of land.

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

Building site development

The degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commerical buildings, and local roads and streets are indicated in table 10. A *slight* limitation indicates that soil properties generally are favorable for the specified use; any limitation is minor and easily overcome. A *moderate* limitation indicates that soil properties and site features are unfavorable for the specified use, but the limitations can be overcome or minimized by special planning and design. A *severe* limitation indicates that one or more soil properties or site features are so unfavorable or difficult to overcome that a major increase in construction effort, special design, or intensive maintenance is required. For some soils rated severe, such costly measures may not be feasible.

Shallow excavations are made for pipelines, sewerlines, communications and power transmission lines, basements, open ditches, and cemeteries. Such digging or trenching is influenced by soil wetness caused by a seasonal high water table; the texture and consistence of soils; the tendency of soils to cave in or slough; and the presence of very firm, dense soil layers, bedrock, or large stones. In addition, excavations are affected by slope of the soil and the probability of flooding. Ratings do not apply to soil horizons below a depth of 6 feet unless otherwise noted.

In the soil series descriptions, the consistence of each soil horizon is given, and the presence of very firm or extremely firm horizons, usually difficult to excavate, is indicated.

Dwellings and *small commercial buildings* referred to in table 10 are built on undisturbed soil and have foundation loads of a dwelling no more than three stories high. Separate ratings are made for small commercial buildings without basements and for dwellings with and without basements. For such structures, soils should be sufficiently stable that cracking or subsidence of the structure from settling or shear failure of the foundation does not occur. These ratings were determined from estimates of the shear strength, compressibility, and shrink-swell potential of the soil. Soil texture, plasticity and in-place density, potential frost action, soil wetness, and depth to a seasonal high water table were also considered. Soil wetness and depth to a seasonal high water table indicate potential difficulty in providing adequate drainage for basements, lawns, and gardens. Depth to bedrock, slope, and large stones in or on the soil are also important considerations in the choice of sites for these structures and were considered in determining the ratings. Susceptibility to flooding is a serious hazard.

Local roads and streets referred to in table 10 have an all-weather surface that can carry light to medium traffic all year. They consist of a subgrade of the underlying soil material; a base of gravel, crushed rock fragments, or soil material stabilized with lime or cement; and a flexible or rigid surface, commonly asphalt or concrete. The roads are graded with soil material at hand, and most cuts and fills are less than 6 feet deep.

The load supporting capacity and the stability of the soil as well as the quantity and workability of fill material available are important in design and construction of roads and streets. The classifications of the soil and the soil texture, density, shrink-swell potential, and potential frost action are indicators of the traffic supporting capacity used in making the rating. Soil wetness, flooding, slope, depth to hard rock or very compact layers, and content of large stones affect stability and ease of excavation.

Sanitary facilities

Favorable soil properties and site features are needed for proper functioning of septic tank absorption fields, sewage lagoons, and sanitary landfills. The nature of the soil is important in selecting sites for these facilities and in identifying limiting soil properties and site features to be considered in design and installation. Also, those soil properties that affect ease of excavation or installation of these facilities will be of interest to contractors and local officials. Table 11 shows the degree and kind of limitations of each soil for such uses and for use of the soil as daily cover for landfills. It is important to observe local ordinances and regulations.

If the degree of soil limitation is expressed as *slight*, soils are generally favorable for the specified use and limitations are minor and easily overcome; if *moderate*, soil properties or site features are unfavorable for the specified use, but limitations can be overcome by special planning and design; and if *severe*, soil properties or site features are so unfavorable or difficult to overcome that major soil reclamation, special designs, or intensive maintenance is required. Soil suitability is rated by the terms *good*, *fair*, or *poor*, which, respectively, mean about the same as the terms *slight*, *moderate*, and *severe*.

Septic tank absorption fields are subsurface systems of tile or perforated pipe that distribute effluent from a septic tank into the natural soil. Only the soil horizons between depths of 18 and 72 inches are evaluated for this use. The soil properties and site features considered are those that affect the absorption of the effluent and those that affect the construction of the system.

Properties and features that affect absorption of the effluent are permeability, depth to seasonal high water table, depth to bedrock, and susceptibility to flooding. Stones, boulders, and shallowness to bedrock interfere with installation. Excessive slope can cause lateral seepage and surfacing of the effluent. Also, soil erosion and soil slippage are hazards if absorption fields are installed on sloping soils.

In some soils, loose sand and gravel or fractured bedrock is less than 4 feet below the tile lines. In these soils the absorption field does not adequately filter the effluent, and ground water in the area may be contaminated.

On many of the soils that have moderate or severe limitations for use as septic tank absorption fields, a system to lower the seasonal water table can be installed or the size of the absorption field can be increased so that performance is satisfactory.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons have a nearly level floor and cut slopes or embankments of compacted soil material. Aerobic lagoons generally are designed to hold 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. Soils that are very high in content of organic matter and those that have cobbles, stones, or boulders are not suitable. Unless the soil has very slow permeability, contamination of ground water is a hazard where the seasonal high water table is above the level of the lagoon floor. In soils where the water table is seasonally high, seepage of ground water into the lagoon can seriously reduce the lagoon's capacity for liquid waste. Slope, depth to bedrock, and susceptibility to flooding also affect the suitability of sites for sewage lagoons or the cost of construction. Shear strength and permeability of compacted soil material affect the performance of embankments.

Sanitary landfill is a method of disposing of solid waste by placing refuse in successive layers either in excavated trenches or on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil material. Landfill areas are subject to heavy vehicular traffic. Risk of polluting ground water and trafficability affect the suitability of a soil for this use. The best soils have a loamy or silty texture, have moderate to slow permeability, are deep to a seasonal water table, and are not subject to flooding. Clayey soils are likely to be sticky and difficult to spread. Sandy or gravelly soils generally have rapid permeability, which might allow noxious liquids to contaminate ground water. Soil wetness can be a limitation, because operating heavy equipment on a wet soil is difficult. Seepage into the refuse increases the risk of pollution of ground water.

Ease of excavation affects the suitability of a soil for the trench type of landfill. A suitable soil is deep to bedrock and free of large stones and boulders. If the seasonal water table is high, water will seep into trenches.

Unless otherwise stated, the limitations in table 11 apply only to soil material within a depth of about 6 feet. If the trench is deeper, a limitation of slight or moderate may not be valid. Site investigation is needed before a site is selected.

Daily cover for landfill should be soil that is easy to excavate and spread over the compacted fill in wet and dry periods. Soils that are loamy or silty and free of stones or boulders are better than other soils. Clayey soils may be sticky and difficult to spread; sandy soils may be subject to soil blowing.

The soils selected for final cover of landfills should be suitable for growing plants. Of all the horizons, the A horizon in most soils has the best workability, more organic matter, and the best potential for growing plants. Thus, for either the area- or trench-type landfill, stockpiling material from the A horizon for use as the surface layer of the final cover is desirable.

Where it is necessary to bring in soil material for daily or final cover, thickness of suitable soil material available and depth to a seasonal high water table in soils surrounding the sites should be evaluated. Other factors to be evaluated are those that affect reclamation of the borrow areas. These factors include slope, erodibility, and potential for plant growth.

Construction materials

The suitability of each soil as a source of roadfill, sand, gravel, and topsoil is indicated in table 12 by ratings of good, fair, poor, or unsuited. The texture, thickness, and organic-matter content of each soil horizon are important factors in rating soils for use as construction materials. Each soil is evaluated to the depth observed, generally about 6 feet.

Roadfill is soil material used in embankments for roads. Soils are evaluated as a source of roadfill for low embankments, which generally are less than 6 feet high and less exacting in design than high embankments. The ratings reflect the ease of excavating and working the material and the expected performance of the material where it has been compacted and adequately drained. The performance of soil after it is stabilized with lime or cement is not considered in the ratings, but information about some of the soil properties that influence such performance is given in the descriptions of the soil series.

The ratings apply to the soil material between the A horizon and a depth of 5 to 6 feet. It is assumed that soil horizons will be mixed during excavation and spreading. Many soils have horizons of contrasting suitability within their profile. The estimated engineering properties in table 14 provide specific information about the nature of each horizon. This information can help determine the suitability of each horizon for roadfill.

Soils rated *good* are coarse grained. They have low shrink-swell potential, low potential frost action, and few cobbles and stones. They are at least moderately well drained and have slopes of 15 percent or less. Soils rated *fair* have a plasticity index of less than 15 and have other limiting features, such as moderate shrink-swell potential, moderately steep slopes, wetness, or many stones. If the thickness of suitable material is less than 3 feet, the entire soil is rated *poor*.

Sand and *gravel* are used in great quantities in many kinds of construction. The ratings in table 12 provide guidance as to where to look for probable sources and are based on the probability that soils in a given area contain sizable quantities of sand or gravel. A soil rated *good* or *fair* has a layer of suitable material at least 3 feet thick, the top of which is within a depth of 6 feet. Coarse fragments of soft bedrock material, such as shale and siltstone, are not considered to be sand and gravel. Fine-grained soils are not suitable sources of sand and gravel.

The ratings do not take into account depth to the water table or other factors that affect excavation of the material. Descriptions of grain size, kinds of minerals, reaction, and stratification are given in the soil series descriptions and in table 14.

Topsoil is used in areas where vegetation is to be established and maintained. Suitability is affected mainly by the ease of working and spreading the soil material in preparing a seedbed and by the ability of the soil material to support plantlife. Also considered is the damage that can result at the area from which the topsoil is taken.

The ease of excavation is influenced by the thickness of suitable material, wetness, slope, and amount of stones. The ability of the soil to support plantlife is determined by texture, structure, and the amount of soluble salts or toxic substances. Organic matter in the A1 or Ap horizon greatly increases the absorption and retention of moisture and nutrients. Therefore, the soil material from these horizons should be carefully preserved for later use.

Soils rated *good* have at least 16 inches of friable loamy material at their surface. They are free of stones and cobbles, are low in content of gravel, and have gentle slopes. They are low in soluble salts that can limit or prevent plant growth. They are naturally fertile or respond well to fertilizer. They are not so wet that excavation is difficult during most of the year.

Soils rated *fair* are loose sandy soils or firm loamy or clayey soils in which the suitable material is only 8 to 16 inches thick or soils that have appreciable amounts of gravel, stones, or soluble salt.

Soils rated *poor* are very sandy soils and very firm clayey soils; soils with suitable layers less than 8 inches thick; soils having large amounts of gravel, stones, or soluble salt; steep soils; and poorly drained soils.

Although a rating of *good* is not based entirely on high content of organic matter, a surface horizon is generally preferred for topsoil because of its organic-matter content. This horizon is designated as A1 or Ap in the soil series descriptions. The absorption and retention of moisture and nutrients for plant growth are greatly increased by organic matter.

Water management

Many soil properties and site features that affect water management practices have been identified in this soil survey. In table 13 the degree of soil limitation and soil and site features that affect use are indicated for each kind of soil. This information is significant in planning, installing, and maintaining water control structures.

Soil and site limitations are expressed as slight, moderate, and severe. *Slight* means that the soil properties and site features are generally favorable for the specified use and that any limitation is minor and easily overcome. *Moderate* means that some soil properties or site features are unfavorable for the specified use but can be overcome or modified by special planning and design. *Severe* means that the soil properties and site features are so unfavorable and so difficult to correct or overcome that major soil reclamation, special design, or intensive maintenance is required.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have a low seepage potential, which is determined by permeability and the depth to fractured or permeable bedrock or other permeable material.

Embankments, dikes, and levees require soil material that is resistant to seepage, erosion, and piping and has favorable stability, shrink-swell potential, shear strength, and compaction characteristics. Large stones and organic matter in a soil downgrade the suitability of a soil for use in embankments, dikes, and levees.

Drainage of soil is affected by such soil properties as permeability; texture; depth to bedrock, hardpan, or other layers that affect the rate of water movement; depth to the water table; slope; stability of ditchbanks; susceptibility to flooding; salinity and alkalinity; and availability of outlets for drainage.

Irrigation is affected by such features as slope, susceptibility to flooding, hazards of water erosion and soil blowing, texture, presence of salts and alkali, depth of root zone, rate of water intake at the surface, permeability of the soil below the surface layer, available water capacity, need for drainage, and depth to the water table.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to intercept runoff. They allow water to soak into the soil or flow slowly to an outlet. Features that affect suitability of a soil for terraces are uniformity and steepness of slope; depth to bedrock, hardpan, or other unfa-

vorable material; large stones; permeability; ease of establishing vegetation; and resistance to water erosion, soil blowing, soil slipping, and piping.

Grassed waterways are constructed to channel runoff to outlets at a nonerosive velocity. Features that affect the use of soils for waterways are slope, permeability, erodibility, wetness, and suitability for permanent vegetation.

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 properties

Table 14 gives estimates of engineering properties and classifications for the major horizons of each soil in the survey area.

Most soils have, within the upper 5 or 6 feet, horizons of contrasting properties. Table 14 gives information for each of these contrasting horizons in a typical profile. *Depth* to the upper and lower boundaries of each horizon is indicated. More information about the range in depth and about other properties in each horizon is given for each soil series in the section "Soil series and morphology."

Texture is described in table 14 in the standard terms used by the (*11*) U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in soil material that is less than 2 millimeters in diameter. "Loam," for example, is soil material that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains gravel or other particles coarser than sand, an appropriate modifier is added, for example, "gravelly loam." Other texture terms are defined in the Glossary.

The two systems commonly used in classifying soils for engineering use are the Unified Soil Classification System (Unified) (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO) (*1*).

The *Unified* system (*2*) 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, plasticity index, liquid limit, and organic-matter content. Soils are grouped into 15 classes—eight classes of coarse-grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; six classes of fine-grained soils, identified as ML, CL, OL, MH, CH, and OH; and one class of highly organic soils, identified as Pt. Soils on the borderline between two classes have a dual classification symbol, for example, CL-ML.

The *AASHTO* (*1*) system classifies soils according to those properties that affect their use in highway construction and maintenance. In this system a mineral soil is classified in one of seven basic groups ranging 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. At the other extreme, in group A-7, are fine-grained soils. Highly organic soils are classified in group A-8 on the basis of visual inspection.

When laboratory data are available, the A-1, A-2, and A-7 groups are further classified as follows: A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, and A-7-6. As an additional refinement, the desirability of soils as subgrade material can be indicated by a group index number. These numbers range from 0 for the best subgrade material to 20 or higher for the poorest. The estimated classification, without group index numbers, is given in table 14. Also in table 14 the percentage, by weight, of rock fragments more than 3 inches in diameter is estimated for each major horizon. These estimates are determined mainly by observing volume percentage in the field and then converting that, by formula, to weight percentage.

Percentage of the soil material less than 3 inches in diameter that passes each of four sieves (U.S. standard) is estimated for each major horizon. The estimates are based on tests of soils that were sampled in the survey area and in nearby areas and on field estimates from many borings made during the survey.

Liquid limit and *plasticity index* indicate the effect of water on the strength and consistence of soil. These indexes are used in both the Unified and AASHTO soil classification systems. They are also used as indicators in making general predictions of soil behavior. Ranges in liquid limit and plasticity index are estimated on the basis of test data from the survey area or from nearby areas.

and on observations of the many soil borings made during the survey.

In some surveys, the estimates are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterburg limits extend a marginal amount across classification boundaries (1 or 2 percent), the classification in the marginal zone is omitted.

Physical and chemical properties

Table 15 shows estimated values for several soil characteristics and features that affect behavior of soils in engineering uses. These estimates are given for each major horizon, at the depths indicated, in the typical pedon of each soil. The estimates are based on field observations and on test data for these and similar soils.

Permeability is estimated on the basis of known relationships among the soil characteristics observed in the field—that influence the downward movement of water in the soil. The estimates are for vertical water movement when the soil is saturated. Not considered in the estimates is lateral seepage or such transient soil features as plowpans and surface crusts. Permeability of the soil is an important factor to be considered in planning and designing drainage systems, in evaluating the potential of soils for septic tank systems and other waste disposal systems, and in many other aspects of land use and management.

Available water capacity is rated on the basis of soil characteristics that influence the ability of the soil to hold water and make it available to plants. Important characteristics are content of organic matter, soil texture, and soil structure. Shallow-rooted plants are not likely to use the available water from the deeper soil horizons. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design of irrigation systems.

Soil reaction is expressed as a range in pH values. The range in pH of each major horizon is based on many field checks. For many soils, the values have been verified by laboratory analyses. Soil reaction is important in selecting the crops, ornamental plants, or other plants to be grown; in evaluating soil amendments for fertility and stabilization; and in evaluating the corrosivity of soils.

Shrink-swell potential depends mainly on the amount and kind of clay in the soil. Laboratory measurements of the swelling of undisturbed clods were made for many soils. For others the swelling was estimated on the basis of the kind and amount of clay in the soil and on measurements of similar soils. The size of the load and the magnitude of the change in soil moisture content also influence the swelling of soils. Shrinking and swelling of some soils can cause damage to building foundations, basement walls, roads, and other structures unless special designs are used. A high shrink-swell potential indicates that special design and added expense may be required if the planned use of the soil will not tolerate large volume changes.

Erosion factors are used to predict the erodibility of a soil and its tolerance to erosion in relation to specific kinds of land use and treatment. The soil erodibility factor (K) is a measure of the susceptibility of the soil to erosion by water. Soils having the highest K values are the most erodible. K values range from 0.10 to 0.64. To estimate annual soil loss per acre, the K value of a soil is modified by factors representing plant cover, grade and length of slope, management practices, and climate. The soil-loss tolerance factor (T) is the maximum rate of soil erosion, whether from rainfall or soil blowing, that can occur without reducing crop production or environmental quality. The rate is expressed in tons of soil loss per acre per year.

Soil and water features

Table 16 contains information helpful in planning land uses and engineering projects that are likely to be affected by soil and water features.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are placed in one of four groups on the basis of the intake of water after the soils have been wetted and have received 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 chiefly of deep, well drained to excessively drained sands or gravels. 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 that have a layer that impedes the downward movement of water or soils that have 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 clay soils 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 is the temporary covering of soil with water from overflowing streams, with runoff from adjacent slopes, and by tides. Water standing for short periods after rains or after snow melts is not considered flooding, nor is water in swamps and marshes. Flooding is rated in general terms that describe the frequency and duration

of flooding and the time of year when flooding is most likely. The ratings are based on evidence in the soil profile of the effects of flooding, namely thin strata of gravel, sand, silt, or, in places, clay deposited by floodwater; irregular decrease in organic-matter content with increasing depth; and absence of distinctive soil horizons that form in soils of the area that are not subject to flooding. The ratings are also based on local information about floodwater levels in the area and the extent of flooding; and on information that relates the position of each soil on the landscape to historic floods.

The generalized description of flood hazards is of value in land-use planning and provides a valid basis for land-use restrictions. The soil data are less specific, however, than those provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table is the highest level of a saturated zone more than 6 inches thick for a continuous period of more than 2 weeks during most years. The depth to a seasonal high water table applies to undrained soils. Estimates are based mainly on the relationship between grayish colors or mottles in the soil and the depth to free water observed in many borings made during the course of the soil survey. Indicated in table 16 are the depth to the seasonal high water table; the kind of water table, that is, perched, artesian, or apparent; and the months of the year that the water table commonly is high. Only saturated zones above a depth of 5 or 6 feet are indicated.

Information about the seasonal high water table helps in assessing the need for specially designed foundations, the need for specific kinds of drainage systems, and the need for footing drains to insure dry basements. Such information is also needed to decide whether or not construction of basements is feasible and to determine how septic tank absorption fields and other underground installations will function. Also, a seasonal high water table affects ease of excavation.

Depth to bedrock is shown for all soils that are underlain by bedrock at a depth of 5 to 6 feet or less. For many soils, the limited depth to bedrock is a part of the definition of the soil series. The depths shown are based on measurements made in many soil borings and on other observations during the mapping of the soils. The kind of bedrock and its hardness as related to ease of excavation is also shown. Rippable bedrock can be excavated with a single-tooth ripping attachment on a 200-horsepower tractor, but hard bedrock generally requires blasting.

Risk of corrosion pertains to potential soil-induced chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to soil moisture, particle-size distribution, total acidity, and electrical conductivity of the soil material. The rate of corrosion of concrete is based mainly on the sulfate content, texture, and acidity of the soil. Protective measures for steel or more resistant concrete help to avoid or minimize damage resulting from the corrosion. Uncoated steel intersecting soil boundaries or soil horizons is more susceptible to corrosion than an installation that is entirely within one kind of soil or within one soil horizon.

Classification of the soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*14*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. In table 17, the soils of the survey area are classified according to the system. 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 Ultisols.

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 Udults (*Ud*, meaning humid, plus *ult*, from Ultisols).

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, thermic, 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 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 (*11*). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (*14*). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Soil maps for detailed planning."

Arkana series

The Arkana series consists of moderately deep, well drained, very slowly permeable soils that formed in clayey residuum from cherty limestone. These soils are gently sloping to steep. They are on uplands. Slopes are 3 to 30 percent.

Arkana soils are geographically associated with Clarksville, Gassville, and Moko soils. Clarksville soils, which are on higher elevations and hillsides, are more than 60 inches deep to bedrock and have a loamy-skeletal control section. Gassville soils, which are on adjacent ridges and hillsides, have less than 35 percent base saturation throughout the argillic horizon. Moko soils, which are on adjacent similar landscapes, are less than 20 inches deep to bedrock and do not have an argillic horizon.

Typical pedon of Arkana very cherty silt loam in an area of Arkana-Moko complex, 20 to 40 percent slopes, in a pasture SE1/4SW1/4SE1/4 sec. 3, T. 20 N., R. 20 W.

A11—0 to 3 inches; very dark grayish brown (10YR 3/2) very cherty silt loam; weak fine granular structure; friable; few fine roots; 45 percent chert fragments; neutral; abrupt smooth boundary.

A12—3 to 6 inches; dark brown (10YR 4/3) very cherty silt loam; moderate medium granular structure; friable; few fine roots; 40 percent chert fragments; neutral; clear smooth boundary.

B21t—6 to 10 inches; yellowish red (5YR 4/6) cherty clay; moderate medium angular blocky structure; firm; few fine roots; thin patchy clay films; 15 percent chert fragments; neutral; clear smooth boundary.

B22t—10 to 18 inches; yellowish red (5YR 5/6) clay; moderate medium angular blocky structure; firm, plastic; thin patchy clay films; 5 percent chert fragments; neutral; clear smooth boundary.

B23t—18 to 28 inches; yellowish brown (10YR 5/6) clay; moderate medium angular blocky structure; firm, plastic; thin patchy clay films; 10 percent fragments of weathered dolomitic limestone; moderately alkaline; abrupt smooth boundary.

R—28 inches; hard dolomitic limestone.

Solum thickness ranges from 20 to 45 inches. Reaction ranges from medium acid to mildly alkaline in the A horizon and from strongly acid to moderately alkaline in the Bt horizon.

The A horizon ranges from 5 to 14 inches in thickness. The A11 horizon has hue of 10YR, value of 2 or 3, and chroma of 1, 2, or 3. Texture is cherty silt loam or very cherty silt loam. The A12 horizon has hue of 10YR with value of 4 and chroma of 3 or 4 or with value of 5 and chroma of 4. Texture is cherty silt loam or very cherty silt loam. Some pedons have an A2 horizon with hue of 10YR, value of 4 or 5, and chroma of 3 or 4. Texture is cherty silt loam or very cherty silt loam.

The B1 horizon, where present, has hue of 7.5YR, value of 5, and chroma of 4 or 6; or hue of 5YR, value of 4 or 5, and chroma of 4. Texture is cherty silty clay loam or very cherty silty clay loam. The B21t and B22t horizons have hue of 7.5YR, 5YR, or 2.5YR; value of 4, 5, or 6; and chroma of 4 or 6. The B23t horizon has matrix colors in hue of 10YR, 7.5YR, or 5YR; value of 4, 5, or 6; and chroma of 4 or 6. Texture of the B21t horizon is clay loam, silty clay, or 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 B22t and B23t horizons commonly have mottles or relict fragments of bedrock in shades of brown or yellow.

The R horizon is hard, level-bedded, fractured limestone or dolomitic limestone.

Boden series

The Boden series consists of deep, well drained, moderately slowly permeable soils that formed in residuum

from sandstone and minor amounts of shale and limestone. These soils are moderately sloping to moderately steep. They are on hillsides. Slopes are 8 to 20 percent.

Boden soils are geographically associated with Boden Variant, Moko, Noark, and Portia soils. Boden Variant soils, which are on adjacent similar landscapes, are shallower to bedrock. Moko soils, which are on higher lying hilltops and side slopes, are less than 20 inches deep to bedrock and do not have an argillic horizon. Noark soils, which are also on higher lying hillsides, have a clayey-skeletal control section. Portia soils, which are on adjacent similar landscapes, have a stone-free surface layer and a fine-loamy control section.

Typical pedon of Boden stony sandy loam, 8 to 20 percent slopes, in a wooded area NE1/4NW1/4NE1/4 sec. 7, T. 18 N., R. 18 W.

O1—1 inch to 0; partially decomposed hardwood leaves and twigs.

A1—0 to 3 inches; dark grayish brown (10YR 4/2) stony sandy loam; moderate medium granular structure; very friable; many fine and medium roots; about 30 percent coarse fragments, with some up to 2 feet across; medium acid; clear wavy boundary.

A2—3 to 8 inches; brown (10YR 5/3) stony sandy loam; weak medium granular structure; very friable; many fine and medium roots; about 30 percent coarse fragments, with some up to 2 feet across; medium acid; clear wavy boundary.

B1—8 to 12 inches; yellowish red (5YR 5/8) sandy clay loam; weak medium subangular blocky structure; friable; common fine and medium roots; thin patchy clay films on faces of peds; about 5 percent coarse fragments; strongly acid; clear wavy boundary.

B21t—12 to 28 inches; red (2.5YR 4/6) sandy clay; moderate medium subangular blocky structure; firm; common fine and medium roots; thin continuous clay films on faces of peds; about 5 percent coarse fragments; strongly acid; gradual smooth boundary.

B22t—28 to 44 inches; mottled red (2.5YR 4/6) and strong brown (7.5YR 5/6) clay; moderate medium angular blocky structure; firm; common fine and medium roots; thin continuous clay films on faces of peds; strongly acid; gradual smooth boundary.

B23t—44 to 48 inches; mottled red (2.5YR 4/6), strong brown (7.5YR 5/6), and grayish brown (10YR 5/2) clay; moderate medium angular blocky structure; firm; few fine and medium roots; thin continuous clay films on faces of peds; very strongly acid; abrupt wavy boundary.

R—48 inches; level-bedded, hard sandstone.

Solum thickness ranges from 36 to 50 inches and depth to bedrock ranges from 40 to 60 inches. Reaction is strongly acid or very strongly acid throughout, except where the A horizon has been limed.

The A horizon ranges from 6 to 11 inches in thickness. The A1 horizon has hue of 10YR with value of 4 and chroma of 2 of 3 or with value of 3 and chroma of 3. The A2 horizon has hue of 10YR, value of 5, and chroma of 3 or 4. The content of sandstone ranges from 20 to 35 percent.

The B1 horizon has hue of 5YR, value of 4 or 5, and chroma of 6 or 8. Texture is fine sandy loam or sandy clay loam. The content of sandstone ranges from 0 to 10 percent. The B2t horizon has hue of 5YR with value of 5 and chroma of 6 or 8 or with value of 4 and chroma of 8, or hue of 2.5YR with value of 4 and chroma of 6 or 8 or with value of 5 and chroma of 8. The lower part mostly has mottles of red, strong brown, yellowish brown, and grayish brown. Texture is sandy clay or clay. The content of sandstone ranges from 0 to 10 percent.

Boden Variant

The Boden Variant consists of moderately deep, well drained, moderately slowly permeable soils that formed in residuum from sandstone and minor amounts of shale and limestone. The soils are steep. They are on hillsides. Slopes are 20 to 40 percent.

Boden Variant are geographically associated with Boden, Moko, Noark, and Portia soils. Boden soils, which are on adjacent similar landscapes, are deeper to bedrock. Moko soils, which are on higher lying hilltops and side slopes, are less than 20 inches deep to bedrock and do not have an argillic horizon. Noark soils, which are also on higher hillsides, have a clayey-skeletal control section. Portia soils, which are adjacent to foot slopes, have a stone-free surface layer and a fine-loamy control section.

Typical pedon of Boden Variant stony sandy loam from an area of Boden Variant-Rock outcrop complex, 20 to 40 percent slopes, in a wooded area SE1/4SE1/4NE1/4 sec. 1, T. 18 N., R. 19 W.

A1—0 to 2 inches; dark grayish brown (10YR 4/2) stony sandy loam; moderate medium subangular blocky structure; very friable; many fine and medium roots; about 30 percent sandstone fragments up to 20 inches across; medium acid; clear wavy boundary.

A2—2 to 9 inches; brown (10YR 5/3) stony sandy loam; weak medium granular structure; friable; common fine and medium roots; about 25 percent sandstone fragments up to 20 inches across; strongly acid; clear wavy boundary.

B1—9 to 12 inches; strong brown (7.5YR 5/6) sandy clay loam; weak medium subangular blocky structure; friable; common fine roots; thin patchy clay films; about 10 percent sandstone fragments up to 1 foot across; strongly acid; clear smooth boundary.

B21t—12 to 26 inches; yellowish red (5YR 5/6) sandy clay; moderate medium subangular blocky structure; firm; few fine roots; thin continuous clay films; occa-

sional sandstone fragments; strongly acid; gradual smooth boundary.

B22t—26 to 32 inches; yellowish red (5YR 5/6) and strong brown (7.5YR 5/6) sandy clay; moderate medium subangular structure; firm; few fine roots; thin continuous clay films; occasional sandstone fragments; strongly acid; abrupt smooth boundary.

R—32 inches; hard sandstone.

Solum thickness ranges from 24 to 36 inches and depth to bedrock ranges from 24 to 40 inches. Reaction is strongly acid or very strongly acid throughout except where the A horizon has been limed.

The A horizon ranges from 5 to 11 inches in thickness. The A1 horizon has hue of 10YR, value of 4, and chroma of 2 or 3, or value of 3, and chroma of 3. The A2 horizon has hue of 10YR, value of 5, and chroma of 3 or 4. Sandstone content ranges from 20 to 35 percent.

The B1 horizon has hue of 5YR, value of 4 or 5, and chroma of 8, or hue of 7.5YR, value of 5, and chroma of 6 or 8. Texture is fine sandy loam or sandy clay loam. The content of sandstone ranges from 0 to 10 percent. The B2t horizon has hue of 5YR with value of 5 and chroma of 6 or 8 or with value of 4 and chroma of 8, or hue of 2.5YR with value of 4 and chroma of 6 or 8 or with value of 5 and chroma of 8. The lower part is mottled red, strong brown, yellowish brown, and grayish brown. Texture is sandy clay or clay. The content of sandstone ranges from 0 to 10 percent.

Britwater series

The Britwater series consists of deep, well drained, moderately permeable soils that formed in loamy, gravelly and clayey old alluvial sediments washed mainly from limestone uplands. These soils are gently sloping to moderately sloping. They are mostly on stream terraces. Some areas are on uplands. Slopes are 3 to 12 percent.

Britwater soils are geographically associated with Peridge and Razort soils. Peridge soils, which are on adjacent similar landscapes, have a fine-silty control section and contain less gravel. Razort soils, which are on adjacent lower lying flood plains, have an argillic horizon that is brown and contains less clay.

Typical pedon of Britwater gravelly silt loam, 3 to 8 percent slopes, in a pasture NW1/4SE1/4SW1/4 sec. 31, T. 21 N., R. 18 W.

Ap—0 to 7 inches; brown (10YR 4/3) gravelly silt loam; moderate medium granular structure; friable; many roots; about 15 percent chert gravel up to 3 inches across; medium acid; clear smooth boundary.

B1—7 to 12 inches; reddish brown (5YR 4/4) gravelly silt loam; weak medium subangular blocky structure; friable; common fine and medium roots; many fine and medium pores; thin patchy clay films; about 20 percent chert gravel; medium acid; clear smooth boundary.

B21t—12 to 19 inches; yellowish red (5YR 4/6) gravelly silty clay loam; moderate medium subangular blocky structure; friable; common fine and medium roots; many fine and medium pores; thin continuous clay films; about 20 percent chert gravel; strongly acid; gradual smooth boundary.

B22t—19 to 34 inches; yellowish red (5YR 4/8) gravelly silty clay loam; moderate medium subangular blocky structure; firm; common fine and medium roots; many fine and medium pores; thin continuous clay films; about 25 percent chert gravel; common dark stains on peds; strongly acid; gradual smooth boundary.

B23t—34 to 50 inches; red (2.5YR 4/6) very gravelly clay loam; moderate medium subangular blocky structure; firm; few small dark concretions; few fine roots; few fine pores; thin continuous clay films; about 45 percent chert gravel; dark coatings on a few peds; medium acid; gradual smooth boundary.

B24t—50 to 72 inches; red (2.5YR 4/6) very gravelly silty clay; moderate fine subangular blocky structure; firm; few fine roots; few fine pores; medium continuous clay films; about 65 percent chert gravel up to 4 inches across; few small dark concretions; strongly acid.

Solum thickness ranges from 60 to more than 80 inches. Reaction is medium acid or strongly acid throughout.

The thickness of the A horizon ranges from 5 to 8 inches. The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 3. The content of gravel ranges from 10 to 20 percent.

The B1 horizon, where present, ranges from 3 to 7 inches thick. It has hue of 10YR, 7.5YR, or 5YR; value of 4 or 5 and chroma of 4. 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 hue of 7.5YR, value of 5, and chroma of 6. Texture is gravelly silty clay loam or gravelly clay loam. The content of gravel ranges from 15 to 30 percent.

The B22t horizon has hue of 5YR or 2.5YR, value of 4, and chroma of 6 or 8. Texture is very gravelly silty clay loam, very gravelly clay loam, gravelly silty clay loam, or gravelly clay loam. The content of gravel ranges from 25 to 45 percent.

The B23t and B24t horizons have hue of 2.5YR or 5YR, value of 4, and chroma of 6. Texture is very gravelly clay, very gravelly silty clay, very gravelly silty clay loam, or very gravelly clay loam. The content of gravel ranges from 35 to 70 percent.

Cane series

The Cane series consists of deep, moderately well drained soils that formed in residuum from sandstone. Permeability is moderate above the fragipan and slow in the fragipan. These soils are gently sloping to moderately sloping. They are on uplands. Slopes are 3 to 12 percent.

Cane soils are geographically associated with Linker, Mountainburg, and Noark soils. Linker and Noark soils, which are on adjacent similar landscapes, do not have a fragipan. Mountainburg soils, which are on adjacent steeper complex slopes, are less than 20 inches deep to bedrock.

Typical pedon of Cane loam, 3 to 8 percent slopes, in a pasture NW1/4SE1/4SE1/4 sec. 1, T. 17 N., R. 20 W.

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

B1—8 to 16 inches; yellowish brown (10YR 5/6) loam; weak medium subangular blocky structure; friable; common medium and fine roots; thin patchy clay films on faces of peds; strongly acid; clear smooth boundary.

B21t—16 to 43 inches; yellowish red (5YR 5/8) clay loam; moderate medium subangular blocky structure; firm; common medium pores; thin continuous clay films on faces of peds and in pores; strongly acid; clear wavy boundary.

Bx1—43 to 53 inches; red (2.5YR 4/8) clay loam with gray (10YR 6/1) sandy streaks; weak medium prismatic structure, parting to moderate medium angular blocky; firm, about 60 percent of volume is brittle; common medium to coarse tubular pores; thin continuous clay films on faces of peds and pore walls; tongues of pale brown sandy material between prisms; strongly acid; clear wavy boundary.

Bx2—53 to 72 inches; red (2.5YR 4/6) clay loam with gray (10YR 6/1) sandy streaks; moderate medium prismatic structure, parting to moderate medium to coarse tubular and vesicular pores; thin continuous clay films on faces of peds and on pore walls; tongues of pale brown sandy material between prisms; strongly acid.

Solum thickness ranges from 60 to 90 inches. Depth to the fragipan ranges from 36 to 50 inches. Except where limed, reaction is medium acid or slightly acid in the A horizon and is very strongly acid or strongly acid in the B horizon.

Thickness of the A horizon ranges from 4 to 10 inches. The A horizon 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 B1 horizon has hue of 10YR, value of 5, and chroma of 6, or hue of 7.5YR, value of 5, and chroma of 6. The content of sandstone gravel ranges from 0 to 10 percent.

The B2t horizon has hue of 2.5YR with value of 3 and chroma of 6 or with value of 4 and chroma of 6 or 8, or hue of 5YR with value of 4 or 5 and chroma of 6 or 8. The lower part is mottled with strong brown in some pedons. Texture is clay loam or sandy clay loam. The content of sandstone ranges from 0 to 15 percent.

The Bx horizon is mottled in hue of 2.5YR, value of 4, and chroma of 6 or 8, or hue of 7.5YR, value of 5, and chroma of 6 or 8, with streaks, seams, and mottles with hue of 10YR, value of 5 or 6, and chroma of 1, 2, or 3. Texture is clay loam or loam.

These soils are considered taxadjuncts because the fragipan is deeper than defined in the series. This difference does not affect the use and management.

Captina series

The Captina series consists of moderately deep and deep, moderately well drained, slowly permeable soils that formed in loamy material overlying limestone. These soils are nearly level to gently sloping. They are on broad uplands and stream terraces. Slopes are 1 to 8 percent.

Captina soils are geographically associated with Nixa, Noark, and Samba soils. Nixa soils, which are on adjacent ridgetops, are very cherty throughout and have a loamy-skeletal control section. Noark soils, which are on adjacent side slopes and ridgetops, do not have a fragipan. Samba soils, which are in depressions, are poorly drained and do not have a fragipan.

Typical pedon of Captina silt loam, 1 to 3 percent slopes, in a pasture NE1/4SW1/4NW1/4 sec. 16, T. 19 N., R. 19 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam; moderate fine granular structure; friable; many roots; slightly acid; clear smooth boundary.

B2t—7 to 20 inches; strong brown (7.5YR 5/6) silty clay loam; moderate medium subangular blocky structure; friable; common roots; many fine pores; thin continuous clay films on faces of peds and pore walls; strongly acid; abrupt wavy boundary.

Bx1—20 to 25 inches; mottled strong brown (7.5YR 5/8), light brownish gray (10YR 6/2), and yellowish red (5YR 4/8) silty clay loam; weak medium angular blocky structure; firm, brittle; few fine pores; thin continuous clay films on faces of peds and pore walls; strongly acid; abrupt wavy boundary.

Bx2—25 to 40 inches; mottled gray (10YR 6/1) and strong brown (7.5YR 5/6) silty clay loam; weak coarse prismatic structure parting to moderate medium platy; firm, 65 percent of mass is brittle; few fine roots; few fine vesicular pores; thin continuous clay films on faces of peds and pore walls; approxi-

mately 5 percent chert fragments; extremely acid; abrupt wavy boundary.

R and C—40 to 45 inches; about 95 percent rippable cherty limestone; cracks and crevices filled with yellowish brown (10YR 5/6) and yellowish red (5YR 4/8) silty clay loam; structure determined by shape of bedrock crevices; firm; thin continuous clay films on faces of peds and lining rock crevice faces; strongly acid.

Depth to the fragipan ranges from 16 to 28 inches. Solum thickness ranges from 36 to 72 inches. Reaction ranges from slightly acid to strongly acid in the A horizon and from strongly acid to extremely acid in the B horizon.

The A horizon ranges from 5 to 10 inches thick. The Ap horizon has hue of 10YR with value of 4 and chroma of 2 or 3 or with value of 5 and chroma of 3 or 4.

Some pedons have a B1 horizon with hue of 10YR, value of 5, and chroma of 4 or 6.

The B2t horizon has hue of 10YR or 7.5YR, value of 5, and chroma of 6. Texture is silt loam or silty clay loam.

The Bx horizon is mottled yellowish brown, strong brown, and shades of gray and red. Texture is silt loam or silty clay loam. The content of chert ranges from 0 to 5 percent in the Bx1 horizon and from 5 to 50 percent in the Bx2 horizon.

In most pedons, an R and B or R and C horizon of rippable cherty limestone with cracks and crevices filled with red and brown silty clay loam or silty clay underlies the Bx horizon.

Clarksville series

The Clarksville series consists of deep, somewhat excessively drained, moderately rapidly permeable, very cherty soils that formed in residuum from cherty limestone. These soils are steep. They are on hillsides. Slopes are 20 to 50 percent.

Clarksville soils are geographically associated with Arkana, Moko, Nixa, and Noark soils. Arkana soils, which are on adjacent lower elevations, are less than 45 inches deep to bedrock and have a very fine control section. Moko soils, which are on lower hilltops and side slopes, are less than 20 inches deep to bedrock and lack an argillic horizon. Nixa soils, which are on adjacent higher ridgetops, have a fragipan. Noark soils, which are on adjacent similar landscapes, have a clayey-skeletal control section.

Typical pedon of Clarksville very cherty silt loam, 20 to 50 percent slopes, in a wooded area SE1/4NE1/4SE1/4 sec. 27, T. 20 N., R 19 W.

O1—1 inch to 0; partially decomposed hardwood leaves and twigs.

A1—0 to 2 inches; dark brown (10YR 3/3) very cherty silt loam; moderate medium granular structure; friable; many roots; 70 percent chert fragments; slightly acid; clear wavy boundary.

A2—2 to 11 inches; brown (10YR 5/3) very cherty silt loam; weak medium granular structure; friable; many roots; 70 percent chert fragments; slightly acid; gradual wavy boundary.

B1—11 to 18 inches; yellowish brown (10YR 5/6) very cherty silt loam; weak medium subangular blocky structure; friable; common roots; thin patchy clay films; 80 percent chert fragments; strongly acid; gradual wavy boundary.

B21t—18 to 42 inches; strong brown (7.5YR 5/6) very cherty silt loam; weak medium subangular blocky structure; friable; common roots; thin patchy clay films; 75 percent chert fragments; very strongly acid; gradual wavy boundary.

B22t—42 to 72 inches; light brown (7.5YR 6/4) very cherty silt loam; weak medium subangular blocky structure; friable; few roots; thin patchy clay films; 70 percent chert fragments; very strongly acid.

Solum thickness ranges from 60 to more than 72 inches. Reaction is strongly acid or very strongly acid throughout except where the surface layer has been limed.

Thickness of the A horizon ranges from 7 to 18 inches. 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 or 3. The content of chert ranges from 65 to 90 percent.

Some pedons have a B1 horizon with hue of 10YR, value of 5, and chroma of 3, 4, or 6. The B21t horizon has hue of 7.5YR values of 5 or 6, and chroma of 4 or 6. It is very cherty silt loam or very cherty silty clay loam and is mottled with brown or pale brown in some pedons. The B22t horizon has hue of 7.5YR, 5YR, or 2.5YR; value of 4, 5, or 6; and chroma is 4 or 6. Texture is 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.

Enders series

Enders series consists of deep, well drained, very slowly permeable soils. The A horizon formed in loamy colluvium. The B horizon formed in residuum from acid shale. These soils are gently sloping to steep. They are on mountainsides, hillsides, and ridges. Slopes are 3 to 40 percent.

Enders soils are geographically associated with Mountainburg and Nella soils. Mountainburg soils, which are on ridgetops and ledges, are less than 20 inches deep to bedrock. Nella soils, which are in colluvial positions on side slopes, have a fine-loamy control section.

Typical pedon of Enders stony loam from an area of Enders-Nella complex, 8 to 20 percent slopes, in a

wooded area SE1/4NW1/4SW1/4 sec. 14, T. 18 N., R. 21 W.

O1—1 inch to 0; hardwood leaves and twigs.
A11—0 to 2 inches; dark brown (10YR 3/3) stony loam; moderate medium granular structure; very friable; many roots; 30 percent sandstone fragments 10 inches to 3 feet across; slightly acid; clear wavy boundary.
A12—2 to 6 inches; brown (10YR 5/3) stony loam; moderate medium granular structure; friable; common roots; 25 percent sandstone fragments 10 inches to 3 feet across; strongly acid; clear smooth boundary.
B21t—6 to 9 inches; yellowish red (5YR 4/8) silty clay; moderate medium and fine subangular blocky structure; firm, slightly plastic; common roots; many medium and fine tubular pores; thin continuous clay films on faces of peds and pore walls; 10 percent sandstone fragments 10 inches to 2 feet across; very strongly acid; gradual smooth boundary.
B22t—9 to 22 inches; red (2.5YR 4/6) clay; moderate medium and fine subangular blocky structure; firm, plastic when moist; few fine roots; few fine tubular pores; thick continuous clay films on faces of peds and pore walls; very strongly acid; gradual smooth boundary.
B23t—22 to 47 inches; mottled red (2.5YR 4/6), yellowish brown (l0YR 5/6), and pale brown (10YR 6/3) clay; moderate fine angular blocky structure; firm, plastic when moist; few roots; few fine tubular pores; thick continuous clay films on faces of peds; few soft dark concretions; few slickensides; very strongly acid; gradual smooth boundary.
Cr—47 to 53 inches; dark gray weathered, rippable shale; gradual smooth boundary.
R—53 inches; dark gray, rippable shale.

Solum thickness ranges from 36 to 58 inches. Depth to bedrock ranges from 40 to more than 62 inches. Reaction ranges from strongly acid to extremely acid throughout, except where the A horizon has been limed.

Thickness of the A horizon ranges from 4 to 8 inches. The A11 horizon has hue of 10YR, value of 3, and chroma of 2 or 3. Texture is gravelly loam or stony loam. The A12 horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. An Ap horizon in cultivated areas is 4 to 7 inches thick, with hue of 10YR, value of 5, and chroma of 3. Texture is gravelly loam or stony loam. In the A horizon, fragments greater than 3 inches in size make up 20 to 35 percent of the volume.

The B1 horizon, where present, has hue of 7.5YR, value of 5, and chroma of 6. Texture is gravelly loam or gravelly silt loam. The B21t and B22t horizons have hue of 5YR or 2.5YR, value of 4, and chroma of 6 or 8. Texture is silty clay or clay. The content of sandstone fragments ranges from 0 to 15 percent. The B23t horizon has hue of 2.5YR, value of 4, and chroma of 6 to 8, and is mottled with shades of brown and gray. The content of sandstone fragments ranges from 0 to 10 percent.

Gassville series

The Gassville series consists of moderately deep, well drained, very slowly permeable soils formed in silty and clayey residuum from limestone. These soils are gently sloping to moderately steep. They are on uplands. Slopes are 3 to 20 percent.

Gassville soils are geographically associated with Arkana, Moko, and Nixa soils. Arkana soils, which are on adjacent similar landscapes, have more than 35 percent base saturation in at least the lower part of the argillic horizon. Moko soils, which are also on adjacen similar landscapes, are less than 20 inches deep to bedrock and do not have an argillic horizon. Nixa soils, which are on adjacent higher lying ridgetops, have a fragipan and a loamy-skeletal control section.

Typical pedon of Gassville very cherty silt loam, 8 to 20 percent slopes, in a pasture SW1/4SW1/4NE1/4 sec. 3, T. 20 N., R. 20 W.

A1—0 to 3 inches; dark brown (10YR 3/3) very cherty silt loam; moderate medium granular structure; friable; many fine and medium roots; about 40 percent chert fragments; slightly acid; clear wavy boundary.
A2—3 to 10 inches; dark brown (10YR 4/3) very cherty silt loam; moderate medium granular structure; friable; many fine and medium roots; about 55 percent chert fragments; slightly acid; clear wavy boundary.
B21t—10 to 17 inches; yellowish red (5YR 5/6) cherty clay; moderate fine subangular blocky structure; firm; common fine and medium roots; thin continuous clay films on faces of peds; about 25 percent chert fragments; strongly acid; gradual smooth boundary.
B22t—17 to 28 inches; yellowish red (5YR 5/8) clay; moderate medium subangular blocky structure; firm; few fine roots; thin continuous clay films on faces of peds; about 10 percent chert fragments; strongly acid; gradual smooth boundary.
B23t—28 to 38 inches; mottled red (2.5YR 4/6), yellowish red (5YR 5/6), and strong brown (7.5YR 5/6) clay; moderate medium subangular blocky structure; firm; few fine roots; thin continuous clay films on faces of peds; about 5 percent chert fragments; very strongly acid; abrupt wavy boundary.
Cr—38 to 50 inches; weathered, rippable siltstone; gradual smooth boundary.
R—50 inches; hard siltstone.

The solum thickness ranges from 30 to 40 inches. Depth to hard rock ranges from 40 to 60 inches. Reaction is strongly acid to slightly acid in the A horizon and very strongly acid or strongly acid in the B horizon.

Thickness of the A horizon ranges from 7 to 14 inches. The A1 horizon has hue of 10YR, value of 3, and chroma of 2 or 3. The content of chert ranges from 35 to 70 percent. The A2 horizon has hue of 10YR, value of 4 or 5, and chroma of 3. The content of chert ranges from 35 to 70 percent.

The B21t horizon has hue of 5YR, value of 5, and chroma of 6 or 8; or hue of 7.5YR, value of 5, and chroma of 6. Texture is clay or cherty clay. The content of chert ranges from 5 to 30 percent. The B22t horizon has hue of 2.5YR, value of 4, and chroma of 6 to 8; or hue of 5YR, value of 4, and chroma of 6 or with value of 5 and chroma of 8. Texture is clay or cherty clay. The content of chert ranges from 5 to 25 percent. The B23t horizon is mottled in hue of 5YR, value of 5, and chroma of 6 or 8; hue of 2.5YR, value of 4, and chroma of 6 or 8; or hue of 7.5YR, value of 5, and chroma of 6.

The Cr horizon is weathered, rippable siltstone 12 to 24 inches thick.

The R horizon is siltstone, shale, or limestone.

Leadvale series

The Leadvale series consists of deep, moderately well drained, slowly permeable soils that formed in residuum from sandstone and siltstone. These soils are nearly level to gently sloping. They are on mountaintops and plateaus. Slopes are 1 to 8 percent.

Leadvale soils are geographically associated with Linker and Mountainburg soils. Linker soils, which are on adjacent similar landscapes, do not have a fragipan. Mountainburg soils, which are on adjacent steeper complex slopes, are less than 20 inches deep to bedrock.

Typical pedon of Leadvale silt loam, 3 to 8 percent slopes, in a pasture NW1/4NE1/4SW1/4 sec. 7, T. 17 N., R 21 W.

Ap—0 to 7 inches; brown (10YR 5/3) silt loam; moderate medium subangular blocky structure; friable; many roots; medium acid; clear smooth boundary

B21t—7 to 14 inches; yellowish brown (10YR 5/6) silt loam; weak medium subangular blocky structure; friable; common roots; many fine and medium tubular pores; thin patchy clay films on faces of peds and pore walls; strongly acid; gradual smooth boundary.

B22t—14 to 21 inches; strong brown (7.5YR 5/6) silty clay loam; moderate medium subangular blocky structure; firm; common roots; many fine and medium tubular pores; thin continuous clay films on faces of peds and pore walls; strongly acid; clear wavy boundary.

Bx1—21 to 29 inches; mottled strong brown (7.5YR 5/6), yellowish red (5YR 5/6), red (2.5YR 5/6), and grayish brown (10YR 5/2) silty clay loam; weak coarse prismatic structure parting to moderate medium angular blocky; firm, 60 percent by volume compact and brittle; few roots; few medium tubular and vesicular pores; thin continuous clay films on faces of peds and pore walls; very strongly acid; gradual smooth boundary.

Bx2—29 to 50 inches; mottled strong brown (7.5YR 5/6), grayish brown (10YR 5/2), and dark red (2.5YR 3/6) silty clay loam; weak coarse prismatic structure parting to moderate medium angular blocky; firm, 70 percent by volume compact and brittle; few roots; common medium to coarse vesicular and tubular pores; thin continuous clay films on faces of peds and pore walls; very strongly acid; abrupt wavy boundary.

R—50 inches; siltstone that is rippable in the upper 20 inches and is hard below.

Solum thickness ranges from 48 to more than 72 inches. Reaction is very strongly acid or strongly acid throughout, except where the surface layer has been limed. Depth to the fragipan ranges from 16 to 30 inches.

Thickness of the A horizon ranges from 5 to 10 inches. The Ap horizon has hue of 10YR, value of 4, 5, or 6, and chroma of 3.

Some pedons have a thin B1 horizon with similar color and texture as the B2t horizon.

The B2t horizon has hue of 10YR or 7.5YR, value of 5, and chroma of 6 or 8. Texture is silt loam or silty clay loam.

The dominant color of the Bx horizon is hue of 7.5YR, value of 5, and chroma of 6 or 8. It is mottled with shades of gray and red. Texture is silt loam or silty clay loam.

Some pedons have a B3 horizon below the Bx horizon. It is silty clay loam, silty clay, and clay that is mottled in shades of brown, red, and gray.

Linker series

The Linker series consists of moderately deep, well drained, moderately permeable soils that formed in residuum from acid sandstone. These soils are gently sloping to moderately steep. They are on mountaintops and ridgetops. Slopes are 3 to 15 percent.

Linker soils are geographically associated with Cane, Mountainburg, and Leadvale soils. Cane and Leadvale soils, which are on adjacent similar landscapes, have a fragipan. Mountainburg soils, which are on adjacent steeper complex slopes, are less than 20 inches deep to bedrock.

Typical pedon of Linker fine sandy loam, 3 to 8 percent slopes, in a meadow SE1/4NE1/4NE1/4 sec. 13, T. 18 N., R. 21 W.

A1—0 to 4 inches; dark grayish brown (10YR 4/2) fine sandy loam; weak medium granular structure; very friable; common fine and medium roots; medium acid; clear smooth boundary.

A2—4 to 10 inches; brown (10YR 5/3) fine sandy loam; moderate medium granular structure; friable; common fine and medium roots; medium acid; clear smooth boundary.
B2t—10 to 27 inches; yellowish red (5YR 5/6) sandy clay loam; moderate medium subangular blocky structure; friable; few fine roots; thin patchy clay films on faces of peds; very strongly acid; clear wavy boundary.
B3—27 to 32 inches; mottled yellowish red (5YR 5/6), strong brown (7.5YR 5/6), red (2.5YR 4/6), and pale brown (10YR 6/3) sandy clay loam; moderate medium subangular blocky structure; friable; thin patchy clay films on faces of peds; very strongly acid; abrupt wavy boundary.
R—32 inches; level bedded sandstone. The sandstone is rippable in the upper 8 inches and is hard below.

Solum thickness ranges from 20 to 40 inches. Reaction ranges from extremely acid to strongly acid throughout, except where the surface layer has been limed.

Thickness of the A horizon ranges from 4 to 10 inches. The A horizon has hue of 10YR with value of 4 or 5 and chroma of 3 or with value of 4 and chroma of 2 or 4, or hue of 7.5YR with value of 5 and chroma of 4. Texture is fine sandy loam, loam, or gravelly fine sandy loam. The content of sandstone ranges from 0 to 25 percent.

The B1 horizon, where present, has hue of 5YR, value of 4 or 5, and chroma of 6 or 8, or hue of 7.5YR, value of 5, and chroma of 6. 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 with shades of brown and red in some pedons. The content of sandstone of the B1 and B2t horizons ranges from 0 to 10 percent.

Moko series

The Moko series consists of shallow, well drained, moderately permeable soils that formed in residuum from limestone. These soils are gently sloping to steep and are on hillsides, mountainsides, and ridges. Slopes are 3 to 50 percent.

Moko soils are geographically associated with Arkana, Boden, Boden Variant, Clarksville, and Gassville soils and Rock outcrop. Arkana soils, which are on adjacent similar landscapes, are more than 20 inches deep to bedrock and have an argillic horizon. Boden and Boden Variant soils, which are on lower lying hillsides, are more than 20 inches deep to bedrock and have an argillic horizon. Clarksville soils, which are on higher lying hillsides, are more than 60 inches deep to bedrock. Gassville soils, which are on adjacent similar landscapes, are more than 20 inches deep to bedrock and have an argillic horizon.

Typical pedon of Moko very stony silt loam from an area of Arkana-Moko complex, 3 to 8 percent slopes, NE1/4SE1/4NW1/4 sec. 17, T. 21 N., R. 19 W.

A11—0 to 5 inches; black (10YR 2/1) very stony silt loam; moderate fine granular structure; friable; many roots; 40 percent chert and limestone fragments; neutral; gradual smooth boundary.
A12—5 to 11 inches; black (10YR 2/1) very stony silt loam; weak medium subangular blocky structure; friable; common roots; many pores; 65 percent chert and limestone fragments; neutral; abrupt smooth boundary.
R—11 inches; hard dolomitic limestone.

Solum thickness and depth to bedrock ranges from 6 to 20 inches. Reaction is neutral or mildly alkaline throughout. The content of chert fragments ranges from 10 to 25 percent by volume. The content of limestone fragments more than 3 inches in diameter ranges from 25 to 60 percent by volume.

Thickness of the A horizon ranges from 6 to 20 inches. The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2.

The R horizon is level bedded limestone or dolomitic limestone that in many places is fractured with few to common cracks which are filled with A horizon material.

Mountainburg series

The Mountainburg series consists of shallow, well drained, moderately rapidly permeable soils that formed in residuum from acid sandstone. These soils are gently sloping to steep. They are on uplands. Slopes are 3 to 40 percent.

Mountainburg soils are geographically associated with Enders, Leadvale, Linker, and Nella soils. Enders soils, which are on adjacent side slopes, have a clayey control section and are more than 20 inches deep to bedrock. Leadvale soils, which are on plateaus and mountaintops, have a fragipan and are more than 20 inches deep to bedrock. Linker soils, which are on benches and mountaintops, are nonskeletal and are more than 20 inches deep to bedrock. Nella soils, which are in colluvial positions on side slopes, have a fine-loamy control section and are more than 20 inches deep to bedrock.

Typical pedon of Mountainburg very stony fine sandy loam from an area of Mountainburg very stony fine sandy loam, 3 to 8 percent slopes, in a wooded area SE1/4NE1/4SE1/4 sec. 14, T. 18 N., R. 22 W.

O1—1 inch to 0; hardwood leaves and twigs.
A1—0 to 1 inch; very dark grayish brown (10YR 3/2) very stony fine sandy loam, moderate medium granular structure; very friable; many roots; 60 percent sandstone fragments up to 2 feet across; medium acid; abrupt irregular boundary.

A2—1 inch to 7 inches; brown (10YR 4/3) very stony fine sandy loam, moderate medium granular structure; friable; many roots; 50 percent sandstone fragments up to 2 feet across; medium acid; clear irregular boundary.

B21t—7 to 12 inches; yellowish brown (10YR 5/6) very stony loam; weak medium subangular blocky structure; friable; common roots; many medium tubular pores; thin patchy clay films on faces of peds and pore walls; 50 percent sandstone fragments; strongly acid; clear smooth boundary.

B22t—12 to 17 inches; strong brown (7.5YR 5/6) very stony loam; moderate medium subangular blocky structure; firm; common roots; many tubular pores; thin patchy clay films; 50 percent sandstone fragments less than 15 inches across; very strongly acid; abrupt smooth boundary.

R—17 inches; sandstone. The sandstone is rippable in the upper 5 inches and is hard below.

Solum thickness ranges from 12 to 20 inches. Reaction is strongly acid or medium acid in the A horizon, and strongly acid or very strongly acid in the B2t horizon.

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

The thickness of the A horizon ranges from 4 to 11 inches. The A1 horizon has hue of 10YR, value of 3, and chroma of 2 or 3.

The A2 horizon has hue of 10YR with value of 5 and chroma of 3 or 4 or with value of 4 and chroma of 3. Texture is very gravelly fine sandy loam or very stony fine sandy loam. The content of coarse fragments in the A horizon ranges from 35 to 60 percent.

The B2t horizon has hue of 10YR or 7.5YR, value of 5, and chroma of 6 or hue of 5YR, value of 4, and chroma of 8. Texture is fine sandy loam, loam, or sandy clay loam. The content of coarse fragments ranges from 35 to 50 percent.

The R horizon is horizontally bedded sandstone. The sandstone is rippable in the upper 4 to 12 inches and is hard below.

Nella series

The Nella series consists of deep, well drained, moderately permeable soils formed in colluvium from acid sandstone and shale. The soils are moderately sloping to steep and are on mountainsides and hillsides. Slopes are 8 to 40 percent. These soils occur only as small and intermingled areas with Enders and Mountainburg soils in a complex.

Nella soils are geographically associated with Enders and Mountainburg soils. Enders soils, which are on crest and side slopes, have a clayey control section. Mountainburg soils, which are on steep ridgetops and side slopes, are less than 20 inches deep to bedrock.

Typical pedon of Nella stony loam from an area of Enders-Nella complex, 8 to 20 percent slopes, in a wooded area SW1/4NW1/4NE1/4 sec. 34. T. 18 N., R. 21 W.

A1—0 to 1 inch; brown (10YR 4/3) stony loam; moderate medium granular structure; very friable; many fine roots; approximately 30 percent sandstone fragments up to 1 foot across; strongly acid; abrupt wavy boundary.

A2—1 inch to 9 inches; yellowish brown (10YR 5/4) stony loam; weak medium granular structure; friable; many fine roots; approximately 30 percent sandstone fragments up to 1 foot across; strongly acid; gradual wavy boundary.

B1—9 to 15 inches; strong brown (7.5YR 5/6) stony loam; weak medium subangular blocky structure; friable; common fine roots; approximately 30 percent sandstone fragments; strongly acid; gradual wavy boundary.

B21t—15 to 29 inches; red (2.5YR 4/6) stony clay loam; moderate medium subangular blocky structure; firm; common fine roots; thin continuous clay films on faces of peds; approximately 15 percent sandstone fragments; very strongly acid; gradual wavy boundary.

B22t—29 to 44 inches; mottled yellowish red (5YR 4/6), strong brown (7.5YR 5/6), and red (2.5YR 4/6) stony clay loam; moderate medium subangular blocky structure; firm; few fine roots; thin continuous clay films on faces of peds; few streaks and pockets of light brownish gray; approximately 15 percent sandstone fragments; very strongly acid; gradual wavy boundary.

B23t—44 to 72 inches; mottled dark red (2.5YR 3/6), strong brown (7.5YR 5/8), and light brownish gray (10YR 6/2) stony clay loam; moderate medium subangular blocky structure; firm; few medium roots; thin continuous clay films on faces of peds; approximately 25 percent sandstone fragments; very strongly acid.

Solum thickness ranges from 60 to more than 80 inches. Depth to bedrock is 6 to 10 feet. Reaction is very strongly acid or strongly acid throughout, except where the surface horizon has been limed.

Thickness of the A horizon ranges from 6 to 11 inches. The A1 horizon has hue of 10YR, value of 4, and chroma of 2 or 3. It ranges from 1 to 3 inches thick. The A2 horizon has hue of 10YR with value of 4 or 5 and chroma of 3 or with value of 5 and chroma of 4. The content of sandstone ranges from 10 to 35 percent in the A horizon.

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. 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 pedons, the middle and lower parts are mottled in shades of red, brown, and gray. Texture is sandy clay loam, silty clay loam, clay loam, and in some pedons, clay in the lower part. 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 soils that formed in residuum from cherty limestone. These soils are gently sloping to moderately sloping. They are on uplands. Slopes are 3 to 12 percent.

Nixa soils are geographically associated with Captina, Clarksville, Gassville, and Noark soils. Captina soils, which are on adjacent broad upland flats, do not contain chert in the A horizon and have a fine-silty control section. Clarksville soils, which are on adjacent lower hillsides, do not have a fragipan. Gassville soils, which are on lower lying ridges and hillsides, do not have a fragipan and have a clayey control section. Noark soils, which are on similar landscapes, do not have a fragipan.

Typical pedon of Nixa very cherty silt loam, 3 to 8 percent slopes, in a pasture NE1/4NE1/4SE1/4 sec. 14, T. 19 N., R. 19 W.

A1—0 to 5 inches; dark grayish brown (10YR 4/2) very cherty silt loam; weak medium granular structure; friable; many fine and medium roots; about 60 percent chert fragments; medium acid; clear smooth boundary.

A2—5 to 13 inches; grayish brown (10YR 5/2) very cherty silt loam; weak medium subangular blocky structure; friable; common fine roots; about 65 percent chert fragments; medium acid; clear smooth boundary.

B1—13 to 18 inches; yellowish brown (10YR 5/6) very cherty silt loam; moderate medium subangular blocky structure; firm; few fine roots; thin patchy clay films; common tubular pores; about 70 percent chert fragments; very strongly acid; clear wavy boundary.

Bx—18 to 36 inches; mottled strong brown (7.5YR 5/6) and pale brown (10YR 6/3) very cherty silt loam; moderate medium subangular blocky structure; firm; about 65 percent is brittle; common vesicular pores; thin patchy clay films; about 75 percent chert fragments; very strongly acid; gradual wavy boundary.

Cr&B—36 to 72 inches; about 75 percent is rippable cherty limestone; cracks and crevices are filled with mottled dark red (2.5YR 3/6) and strong brown (7.5YR 5/6) clay; moderate medium subangular blocky structure; firm; many vesicular pores; thin patchy clay films; very strongly acid.

Depth to the fragipan is 14 to 22 inches. Depth to the Cr&B horizon is 30 to 40 inches and depth to consolidated bedrock is over 60 inches. Reaction is strongly acid or very strongly acid throughout, except where the surface horizon has been limed.

Thickness of the A horizon ranges from 6 to 13 inches. An Ap horizon in cultivated areas has hue of 10YR, value of 4 or 5, and chroma of 3. The A1 horizon has hue of 10YR, value of 3 or 4, and chroma of 2. The A2 horizon has hue of 10YR, value of 5, and chroma of 2 or 3, or value of 6 and chroma of 3. The content of chert of the A horizon ranges from 45 to 70 percent.

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

Some pedons contain an A'2 horizon that has hue of 10YR, value of 6, and chroma of 3. It is very cherty silt loam.

The Bx horizon is mottled in hue of 10YR, value of 5 or 6, and chroma of 2, 3, 4, or 6; or hue of 7.5YR, value of 5, and chroma of 6. Texture is very cherty silt loam or very cherty silty clay loam.

The Cr&B horizon is chert beds with yellowish brown, yellowish red, or red silty clay loam, silty clay, or clay in cracks and crevices. The content of chert ranges from 45 to 70 percent in the B horizon and 40 to 80 percent in the Bx horizon.

Noark series

The Noark series consists of deep, well drained, moderately permeable soils that formed in residuum from cherty limestone. These soils are gently sloping to steep. They are on uplands. Slopes are 3 to 40 percent.

Noark soils are geographically associated with Boden, Boden Variant, Cane, Captina, Clarksville, Nixa, and Portia soils. Boden and Boden Variant soils, which are on adjacent lower hillsides, have a clayey control section. Cane, Captina, and Nixa soils, which are on adjacent similar landscapes, have a fragipan. Clarksville soils, which are on adjacent similar landscapes, have a loamy-skeletal control section. Moko soils, which are on lower hillsides and ridges, are less than 20 inches deep to bedrock and do not have an argillic horizon. Portia soils which are on adjacent upland landscapes, have a fine-loamy control section.

Typical pedon of Noark very cherty silt loam, 3 to 8 percent slopes, in a wooded area SW1/4NE1/4SW1/4 sec. 31, T. 19 N., R. 20 W.

A1—0 to 3 inches; dark grayish brown (10YR 4/2) very cherty silt loam; moderate medium granular structure; friable; many fine and medium roots; few fine pores; about 40 percent chert fragments; medium acid; abrupt smooth boundary.

A2—3 to 14 inches; brown (10YR 5/3) very cherty silt loam; weak medium subangular blocky structure; friable; many fine and medium roots; few fine pores; about 50 percent chert fragments; strongly acid; clear wavy boundary.

B1—14 to 22 inches; yellowish red (5YR 4/6) very cherty silty clay loam; moderate medium subangular blocky structure; friable; few fine roots; few fine pores; thin patchy clay films; about 60 percent chert fragments; very strongly acid; clear smooth boundary.

B21t—22 to 35 inches; red (2.5YR 4/8) very cherty clay; moderate medium subangular blocky structure; firm; few fine pores; thin continuous clay films; about 35 percent chert fragments; very strongly acid; clear smooth boundary.

B22t—35 to 72 inches; dark red (2.5YR 3/6) very cherty clay; few medium distinct strong brown (7/5YR 5/6) mottles; moderate medium angular blocky structure; firm; few fine pores; thin continuous clay films; about 60 percent chert fragments; very strongly acid.

Solum thickness ranges from 60 to more than 80 inches. Reaction ranges from strongly acid to slightly acid in the A horizon and is very strongly acid or strongly acid in the B horizon.

Thickness of the A horizon ranges from 8 to 18 inches. The Ap horizon, where present, has hue of 10YR, value of 3 or 4, and chroma of 2 or 4. The A1 horizon has hue of 10YR with value of 4 and chroma of 2 or 3 or with value of 3 and chroma of 3. The A2 horizon has hue of 10YR, value of 5 or 6, and chroma of 3. 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 hue of 7.5YR or 10YR, value of 5, and chroma of 6. Texture is very cherty silt loam or very cherty silty clay loam. The B21t horizon has hue of 2.5YR with value of 4 or 5 and chroma of 6 or 8 or with value of 3 and chroma of 6, or hue of 5 YR, value of 4, and chroma of 6 or 8. Texture is very cherty clay or very cherty silty clay. The B22t horizon is the same as the B21t except in some pedons it has few to common strong brown mottles. The content of chert ranges from 35 to 70 percent in the B2t horizon and 50 to 80 percent in the B22t horizon.

Peridge series

The Peridge series consists of deep, well drained, moderately permeable soils that formed in material weathered from limestone, siltstone, or old alluvium. These soils are nearly level to gently sloping and are on stream terraces and broad uplands. Slopes are 1 to 8 percent.

Peridge soils are geographically associated with Britwater and Razort soils. Britwater soils, which are on adjacent similar landscapes, have a fine-loamy control section and contain more gravel. Razort soils, which are on adjacent lower lying flood plains, have a fine-loamy control section and are brown.

Typical pedon of Peridge silt loam, 3 to 8 percent slopes, in a meadow NW1/4SW1/4SW1/4 sec. 28, T. 18 N., R. 20 W.

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

B21t—6 to 20 inches; yellowish red (5YR 4/6) silt loam; moderate medium subangular blocky structure; firm; common fine roots; thin patchy clay films on faces of peds; few fine tubular pores; medium acid; clear smooth boundary.

B22t—20 to 33 inches; mottled yellowish red (5YR 4/6), yellowish brown (10YR 5/6), and strong brown (7.5YR 5/6) silty clay loam; moderate medium subangular blocky structure; firm; common fine and medium pores; thin patchy clay films on faces of peds; common black splotches on ped faces; very strongly acid; clear smooth boundary.

B23t—33 to 52 inches; mottled red (2.5YR 4/6), pale brown (10YR 6/3), and yellowish red (5YR 5/6) silty clay; moderate medium subangular blocky structure; firm; few fine pores; thin patchy clay films on faces of peds; common black splotches on ped faces; very strongly acid; clear smooth boundary.

B24t—52 to 72 inches; mottled red (2.5YR 4/6) and yellowish red (5YR 4/6) silty clay; moderate medium angular blocky structure; firm; common fine tubular pores; thin patchy clay films on faces of peds; common black splotches on ped faces; very strongly acid.

Solum thickness is 80 inches or more. Underlying material is beds of gravelly and silty material or limestone. Reaction ranges from very strongly acid to medium acid throughout, except where the surface layer has been limed.

The A horizon ranges from 5 to 10 inches in thickness. The Ap horizon has hue of 10YR, value of 3, 4, or 5, and chroma of 3; or hue of 7.5YR, value of 4, and chroma of 4.

Some pedons have a B1 horizon 3 to 8 inches thick. It has hue of 7.5YR, value of 5, and chroma of 4 or 6, or hue of 5YR, value of 4 and chroma of 4. The B21 horizon has hue of 5YR, value of 4, and chroma of 6 or 8. Texture is silt loam or silty clay loam. The content of gravel is generally less than 5 percent. The B22t horizon has hue of 2.5YR or 5YR, value of 4, and chroma of 6 or 8, and in some pedons has mottles in shades of brown. The content of gravel is generally 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, and are mottled with hue of 10YR with value of 5 and chroma of 6 or with value of 6 and chroma of 3, and hue of 7.5YR, value of 5 or 6, and chroma of 6. 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 soils that formed in residuum from sandstone. These soils are gently sloping to moderately sloping and are on uplands. Slopes are 3 to 12 percent.

Portia soils are geographically associated with Boden, Boden Variant, and Noark soils. Boden and Boden Variant soils, which are on adjacent hillsides, have a stony surface layer and a clayey control section. Noark soils, which are on adjacent hillsides, have a clayey-skeletal control section.

Typical pedon of Portia sandy loam, 3 to 8 percent slopes, in a pasture NE1/4SW1/4NE1/4 sec. 16, T. 17 N., R. 18 W.

Ap—0 to 6 inches; brown (10YR 5/3) sandy loam; weak medium granular structure; very friable; many fine roots; medium acid; clear smooth boundary.

A2—6 to 12 inches; yellowish brown (10YR 5/4) sandy loam; weak medium subangular blocky structure; friable; many fine roots; medium acid; gradual smooth boundary.

B21t—12 to 25 inches; yellowish red (5YR 4/6) loam; weak medium subangular blocky structure; friable; common fine roots; few fine pores; thin patchy clay films on faces of peds; strongly acid; gradual smooth boundary.

B22t—25 to 50 inches; red (2.5YR 4/6) sandy clay loam; weak coarse subangular blocky structure; firm; few pores; thin patchy clay films on faces of peds; strongly acid; gradual smooth boundary.

B23t—50 to 72 inches; red (2.5YR 4/8) sandy clay loam; few medium distinct strong brown (7.5YR 5/6) mottles; weak coarse subangular blocky structure; firm; thin patchy clay films on faces of peds; strongly acid.

Solum thickness ranges from 60 to more than 80 inches. Reaction ranges from slightly acid to strongly acid in the A horizon and is strongly acid or very strongly acid in the B2t horizon.

Thickness of the A horizon ranges from 5 to 16 inches. The Ap horizon has hue of 10YR, value of 4 and chroma of 2, 3, or 4, or value of 5 and chroma of 3. The A2 horizon has hue of 10YR, value of 5, and chroma of 3 or 4.

Some pedons have a B1 horizon with hue of 7.5YR, value of 5, and chroma of 6, or hue of 5YR, value of 4 or 5, and chroma of 4. The B21t horizon has hue of 5YR, value of 4 or 5, and chroma of 6 or 8, or hue of 2.5YR, value of 4, and chroma of 6 or 8. Texture is loam or sandy clay loam. The B22t horizon has hue of 5YR, value of 4 or 5, and chroma of 6 or 8, or hue of 2.5YR, value of 4, and chroma of 6 or 8. Texture is sandy clay loam or sandy clay. The B23t horizon has hue of 5YR or 2.5YR, value of 4, and chroma of 6 or 8 with mottles in shades of brown.

Some pedons have thin, soft bands of sandstone in the lower part of the solum.

Razort series

The Razort series consists of deep, well drained, moderately permeable soils that formed in loamy alluvium on flood plains of streams. These soils are level and nearly level. Slopes are 0 to 3 percent.

Razort soils are geographically associated with Britwater, Peridge, and Samba soils. Britwater soils, which are on higher lying stream terraces, do not have so dark a surface layer as the Razort soils but have a redder subsoil. Peridge soils, which are on uplands and higher lying terraces, have a fine-silty control section and redder colors. Samba soils, which are in depressions on stream terraces and uplands, are poorly drained and have a fine control section.

Typical pedon of Razort loam from an area of Razort soils, frequently flooded, in a pasture NE1/4SE1/4SE1/4 sec. 32, T. 19 N., R. 20 W.

Ap—0 to 10 inches; dark brown (10YR 3/3) loam; moderate fine granular structure; very friable; slightly acid; gradual smooth boundary.

B1—10 to 19 inches; dark brown (7.5YR 3/2) silt loam; weak medium subangular blocky structure; friable; many fine pores; thin patchy clay films on pore walls; slightly acid; gradual smooth boundary.

B21t—19 to 49 inches; dark brown (7.5YR 4/4) silt loam; weak medium subangular blocky structure; friable; many fine pores; thin patchy clay films on faces of peds and pore walls; medium acid; clear smooth boundary.

B22t—49 to 60 inches; mottled dark brown (7.5YR 4/4) and dark yellowish brown (10YR 3/4) gravelly silt loam; weak coarse subangular blocky structure; friable; many fine pores; thin patchy clay films on faces of peds and pore walls; 20 percent chert fragments; medium acid; abrupt smooth boundary.

IIC—60 to 84 inches; dark brown (7.5YR 4/4) very gravelly clay loam; massive; firm; 80 percent chert fragments; medium acid.

Solum thickness ranges from 40 to 70 inches. Reaction is neutral or slightly acid in the A horizon and slightly acid or medium acid in the B horizon.

Thickness of the A horizon ranges from 6 to 10 inches. The A horizon has hue of 10YR, value of 3, and chroma of 3 or 4, or hue of 7.5YR, value of 3, and chroma of 2. Texture is loam or gravelly silt loam.

The B1 horizon has hue of 10YR with value of 3 and chroma of 3 or 4 or with value of 4 and chroma of 3, or hue of 7.5YR, value of 3, and chroma of 2. Texture is loam or silt loam. The B2t horizon has hue of 10YR with value of 3 and chroma of 3, with value of 4 and chroma of 3 or 4, or with value of 5 and chroma of 3, or hue of 7.5YR with value of 4 and chroma of 4 or with value of 5 and chroma of 4 or 6. Texture is silt loam, loam, or clay loam. The content of chert and gravel ranges from 0 to 25 percent by volume.

The underlying IIC horizon is stratified silty, sandy, and gravelly material.

Samba series

The Samba series consists of deep, poorly drained, very slowly permeable soils that formed in silty and clayey sediments in valley fills. These soils are level and are in depressions. Slopes are 0 to 1 percent.

Samba soils are geographically associated with Captina and Razort soils. Captina soils, which are on adjacent sloping uplands, are moderately well drained and have a fragipan. Razort soils, which are on flood plains, are well drained and have a fine-loamy control section.

Typical pedon of Samba silt loam, 0 to 1 percent slopes, in a pasture NE1/4NE1/4NE1/4 sec. 32, T. 21 N., R. 18 W.

Ap—0 to 9 inches; very dark gray (10YR 3/1) silt loam; moderate medium granular structure; friable; many medium roots; few gravel; slightly acid; clear smooth boundary.

A1—9 to 13 inches; very dark grayish brown (10YR 3/2) silt loam; moderate medium granular structure; friable; many medium roots; many fine and medium pores; few dark concretions; slightly acid; clear wavy boundary.

B21tg—13 to 20 inches; dark gray (10YR 4/1) silty clay loam; common medium distinct yellowish red (5YR 4/6) mottles; moderate medium subangular blocky structure; firm; common medium roots; few fine pores; thin continuous clay films on faces of peds; few gravel; common fine and medium black concretions; common white silt coatings on faces of peds in lower 3 inches; medium acid; clear smooth boundary.

B22tg—20 to 36 inches; dark gray (10YR 4/1) clay; many medium distinct yellowish red (5YR 4/6) mottles; moderate medium angular blocky structure; firm, slightly plastic; few fine roots; few fine pores; thin continuous clay films on faces of peds; few small black concretions; slightly acid; gradual smooth boundary.

B23tg—36 to 59 inches; grayish brown (2.5YR 5/2) clay; common medium distinct light olive brown (2.5YR 5/6) mottles; weak coarse angular blocky structure; firm, plastic; few fine roots; few fine pores; thin continuous clay films on faces of peds; few gravel; few slickensides; neutral; gradual smooth boundary.

B3g—59 to 72 inches; gray (10YR 6/1) clay; many medium distinct strong brown (7.5YR 5/6) mottles; weak fine angular blocky structure; firm, plastic; thin patchy clay films on faces of peds; few small black concretions; few gravel; neutral.

Solum thickness ranges from 60 to more than 90 inches. Reaction is slightly acid or medium acid in the A horizon and strongly acid to neutral in the B horizon.

Thickness of the A horizon ranges from 8 to 18 inches. The Ap and A1 horizons have hue of 10YR, value of 2 or 3, and chroma of 1 or 2.

The B21tg and B22tg horizons have hue of 10YR, value of 4 or 5, and chroma of 1 with brown and red mottles. Texture of the B21tg horizon is silty clay loam, silty clay, or clay. Texture of the B22tg horizon is clay or silty clay. The B23tg horizon has hue of 10YR, value of 5, and chroma of 1 or 2, or hue of 2.5YR, value of 5 or 6, and chroma of 2. It is mottled with shades of brown and red. Texture is clay or silty clay. The B3g horizon has hue of 10YR, value of 5 or 6, and chroma of 1 or 2. It is mottled with shades of brown and red.

Formation of the soils

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

Factors of soil formation

Soil is a natural, three-dimensional body on the earth's surface that supports plants and that 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.

The interaction of five main factors results in differences among the soils. These factors are the physical and chemical composition of the parent material; the climate during and after the accumulation of the parent material; the kind of plants and organisms living in the soils; the relief of the land and its effect on runoff; and the length of time needed for the soil to form (*10*).

The effect of one factor can differ from place to place, but the interaction of all the factors determines the kind of soil that forms. In the following paragraphs the factors of soil formation are discussed as they relate to the soils in the survey area.

Parent material

The hard rock parent material in Boone County is of the Ordovician, Mississippian, and Pennsylvanian periods (*7, 8*). On the Salem Plateau are Ordovician Sandstone and Dolomitic Limestone, on the Springfield Plateau is

Mississippian Cherty Limestone, and in the Boston Mountains is interbedded acid sandstone and shale of the Mississippian and Pennsylvanian periods.

The Cotter and Powell Formations are of the Ordovician period. Both are fine grained, gray dolomitic limestone. The Cotter Formation contains minor amounts of chert. Arkana, Gassville, and Moko soils formed in residuum from these formations on the Salem Plateau.

Also on the Salem Plateau and overlying the Powell Formation are the St. Peter Sandstone and Everton Formations of the Ordovician period. These formations consist mainly of massive, buff to white, medium to fine grained, friable sandstone and minor amounts of interbedded limestone and shale. They are thick enough to be important to soil formation only in the southeastern part of Boone County. Boden and Portia soils formed in residuum from these formations.

The Boone Formation overlies the St. Peter Sandstone and Everton Formations. It forms the Springfield Plateau and consists of alternating beds of limestone and chert of cherty limestone that were deposited in marine waters. The amount of chert varies both vertically and laterally within the formation. The limestone weathers more rapidly than the chert. Clarksville, Nixa, and Noark soils, which contain large quantities of chert, formed in these dissected areas.

Acid sandstone and shale of the Mississippian and Pennsylvanian periods form most of the Boston Mountains in Boone County. There are minor amounts of limestone. The subsoil of Enders soils formed in residuum from shale. Linker and Mountainburg soils formed in residuum from sandstone. The soils on foot slopes and mountain benches, Nella soils, for example, formed in deep, loamy, stony colluvial material that washed or sloughed down from adjacent higher slopes.

The Razort soils formed in deep, loamy alluvial deposits on flood plains. The alluvium was washed from local uplands.

Climate

The climate of Boone County is characterized by mild winters, warm or hot summers, and fairly abundant rainfall. The generally warm temperatures and high precipitation probably are similar to the climate under which the soils formed. The average daily maximum temperature is about 90 degrees F in July and 48 degrees in January. The total annual rainfall is about 43 inches and is well distributed throughout the year. For additional information on the climate, refer to the section "General nature of the survey area."

The warm, moist climate promotes rapid soil formation, and the warm temperature encourages rapid chemical reaction. The large amount of water that moves through the soil moves dissolved or suspended material downward in the profile. Plant residue decomposes rapidly, and the organic acid thus formed hastens the removal of carbonates and the formation of clay minerals. Because the soil is frozen only to shallow depths and for short periods, soil formation continues almost year round. Although the climate throughout the county is uniform, its effect is modified locally by elevation, runoff, and slope. Climate alone does not account for differences in the soils of the county.

Living organisms

The higher plants and animal activity, as well as insects, bacteria, and fungi, are important in the formation of soils. They cause gains in organic matter and nitrogen in the soil, gains or losses in plant nutrients, and changes in structure and porosity.

Before Boone County was settled, the native vegetation had more influence on soil formation than did animal activity. Forests of dense to sparse 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 moderately deep and shallow upland soils underlain by limestone in the northeastern part of the county supported savannas. The vegetation on those savannas was eastern redcedar or mixed eastern redcedar and hardwoods and tall grasses, similar to those on the small prairies, in the openings between trees. Arkana and Moko soils are dominant in these areas.

The native vegetation on most of the uplands of the county was forest of dense to sparse stands of upland oaks and hickory, locally in mixed stands with shortleaf pine. Only the uppermost few inches of the soils in these areas have a significant accumulation of organic matter and are dark colored. Boden, Cane, Captina, Enders, Gassville, Leadvale, Linker, Mountainburg, Nella, Nixa, Noark, and Portia soils formed on these uplands. They differ mainly in parent material, relief, age, and degree of weathering.

There were several small gently sloping tall grass prairies distributed throughout the county. The native vegetation was mostly tall grasses, such as big bluestem, little bluestem, indiangrass, switchgrass, and a variety of forbs. The surface layer 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 soils formed in these areas.

Variations in native vegetation are related partly to variations in the available water capacity and in the surface and internal drainage of soils. Slope aspect and soil fertility cause minor variations.

Only major differences in the original vegetation are reflected to any extent by the characteristics of the soils.

Man is an important influence in the future rate and direction of soil formation. He clears the forest, 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 for flood control and grades the soil surface—cutting, filling, and compacting—and covers the soil with pavement through urban development. He cultivates erodible areas. Fires affect the kind and amount of vegetation. All of these affect the future development of soils. The results of some changes will not be evident for many centuries. Nevertheless, the complex of living organisms affecting soil formation in this county has been drastically changed by man.

Relief

Relief, the inequalities in elevation, in Boone County 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 broad level to gently sloping areas. The highest elevation in the county, about 2,240 feet above sea level, is in the southwestern part of the county. The lowest elevation, about 650 feet above sea level, is in the northern part of the county along Bull Shoals Lake.

Some of the greatest differences in the soils in Boone County are caused by differences in relief through its effect on drainage, runoff, erosion, and percolation of water through the soil.

In places the steeper slopes, narrow ridges, and hilltops have lost so much soil material through geologic erosion that the soils, for example, Moko and Mountainburg, are shallow. In other areas of strong relief in cherty limestone, Clarksville, Nixa, and Noark soils formed. All contain large quantities of chert residue of the cherty limestone. This chert mantle retards geologic erosion. In contrast, the nearly level to moderately sloping Captina, Leadvale, Linker, and Cane soils of the 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 are accumulations of material that washed or sloughed down from adjacent higher slopes. Nella soils and the surface layer of Enders soils formed in this material. In places where rocks have broken off and rolled downslope, these soils are stony. The nearly level to moderately sloping Britwater and Peridge soils on stream terraces formed in deep loamy and silty material that was washed from uplands and deposited on stream flood plains before the streams were further entrenched.

The present flood plains along streams in the county are level to nearly level and are subject to frequent flooding. Razort soils formed on flood plains in deep, loamy alluvial deposits.

Time

The length of time required for formation of soil depends largely on the other factors of soil formation. Less time is usually required if the climate is warm and humid and the vegetation luxuriant. If other factors are equal, less time is also required if the parent material is coarse textured than if it is fine textured.

In terms of geologic time, most of the soils of Boone County are old, regardless of whether they are on mountaintops, mountainsides, or stream terraces. Soils of intermediate age formed in alluvium along the larger streams. The young soils formed in residuum of bedrock where geologic erosion has nearly kept pace with weathering.

Some soils on uplands are examples of old soils. They formed in residuum of cherty limestone, sandstone, siltstone, and interbedded shale and sandstone and show a fairly high degree of development. Most are old enough that most of the cations have been leached out. 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. Clarksville, Nixa, and Noark soils clearly show the impact of time on the parent material.

Razort soils are examples of intermediate age soils. They formed in loamy alluvium, overlying nonconforming alluvium, residuum, or bedrock of varying character. Horizonation is weakly expressed. The B horizon is underlain by stratified beds of silty, sandy, and gravelly material.

The shallow Moko soils are young soils that formed over limestone where geologic erosion has nearly kept pace with weathering of the rock material.

Processes of soil formation

The paragraphs that follow briefly define the horizon nomenclature and the processes of soil formation.

The effects of the soil-forming factors are recorded in the soil profile. The profile is a succession of layers, or horizons, from the surface layer to the parent rock. The horizons differ in one or more properties, such as color, texture, structure, consistency, and porosity.

Most soil profiles contain three major horizons—the A, B, and C horizons. Very young soils do not have a B horizon.

If the A horizon is the horizon of maximum accumulation of organic matter, it is called the A1 horizon, or the surface layer. If it is the horizon of maximum leaching of dissolved or suspended materials, it is called the A2 horizon, or the subsurface layer.

The B horizon, directly below the A horizon, is sometimes called the subsoil (*15*). It is the horizon of maximum accumulation of suspended materials, such as clay and iron. The B horizon commonly has blocky structure

and is firmer than the horizons directly above and below it.

Beneath the B horizon is the C horizon. The C horizon has been little affected by the soil-forming processes, but it can be materially modified by weathering. In some young soils, the C horizon, just below the A horizon, has been slightly modified by living organisms as well as by weathering.

Several processes have been active in the formation of soils in Boone County. Among these processes are accumulation of organic matter, leaching of bases, oxidation or reduction and transfer of iron, and formation and translocation of silicate clay minerals. In most of the soils, more than one of these processes have been active in soil formation.

Physical weathering of rocks, through heating and cooling and wetting and drying, slowly breaks them into small fragments. These fragments form the parent material of the residual soils in the county. This process is most evident in Linker and Mountainburg soils.

Accumulation of organic matter in the upper part of the profile to form an A1 horizon has been an important process of soil formation.

Leaching of bases has occurred to some degree in nearly all soils of Boone County. Among soil scientists it is generally accepted that bases are leached downward before silicate clay minerals move. Razort soils are moderately leached. Moko soils are only slightly leached. Enders, Linker, and Mountainburg soils are strongly leached.

Oxidation of iron is evident in the moderately well drained and well drained soils in the county. Oxidation of iron is indicated by the red and brown colors in the B horizon of Peridge and Noark soils.

Reduction and transfer of iron has occurred to a significant degree only in the poorly drained Samba soils in Boone County. In the naturally wet soils, this process is called gleying. Gray colors in the horizons below the surface layer indicate the reduction and loss of iron. Some horizons contain 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 eluviated A2 horizon has been destroyed. Where it is present, the structure is blocky, clay content is less than in the lower horizons where it has accumulated, and the horizon is lighter in color. Clay films generally have accumulated, and the horizon is lighter in color. Clay films generally have accumulated in pores and on the surfaces of peds in the B horizon. The soils were probably leached of carbonates and soluble salts to a great extent before translocation of silicate clay took place, even though the content of bases is still moderate in some of the soils on lowlands.

Leaching of bases and translocation of silicate clay are among the most important processes in horizon differentiation in the soils of Boone County.

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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 a 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 loosen the subsoil and bring clods to the surface. A form of emergency tillage to control soil blowing.

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. Mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter.

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 (or contour farming). 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. 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 for 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 does not provide a source of gravel or sand for construction purposes.

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

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

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

Fine textured soil. Sandy clay, silty clay, 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.

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.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a

combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. 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 Roman numeral II 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.

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

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

Large stones (in tables). Rock fragments 10 to 24 inches (25 to 60 centimeters) 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 areas. Areas that have little or no natural soil and support 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.

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 0.20 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, differences in 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.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

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

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

Reaction, soil. A measure of 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.

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 groundwater 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 runoff water.

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

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

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

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

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

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

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

Small stones (in tables). Rock fragments 3 to 10 inches (7.5 to 25 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 mm 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.

Stones. Rock fragments 3 inches (7.5 centimeters) or more 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. Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

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 be-

cause 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 it can soak into the soil or flow slowly to a prepared outlet without harm. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

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

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt, silt loam, 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 low lands along streams.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.

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.

ILLUSTRATIONS

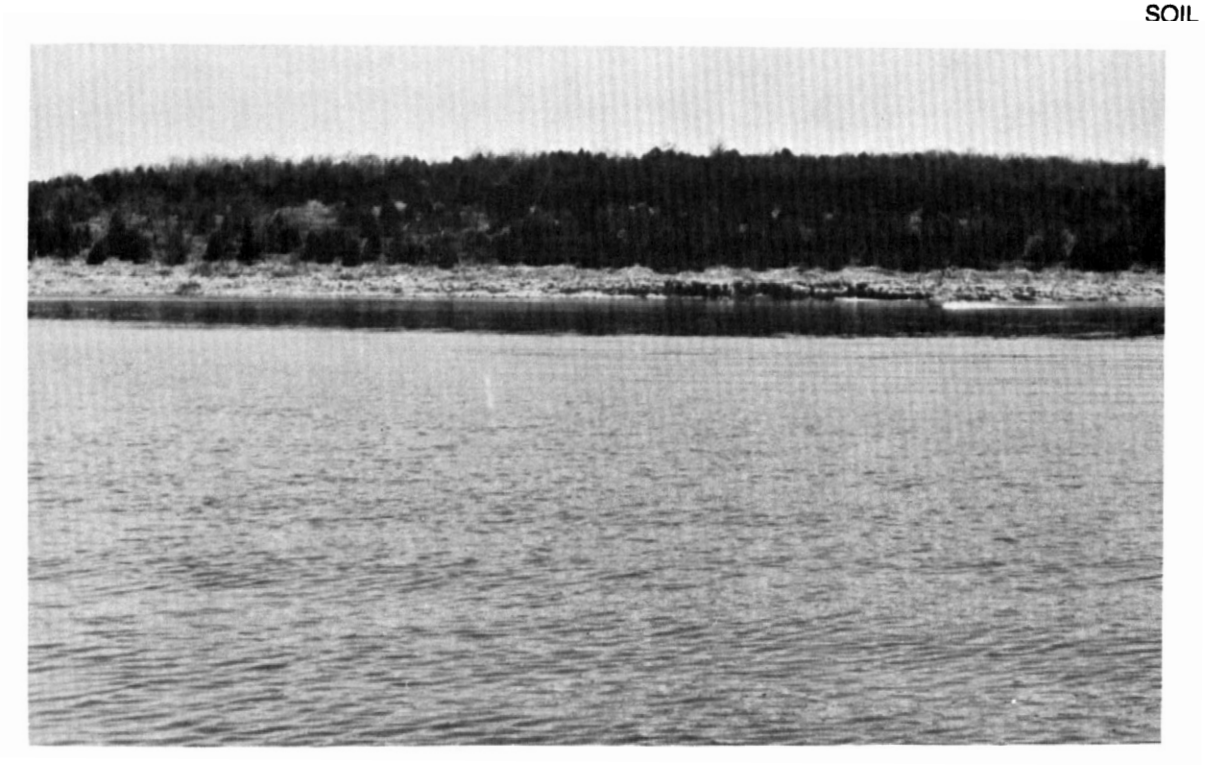

Figure 1.—Arkana-Moko map unit along shoreline of Bull Shoals Lake. This unit is not suitable for homesites. Limitations are severe for septic tank absorption fields. Consequently, pollution is a hazard.

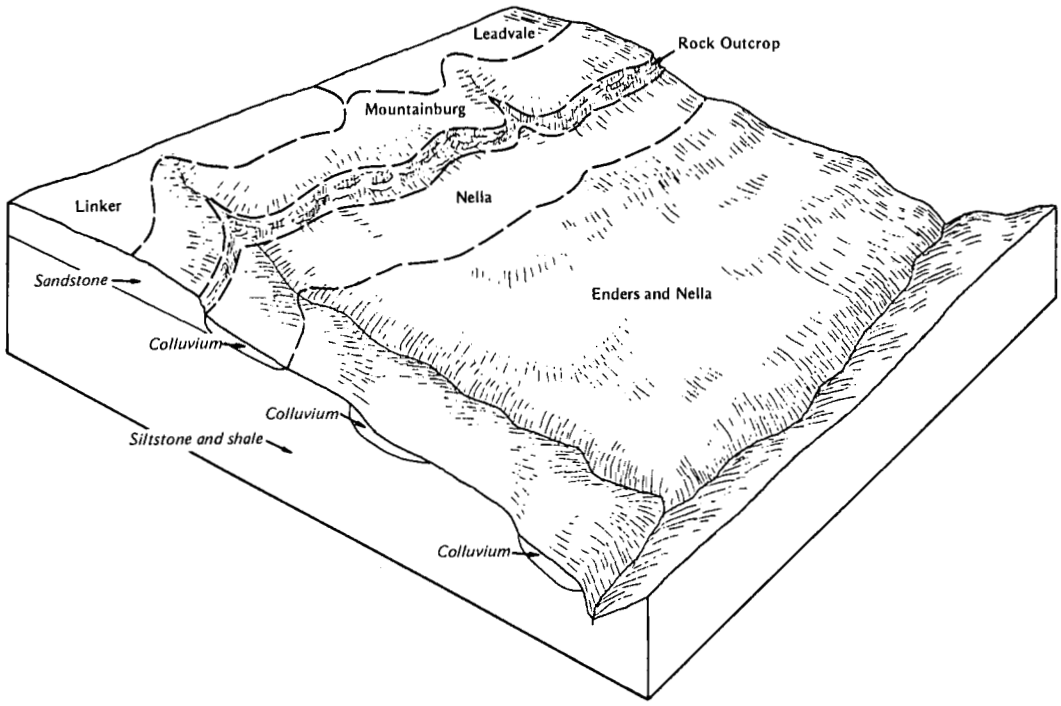

Figure 2.—Pattern of soils and parent material in Enders-Nella-Mountainburg unit.

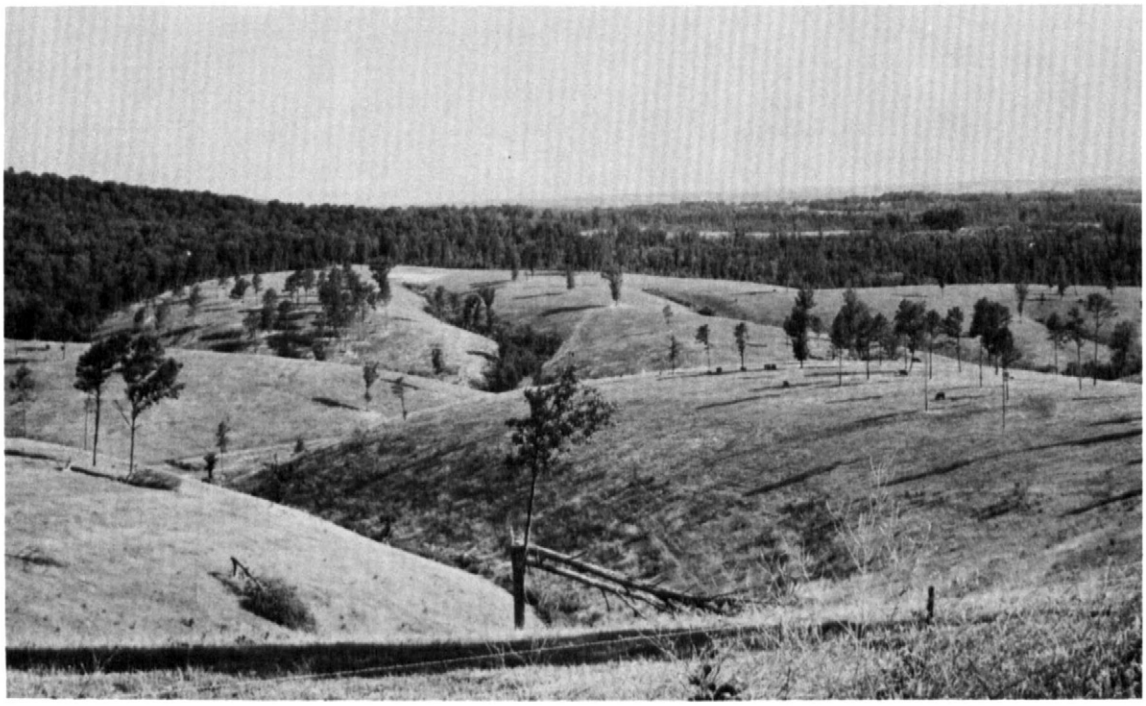

Figure 3.—Landscape of Clarksville-Nixa-Noark map unit. Clarksville soils are on hillsides. Nixa soils are on ridges. Noark soils are on both ridges and hillsides.

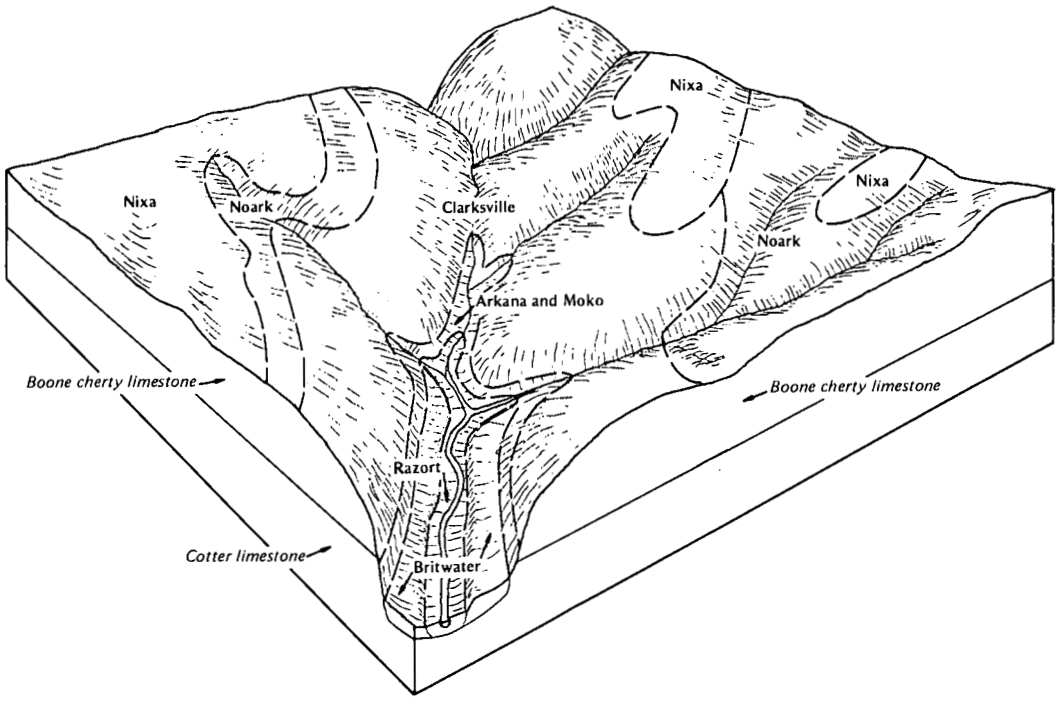

Figure 4.—Pattern of soils and parent material in Clarksville-Nixa-Noark unit.

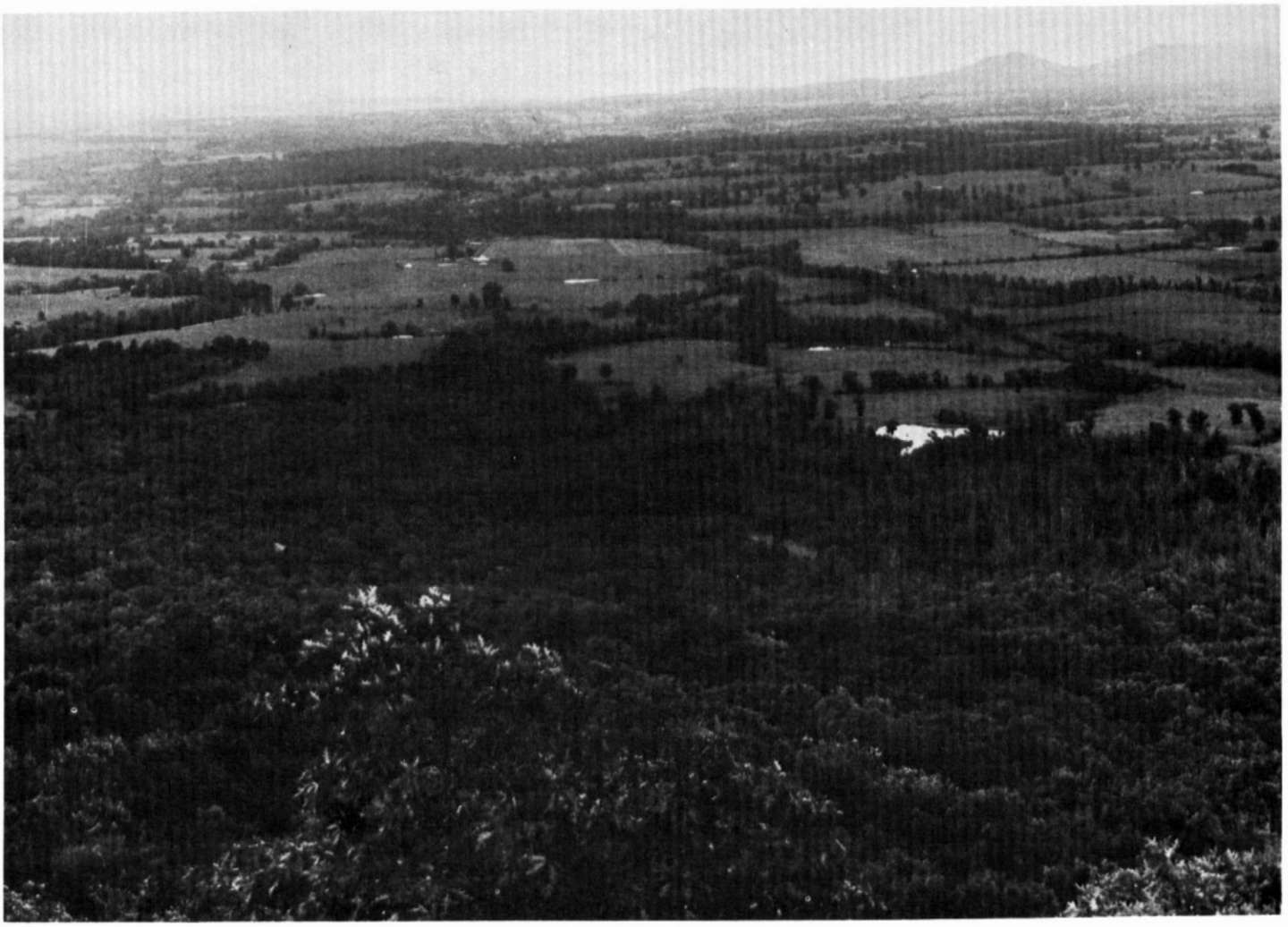

Figure 5.—Broad plateau in Boston Mountains. Cleared areas are mainly Cane, Linker, and Leadvale soils.

Figure 6.—Pasture on Razort soil in Razort-Peridge map unit. The sloping area in the background is part of another soil unit.

Figure 7.—Red clover and grass hay on Leadvale silt loam, 3 to 8 percent slopes.

Figure 8.—Typical area of Moko-Rock outcrop complex, 3 to 15 percent slopes. The trees are mostly eastern redcedar.

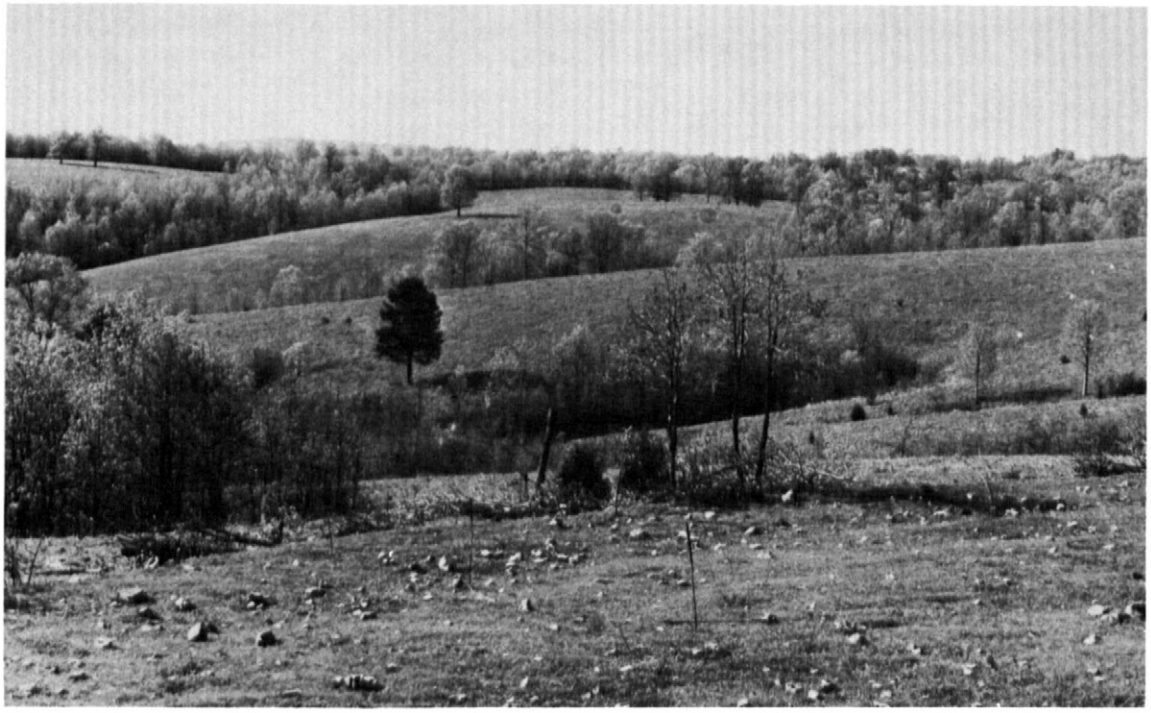

Figure 9.—Typical landscape of Nixa very cherty silt loam, 3 to 8 percent slopes, on ridgetops. The Clarksville soil is on the steeper side slopes below the ridgetops.

Figure 10.—Hay on Nixa very cherty silt loam, 3 to 8 percent slopes.

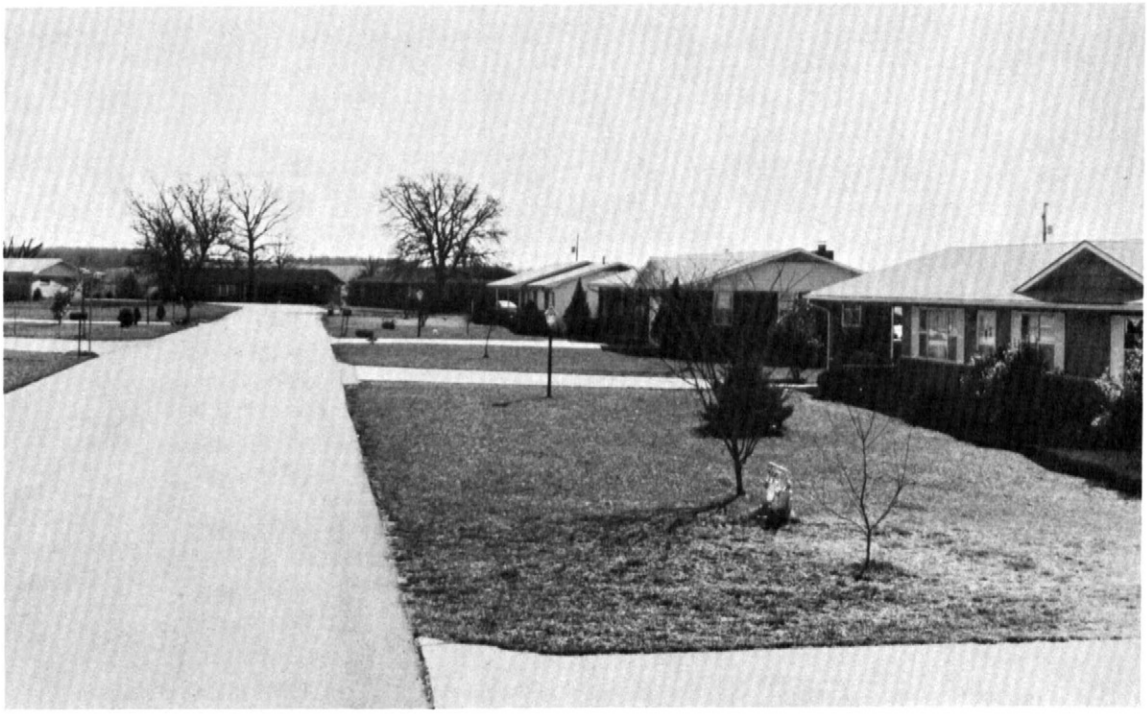

Figure 11.—Housing development on Noark very cherty silt loam, 3 to 8 percent slopes. This soil has no significant limitations for dwellings.

Figure 12.—Good stand of mixed hardwoods on Noark very cherty silt loam, 8 to 20 percent slopes.

Figure 13.—Tall fescue pasture on Razort soils, frequently flooded. Light spots in the foreground are sandy outwash.

Figure 14.—Tall fescue pasture and black walnut trees in an area of Razort soils, frequently flooded.

Figure 15.—Spring fed streams furnish water for livestock and wildlife. This stream is in an area of Arkana-Moko complex, 8 to 20 percent slopes.

TABLES

TABLE 1.--NUMBER OF LIVESTOCK IN BOONE COUNTY IN 1969 AND 1974

Livestock	1969	1974
All cattle and calves on farms	44,631	53,854
Beef cows	19,403	26,000
Milk cows	2,964	2,711
Hogs and pigs	10,329	5,615

TABLE 2.--TEMPERATURE AND PRECIPITATION

[Recorded in the period 1951-73 at Harrison, Ark.]

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average daily	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----	48.6	24.9	36.8	75	-1	8	2.12	.96	3.05	4	3.4
February---	52.7	28.4	40.6	77	3	19	2.68	1.45	3.68	5	3.9
March------	60.1	35.1	47.6	84	11	134	3.62	1.67	5.21	6	3.2
April------	72.1	46.1	59.1	91	23	290	4.56	2.83	6.10	7	.1
May--------	79.3	54.0	66.7	91	34	518	5.22	2.93	7.09	7	.0
June-------	86.6	62.0	74.3	97	46	729	4.75	1.73	7.16	7	.0
July-------	90.9	65.9	78.5	101	49	884	3.88	2.43	5.18	6	.0
August-----	90.1	63.9	77.0	101	49	837	3.13	1.62	4.35	5	.0
September--	83.6	56.9	70.3	98	38	609	3.38	1.36	5.00	5	.0
October----	73.6	45.7	59.7	91	24	313	3.41	1.10	5.24	5	.0
November---	59.9	35.4	47.7	80	12	72	3.48	1.52	5.06	5	1.3
December---	50.8	28.5	39.7	76	3	16	2.78	1.22	4.04	5	1.9
Yearly:											
Average--	70.7	45.6	58.2	---	---	---	---	---	---	---	---
Extreme--	---	---	---	103	-5	---	---	---	---	---	---
Total----	---	---	---	---	---	4,429	43.01	35.04	50.53	67	13.8

[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 3.--FREEZE DATES IN SPRING AND FALL

[Recorded in the period 1964-77 at Harrison, Ark.]

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 11	April 19	April 30
2 years in 10 later than--	April 6	April 14	April 25
5 years in 10 later than--	March 26	April 5	April 15
First freezing temperature in fall:			
1 year in 10 earlier than--	October 27	October 17	October 2
2 years in 10 earlier than--	November 1	October 21	October 8
5 years in 10 earlier than--	November 10	October 30	October 18

TABLE 4.--GROWING SEASON

[Recorded in the period 1964-73 at Harrison, Ark.]

Probability	Daily minimum temperature during growing season		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	207	189	169
8 years in 10	215	195	175
5 years in 10	228	208	186
2 years in 10	242	220	197
1 year in 10	249	226	203

TABLE 5.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
1	Arkana cherty silt loam, 3 to 8 percent slopes	3,431	0.9
2	Arkana very cherty silt loam, 8 to 12 percent slopes	1,100	0.3
3	Arkana-Moko complex, 3 to 8 percent slopes	2,463	0.7
4	Arkana-Moko complex, 8 to 20 percent slopes	25,417	6.8
5	Arkana-Moko complex, 20 to 40 percent slopes	46,563	12.4
6	Boden stony sandy loam, 8 to 20 percent slopes	8,468	2.3
7	Boden Variant-Rock outcrop complex, 20 to 40 percent slopes	870	0.2
8	Britwater gravelly silt loam, 3 to 8 percent slopes	6,074	1.6
9	Britwater gravelly silt loam, 8 to 12 percent slopes	1,182	0.3
10	Cane loam, 3 to 8 percent slopes	5,304	1.4
11	Cane loam, 8 to 12 percent slopes	1,326	0.4
12	Captina silt loam, 1 to 3 percent slopes	2,144	0.6
13	Captina silt loam, 3 to 8 percent slopes	3,256	0.9
14	Clarksville very cherty silt loam, 20 to 50 percent slopes	47,243	12.6
15	Enders gravelly loam, 3 to 8 percent slopes	2,031	0.6
16	Enders-Nella complex, 8 to 20 percent slopes	10,523	2.8
17	Enders-Nella complex, 20 to 40 percent slopes	6,461	1.7
18	Gassville very cherty silt loam, 3 to 8 percent slopes	3,635	1.0
19	Gassville very cherty silt loam, 8 to 20 percent slopes	9,988	2.7
20	Leadvale silt loam, 1 to 3 percent slopes	885	0.2
21	Leadvale silt loam, 3 to 8 percent slopes	4,908	1.3
22	Linker fine sandy loam, 3 to 8 percent slopes	3,675	1.0
23	Linker gravelly fine sandy loam, 3 to 8 percent slopes	2,700	0.7
24	Linker-Mountainburg complex, 8 to 20 percent slopes	4,532	1.2
25	Moko-Rock outcrop complex, 3 to 15 percent slopes	479	0.1
26	Moko-Rock outcrop complex, 15 to 50 percent slopes	2,784	0.7
27	Mountainburg very gravelly fine sandy loam, 3 to 8 percent slopes	2,637	0.7
28	Mountainburg very stony fine sandy loam, 3 to 8 percent slopes	2,805	0.8
29	Mountainburg very stony fine sandy loam, 8 to 20 percent slopes	3,298	0.9
30	Mountainburg very stony fine sandy loam, 20 to 40 percent slopes	4,505	1.2
31	Nella-Mountainburg complex, 20 to 40 percent slopes	6,472	1.7
32	Nixa very cherty silt loam, 3 to 8 percent slopes	34,210	9.1
33	Nixa very cherty silt loam, 8 to 12 percent slopes	24,551	6.6
34	Noark very cherty silt loam, 3 to 8 percent slopes	19,958	5.3
35	Noark very cherty silt loam, 8 to 20 percent slopes	35,409	9.4
36	Noark very cherty silt loam, 20 to 40 percent slopes	9,804	2.6
37	Peridge silt loam, 1 to 3 percent slopes	846	0.2
38	Peridge silt loam, 3 to 8 percent slopes	7,960	2.1
39	Portia sandy loam, 3 to 8 percent slopes	1,616	0.4
40	Portia sandy loam, 8 to 12 percent slopes	966	0.3
41	Razort soils, frequently flooded	11,011	2.9
42	Samba silt loam, 0 to 1 percent slopes	341	0.1
	Water	1,209	0.3
	Total	375,040	100.0

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE

[All yields were estimated for a high level of management. Absence of a yield figure indicates the crop is seldom grown or is not suited]

Map symbol and soil name	Corn	Tall fescue	Common bermudagrass	Improved bermudagrass
	Bu	AUM*	AUM*	AUM*
1--- Arkana	---	5.0	5.0	---
2--- Arkana	---	4.5	4.5	---
3--- Arkana	---	4.0	4.0	---
4--- Arkana	---	3.0	---	---
5--- Arkana	---	---	---	---
6--- Boden	---	4.0	---	---
7--- Boden Variant	---	---	---	---
8--- Britwater	55	7.0	5.5	7.0
9--- Britwater	---	6.0	4.5	6.0
10--- Cane	65	7.0	6.0	8.0
11--- Cane	60	7.0	6.0	8.0
12--- Captina	65	8.0	7.0	8.5
13--- Captina	60	7.0	6.0	7.5
14--- Clarksville	---	2.0	---	---
15--- Enders	---	4.0	---	---
16--- Enders	---	---	---	---
17--- Enders	---	---	---	---
18--- Gassville	---	5.0	5.0	---
19--- Gassville	---	---	---	---
20--- Leadvale	60	7.0	7.0	8.5
21--- Leadvale	55	7.0	7.0	8.5

See footnote at end of table.

TABLE 6.--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--Linker	40	5.0	5.0	6.0
24--Linker	---	---	---	---
25--Moko	---	---	---	---
26--Moko	---	---	---	---
27--Mountainburg	---	3.0	---	---
28--Mountainburg	---	3.0	5.0	---
29, 30--Mountainburg	---	3.0	4.0	---
31--Nella	---	---	---	---
32--Nixa	---	5.0	---	4.0
33--Nixa	---	4.0	---	3.0
34--Noark	55	7.0	6.0	7.5
35--Noark	---	6.0	5.0	6.0
36--Noark	---	6.0	5.0	6.0
37--Peridge	70	8.0	7.0	8.5
38--Peridge	65	7.5	6.5	8.0
39--Portia	70	7.0	6.0	7.5
40--Portia	---	6.0	5.0	6.0
41--Razort	---	10.0	8.0	10.0
42--Samba	---	5.0	4.0	6.0

* 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 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed in this table. Absence of an entry in a column means the information was not available. Site index was calculated at age 30 for eastern cottonwood, at age 35 for American sycamore, and at age 50 for all other species.]

Map symbol and soil name	Woodland suitability group	Management concerns			Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Important trees	Site index	
1, 2--- Arkana	5c8	Slight	Moderate	Moderate	Shortleaf pine--- Southern red oak--- Eastern redcedar--- White oak---	55 55 35 ---	Shortleaf pine, eastern redcedar.
3*:							
Arkana---	5c8	Slight	Moderate	Moderate	Shortleaf pine--- Southern red oak--- Eastern redcedar--- White oak---	55 55 35 ---	Shortleaf pine, eastern redcedar.
Moko---	5x3	Moderate	Severe	Moderate	Eastern redcedar---	30	Eastern redcedar.
4*:							
Arkana---	5c8	Slight	Moderate	Moderate	Shortleaf pine--- Southern red oak--- Eastern redcedar--- White oak---	55 55 35 ---	Shortleaf pine, eastern redcedar.
Moko---	5x3	Severe	Severe	Moderate	Eastern redcedar---	30	Eastern redcedar.
5*:							
Arkana---	5c9	Moderate	Severe	Severe	Shortleaf pine--- Southern red oak--- Eastern redcedar--- White oak---	55 55 35 ---	Shortleaf pine, eastern redcedar.
Moko---	5x3	Severe	Severe	Moderate	Eastern redcedar---	30	Eastern redcedar.
6--- Boden	4x8	Moderate	Moderate	Slight	Southern red oak--- Eastern redcedar--- Black walnut--- Shortleaf pine--- Black locust--- White oak--- Black cherry---	65 40 --- 60 --- --- ---	Shortleaf pine, loblolly pine, eastern redcedar.
7*:							
Boden Variant---	4x8	Severe	Severe	Slight	Southern red oak--- Eastern redcedar--- Black walnut--- Shortleaf pine--- Black locust--- White oak--- Black cherry---	65 40 --- 60 --- --- ---	Shortleaf pine, loblolly pine, eastern redcedar.
Rock outcrop.							
8, 9--- Britwater	3o7	Slight	Slight	Slight	Shortleaf pine--- Southern red oak--- Eastern redcedar--- Loblolly pine---	70 70 50 80	Shortleaf pine, southern red oak, eastern redcedar, loblolly pine.
10, 11--- Cane	3o7	Slight	Slight	Slight	Sweetgum--- Loblolly pine---	80 77	Loblolly pine, Shortleaf pine.
12, 13--- Captina	4o7	Slight	Slight	Slight	Shortleaf pine--- Southern red oak--- Eastern redcedar--- Black locust--- Black walnut---	60 65 40 --- ---	Shortleaf pine, eastern redcedar, black walnut, black locust, southern red oak.

See footnote at end of table.

TABLE 7.--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	Important trees	Site index	
14---------- Clarksville	4f9	Moderate	Severe	Severe	White oak----------	55	White oak, shortleaf pine, sweetgum, green ash.
					Shortleaf pine---------	---	
15---------- Enders	4o1	Slight	Slight	Slight	Southern red oak-------	60	Loblolly pine, shortleaf pine.
					White oak----------	55	
					Shortleaf pine---------	60	
16*:							
Enders----------	4x8	Slight	Moderate	Slight	Southern red oak-------	60	Loblolly pine, shortleaf pine, eastern redcedar.
					White oak----------	55	
					Eastern redcedar-------	40	
					Shortleaf pine---------	60	
Nella----------	4x8	Slight	Moderate	Slight	Shortleaf pine---------	60	Shortleaf pine, loblolly pine, black walnut.
					Southern red oak-------	60	
					Eastern red cedar------	40	
					Black oak----------	---	
					Black walnut-----------	---	
17*:							
Enders----------	5r9	Moderate	Severe	Moderate	Southern red oak-------	50	Loblolly pine, shortleaf pine, eastern redcedar.
					White oak----------	50	
					Eastern redcedar-------	35	
					Shortleaf pine---------	50	
Nella----------	4x8	Moderate	Moderate	Slight	Shortleaf pine---------	60	Shortleaf pine, loblolly pine, black walnut.
					Southern red oak-------	60	
					Eastern redcedar-------	40	
					Black oak----------	---	
					Black walnut-----------	---	
18, 19---------- Gassville	4o7	Slight	Slight	Slight	Shortleaf pine---------	56	Shortleaf pine, eastern redcedar, loblolly pine, black walnut, southern red oak.
					Southern red oak-------	65	
					Black locust-----------	---	
					Black walnut-----------	---	
					Black cherry-----------	---	
					Eastern redcedar-------	36	
20, 21---------- Leadvale	3o7	Slight	Slight	Slight	White oak----------	70	Loblolly pine, shortleaf pine, eastern redcedar.
					Shortleaf pine---------	70	
					Eastern redcedar-------	45	
22, 23---------- 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----------	---	
24*:							
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----------	---	

See footnote at end of table.

TABLE 7.--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	Important trees	Site index	
24*:							
Mountainburg	5x3	Moderate	Severe	Moderate	Shortleaf pine Eastern redcedar	50 30	Shortleaf pine, eastern redcedar, loblolly pine.
25*:							
Moko	5x3	Moderate	Severe	Moderate	Eastern redcedar	30	Eastern redcedar.
Rock outcrop.							
26*:							
Moko	5x3	Severe	Severe	Moderate	Eastern redcedar	30	Eastern redcedar.
Rock outcrop.							
27 Mountainburg	5d2	Slight	Slight	Moderate	Shortleaf pine Eastern redcedar	50 30	Shortleaf pine, eastern redcedar, loblolly pine.
28 Mountainburg	5x3	Slight	Severe	Moderate	Shortleaf pine Eastern redcedar	50 30	Shortleaf pine, eastern redcedar, loblolly pine.
29 Mountainburg	5x3	Moderate	Severe	Moderate	Shortleaf pine Eastern redcedar	50 30	Shortleaf pine, eastern redcedar, loblolly pine.
30 Mountainburg	5x3	Severe	Severe	Moderate	Shortleaf pine Eastern redcedar	50 30	Shortleaf pine, eastern redcedar, loblolly pine.
31*:							
Nella	4x8	Moderate	Moderate	Slight	Shortleaf pine Southern red oak Eastern redcedar Black oak Black walnut	60 60 40 --- ---	Shortleaf pine, loblolly pine, black walnut.
Mountainburg	5x3	Severe	Severe	Moderate	Shortleaf pine Eastern redcedar	50 30	Shortleaf pine, eastern redcedar, loblolly pine.
32, 33 Nixa	4f8	Slight	Slight	Moderate	Shortleaf pine Southern red oak White oak Eastern redcedar Black walnut Black locust	60 60 60 40 --- ---	Shortleaf pine, loblolly pine, eastern redcedar, southern red oak.
34, 35 Noark	4f8	Slight	Moderate	Moderate	Shortleaf pine Eastern redcedar Southern red oak White oak	60 40 60 ---	Shortleaf pine, eastern redcedar, southern red oak.
36 Noark	4r9	Moderate	Severe	Moderate	Shortleaf pine Eastern redcedar Southern red oak White oak	60 40 60 ---	Shortleaf pine, eastern redcedar, southern red oak.

See footnote at end of table.

TABLE 7.--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	Important trees	Site index	
37, 38---------- Peridge	3o7	Slight	Slight	Slight	Shortleaf pine---------	70	Shortleaf pine, loblolly pine, black walnut, southern red oak, white ash, eastern redcedar.
					Southern red oak-------	70	
					Eastern redcedar-------	50	
					Black walnut-----------	---	
					White oak--------------	---	
					White ash--------------	---	
					Black cherry-----------	---	
					Black locust-----------	---	
39, 40---------- Portia	3o7	Slight	Slight	Slight	Sweetgum---------------	80	Loblolly pine.
					Shortleaf pine---------	75	
					White oak--------------	---	
					Southern red oak-------	---	
41*---------- 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	
42---------- Samba	4w8	Slight	Moderate	Moderate	Water oak--------------	70	Sweetgum, loblolly pine, shortleaf pine.
					Sweetgum---------------	70	
					Shortleaf pine---------	65	

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

TABLE 8.--RECREATIONAL DEVELOPMENT

[Some of the terms used in this table to describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry means soil was not rated]

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails
1 Arkana	Severe: percs slowly.	Moderate: small stones.	Severe: percs slowly.	Moderate: small stones.
2 Arkana	Severe: percs slowly.	Moderate: slope, small stones.	Severe: slope, percs slowly.	Moderate: small stones.
3*: Arkana	Severe: percs slowly.	Moderate: small stones.	Severe: percs slowly.	Moderate: small stones.
Moko	Moderate: large stones.	Moderate: large stones.	Severe: depth to rock, large stones.	Moderate: large stones.
4*: Arkana	Severe: percs slowly.	Moderate: slope, small stones.	Severe: slope, percs slowly.	Moderate: small stones.
Moko	Moderate: large stones, slope.	Moderate: large stones, slope.	Severe: depth to rock, large stones, slope.	Moderate: large stones.
5*: Arkana	Severe: slope, percs slowly.	Severe: slope.	Severe: slope, percs slowly.	Severe: slope.
Moko	Severe: slope, large stones.	Severe: slope, large stones.	Severe: depth to rock, large stones, slope.	Severe: slope, large stones.
6 Boden	Moderate: slope, large stones.	Moderate: slope, large stones.	Severe: slope.	Moderate: large stones.
7*: Boden Variant	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
Rock outcrop.				
8 Britwater	Slight	Slight	Moderate: small stones, slope.	Slight.
9 Britwater	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
10 Cane	Moderate: wetness, percs slowly.	Moderate: wetness.	Moderate: slope, percs slowly, wetness.	Slight.
11 Cane	Moderate: slope, percs slowly, wetness.	Moderate: slope, wetness.	Severe: slope.	Slight.
12, 13 Captina	Moderate: wetness, percs slowly.	Moderate: wetness.	Moderate: slope, wetness, percs slowly.	Slight.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails
14--- Clarksville	Severe: small stones, slope.	Severe: small stones, slope.	Severe: small stones, slope.	Severe: small stones, slope.
15--- Enders	Severe: percs slowly.	Slight---	Severe: percs slowly.	Slight.
16*: Enders---	Severe: percs slowly, large stones.	Moderate: large stones.	Severe: slope, percs slowly, large stones.	Severe: large stones.
Nella---	Moderate: slope, large stones.	Moderate: slope, large stones.	Severe: slope.	Moderate: large stones.
17*: Enders---	Severe: slope, percs slowly, large stones.	Severe: slope.	Severe: slope, percs slowly, large stones.	Severe: slope, large stones.
Nella---	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
18--- Gassville	Severe: percs slowly, small stones, slope.	Severe: small stones.	Severe: percs slowly, small stones.	Severe: small stones.
19--- Gassville	Severe: percs slowly, small stones, slope.	Severe: slope, small stones.	Severe: slope, percs slowly, small stones.	Severe: small stones.
20, 21--- Leadvale	Moderate: wetness.	Moderate: wetness.	Moderate: slope, percs slowly, wetness.	Slight.
22--- Linker	Slight---	Slight---	Moderate: slope.	Slight.
23--- Linker	Slight---	Slight---	Moderate: slope, small stones.	Slight.
24*: Linker---	Moderate: slope.	Moderate: slope.	Severe: slope, large stones.	Slight.
Mountainburg---	Severe: large stones.	Severe: large stones.	Severe: slope, depth to rock, large stones.	Severe: large stones.
25*: Moko---	Moderate: large stones, slope.	Moderate: large stones, slope.	Severe: depth to rock, large stones, slope.	Moderate: large stones.
Rock outcrop.				
26*: Moko---	Severe: slope, large stones.	Severe: slope, large stones.	Severe: depth to rock, large stones, slope.	Severe: slope, large stones.
Rock outcrop.				

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails
27--- Mountainburg	Moderate: small stones.	Moderate: small stones.	Severe: small stones, depth to rock.	Moderate: small stones.
28--- Mountainburg	Severe: large stones.	Severe: large stones.	Severe: depth to rock, large stones.	Severe: large stones.
29--- Mountainburg	Severe: large stones.	Severe: large stones.	Severe: slope, depth to rock, large stones.	Severe: large stones.
30--- Mountainburg	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, depth to rock, large stones.	Severe: slope, large stones.
31*: Nella---	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Mountainburg---	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, depth to rock, large stones.	Severe: slope, large stones.
32--- Nixa	Severe: percs slowly.	Moderate: small stones.	Severe: percs slowly, small stones.	Moderate: small stones.
33--- Nixa	Severe: percs slowly.	Moderate: slope, small stones.	Severe: slope, percs slowly, small stones.	Moderate: small stones.
34--- Noark	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Moderate: small stones.
35--- Noark	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Moderate: small stones.
36--- Noark	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.
37, 38--- Peridge	Slight---	Slight---	Moderate: slope.	Slight.
39--- Portia	Moderate: percs slowly.	Slight---	Moderate: percs slowly, slope.	Slight.
40--- Portia	Moderate: percs slowly, slope.	Moderate: slope.	Severe: slope.	Slight.
41*--- Razort	Severe: floods.	Moderate: floods.	Severe: floods.	Moderate: floods.
42--- Samba	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, percs slowly.	Severe: wetness.

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

TABLE 9.--WILDLIFE HABITAT POTENTIALS

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates 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, 2---------- Arkana	Fair	Good	Fair	Good	---	Poor	Very poor.	Fair	Good	Very poor.
3*, 4*: Arkana----------	Fair	Good	Fair	Good	---	Poor	Very poor.	Fair	Good	Very poor.
Moko----------	Very poor.	Poor	Poor	---	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
5*: Arkana.										
Moko----------	Very poor.	Poor	Poor	---	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
6---------- Boden	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
7*: Boden Variant-----	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Rock outcrop.										
8, 9---------- Britwater	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
10, 11---------- Cane	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
12---------- Captina	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
13---------- Captina	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
14---------- Clarksville	Very poor.	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
15---------- Enders	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
16*: Enders----------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Nella----------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
17*: Enders----------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Nella----------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
18---------- Gassville	Fair	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
19---------- Gassville	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT POTENTIALS--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
20---------- Leadvale	Fair	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
21---------- Leadvale	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
22, 23---------- Linker	Fair	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
24*:										
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.
25*, 26*:										
Moko----------	Very poor.	Poor	Poor	---	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Rock outcrop.										
27---------- Mountainburg	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Very poor.	Poor	Very poor.	Very poor.
28, 29, 30--------- Mountainburg	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Poor	Very poor.
31*:										
Nella----------	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.
32---------- Nixa	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
33---------- Nixa	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
34, 35---------- Noark	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
36---------- Noark	Very poor.	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
37---------- Peridge	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
38---------- Peridge	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
39---------- Portia	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
40---------- Portia	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
41*---------- Razort	Poor	Fair	Fair	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
42---------- Samba	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.

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

TABLE 10.--BUILDING SITE DEVELOPMENT

[Some of the terms used in this table to describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry means soil was not rated]

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, too clayey.	Severe: shrink-swell, low strength.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell, low strength.	Severe: low strength, shrink-swell.
2---------- Arkana	Severe: depth to rock, too clayey.	Severe: shrink-swell, low strength.	Severe: depth to rock, shrink-swell.	Severe: slope, shrink-swell, low strength.	Severe: low strength, shrink-swell.
3*:					
Arkana----------	Severe: depth to rock, too clayey.	Severe: shrink-swell, low strength.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell, low strength.	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: depth to rock, large stones.	Severe: depth to rock, large stones.
4*:					
Arkana----------	Severe: depth to rock, too clayey.	Severe: shrink-swell, low strength.	Severe: depth to rock, shrink-swell.	Severe: slope, shrink-swell, low strength.	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: depth to rock, large stones, slope.	Severe: depth to rock, large stones.
5*:					
Arkana----------	Severe: depth to rock, too clayey, slope.	Severe: slope, shrink-swell, low strength.	Severe: depth to rock, slope, shrink-swell.	Severe: slope, shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.
Moko----------	Severe: depth to rock, large stones, slope.	Severe: depth to rock, large stones, slope.	Severe: depth to rock, large stones, slope.	Severe: depth to rock, large stones, slope.	Severe: depth to rock, large stones, slope.
6---------- Boden	Moderate: depth to rock, large stones, too clayey.	Severe: low strength.	Severe: low strength.	Severe: low strength, slope.	Severe: low strength.
7*:					
Boden Variant----	Severe: depth to rock, slope.	Severe: low strength, slope.	Severe: low strength, slope, depth to rock.	Severe: low strength, slope.	Severe: low strength, slope.
Rock outcrop.					
8---------- Britwater	Moderate: too clayey.	Slight----------	Slight----------	Moderate: slope.	Slight.
9---------- Britwater	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
10---------- Cane	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness, slope.	Moderate: low strength.
11---------- Cane	Moderate: slope, wetness.	Moderate: wetness, slope.	Moderate: wetness, slope.	Severe: slope.	Moderate: low strength, slope.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
12---------- Captina	Moderate: depth to rock.	Moderate: low strength, wetness.	Moderate: low strength, wetness.	Moderate: low strength, wetness.	Moderate: low strength.
13---------- Captina	Moderate: depth to rock.	Moderate: low strength.	Moderate: low strength.	Moderate: slope, low strength.	Moderate: low strength.
14---------- Clarksville	Moderate: small stones.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
15---------- Enders	Severe: too clayey.	Severe: low strength, shrink-swell.	Severe: low strength, shrink-swell.	Severe: low strength, shrink-swell.	Severe: low strength, shrink-swell.
16*:					
Enders----------	Severe: too clayey, large stones.	Severe: low strength, large stones, shrink-swell.	Severe: shrink-swell, large stones.	Severe: slope, shrink-swell, low strength.	Severe: shrink-swell, large stones, low strength.
Nella----------	Moderate: slope, low strength, large stones.	Moderate: slope, low strength, large stones.	Moderate: slope, low strength, large stones.	Severe: slope.	Severe: low strength.
17*:					
Enders----------	Severe: slope, too clayey, large stones.	Severe: slope, low strength, shrink-swell.	Severe: slope, large stones, depth to rock.	Severe: slope, shrink-swell, low strength.	Severe: slope, shrink-swell, large stones.
Nella----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, low strength.
18---------- Gassville	Severe: too clayey, small stones.	Severe: low strength.	Severe: low strength.	Severe: low strength.	Severe: low strength.
19---------- Gassville	Severe: too clayey, small stones.	Severe: low strength.	Severe: low strength.	Severe: slope, low strength.	Severe: low strength.
20, 21---------- Leadvale	Severe: too clayey.	Moderate: wetness, low strength.	Moderate: wetness.	Moderate: low strength, wetness.	Severe: low strength.
22, 23---------- Linker	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: slope, low strength, depth to rock.	Moderate: depth to rock.
24*:					
Linker----------	Severe: depth to rock.	Moderate: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: slope, depth to rock.
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.
25*:					
Moko----------	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones, slope.	Severe: depth to rock, large stones.
Rock outcrop.					

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
26*:					
Moko	Severe: depth to rock, large stones, slope.	Severe: depth to rock, large stones, slope.	Severe: depth to rock, large stones, slope.	Severe: depth to rock, large stones, slope.	Severe: depth to rock, large stones, slope.
Rock outcrop.					
27--- Mountainburg	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
28--- 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.
29--- 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.
30--- Mountainburg	Severe: slope, depth to rock, large stones.	Severe: slope, depth to rock, large stones.	Severe: slope, depth to rock, large stones.	Severe: slope, depth to rock, large stones.	Severe: slope, depth to rock, large stones.
31*:					
Nella	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, low strength.
Mountainburg	Severe: slope, depth to rock, large stones.	Severe: slope, depth to rock, large stones.	Severe: slope, depth to rock, large stones.	Severe: slope, depth to rock, large stones.	Severe: slope, depth to rock, large stones.
32--- Nixa	Severe: small stones, depth to rock.	Slight	Moderate: depth to rock.	Moderate: slope.	Slight.
33--- Nixa	Severe: small stones, depth to rock.	Moderate: slope.	Moderate: slope, depth to rock.	Severe: slope.	Moderate: slope.
34--- Noark	Severe: too clayey, small stones.	Slight	Slight	Moderate: slope.	Moderate: low strength.
35--- Noark	Severe: too clayey, small stones.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, low strength.
36--- Noark	Severe: small stones, too clayey, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
37--- Peridge	Moderate: too clayey.	Moderate: low strength.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Severe: low strength.
38--- Peridge	Moderate: too clayey.	Moderate: low strength.	Moderate: shrink-swell, low strength.	Moderate: slope, shrink-swell, low strength.	Severe: low strength.
39--- Portia	Moderate: too clayey.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: slope, shrink-swell, low strength.	Moderate: low strength, shrink-swell.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Map symbol and Soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
40---------- Portia	Moderate: too clayey, slope.	Moderate: slope, shrink-swell, low strength.	Moderate: slope, shrink-swell, low strength.	Severe: slope.	Moderate: low strength. shrink-swell, slope.
41*---------- Razort	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
42---------- Samba	Severe: wetness, too clayey.	Severe: wetness, low strength, shrink-swell.	Severe: wetness, low strength, shrink-swell.	Severe: wetness, low strength, shrink-swell.	Severe: wetness, low strength, shrink-swell.

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

TABLE 11.--SANITARY FACILITIES

[Some of the terms used in this table to describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms used to rate soils. Absence of an entry means soil was not rated]

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.	Slight	Poor: small stones, thin layer.
2 Arkana	Severe: depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: depth to rock, too clayey.	Moderate: slope.	Poor: small stones, thin layer.
3*: Arkana	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Slight	Poor: small stones, thin layer.
Moko	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: seepage.	Poor: large stones, thin layer.
4*: Arkana	Severe: depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: depth to rock, too clayey.	Moderate: slope.	Poor: small stones, thin layer.
Moko	Severe: depth to rock, large stones.	Severe: depth to rock, large stones, slope.	Severe: depth to rock, large stones.	Severe: seepage.	Poor: large stones, thin layer.
5*: Arkana.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock, too clayey.	Severe: slope.	Poor: small stones, slope, thin layer.
Moko	Severe: depth to rock, large stones, slope.	Severe: depth to rock, large stones, slope.	Severe: depth to rock, large stones, slope.	Severe: seepage, slope.	Poor: large stones, thin layer, slope.
6 Boden	Severe: depth to rock, percs slowly.	Severe: slope.	Severe: depth to rock.	Moderate: slope.	Fair: thin layer.
7*: Boden Variant	Severe: depth to rock, percs slowly, slope.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Poor: slope, area reclaim.
Rock outcrop.					
8 Britwater	Moderate: slope, percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Poor: small stones.
9 Britwater	Moderate: slope, percs slowly.	Severe: slope.	Moderate: too clayey.	Moderate: slope.	Poor: small stones.
10 Cane	Severe: percs slowly, wetness.	Moderate: slope, wetness.	Slight	Slight	Good.
11 Cane	Severe: percs slowly, wetness.	Severe: slope.	Slight	Moderate: slope.	Fair: slope.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
12, 13--- Captina	Severe: percs slowly, wetness, depth to rock.	Moderate: slope, depth to rock.	Severe: depth to rock.	Moderate: wetness.	Fair: too clayey, small stone.
14--- Clarksville	Severe: slope.	Severe: seepage, small stones.	Severe: seepage, small stones.	Severe: seepage.	Poor: seepage, small stones.
15--- Enders	Severe: percs slowly.	Moderate: slope.	Severe: depth to rock, too clayey.	Slight---	Poor: too clayey.
16*:					
Enders---	Severe: percs slowly, slope, large stones.	Severe: slope.	Severe: depth to rock, too clayey.	Moderate: slope.	Poor: too clayey, large stones.
Nella---	Moderate: slope, large stones.	Severe: slope.	Moderate: large stones.	Moderate: slope.	Fair: slope, large stones.
17*:					
Enders---	Severe: slope, percs slowly, large stones.	Severe: slope.	Severe: slope, depth to rock, too clayey.	Severe: slope.	Poor: too clayey, slope, large stones.
Nella---	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
18--- Gassville	Severe: percs slowly, depth to rock.	Severe: small stones.	Severe: too clayey, depth to rock.	Slight---	Poor: too clayey, small stones.
19--- Gassville	Severe: percs slowly, depth to rock.	Severe: slope, small stones.	Severe: too clayey, depth to rock.	Moderate: slope.	Poor: too clayey, small stones, slope.
20, 21--- Leadvale	Severe: wetness, percs slowly.	Severe: wetness.	Severe: depth to rock.	Moderate: wetness.	Fair: too clayey.
22, 23--- Linker	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight---	Fair: thin layer.
24*:					
Linker---	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Moderate: slope.	Fair: slope, thin layer.
Mountainburg---	Severe: depth to rock, large stones.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, large stones, seepage.	Severe: seepage.	Poor: thin layer, large stones.
25*:					
Moko---	Severe: depth to rock, large stones.	Severe: depth to rock, large stones, slope.	Severe: depth to rock, large stones.	Severe: seepage.	Poor: large stones, thin layer.
Rock outcrop.					

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
26*:					
Moko	Severe: depth to rock, large stones, slope.	Severe: depth to rock, large stones, slope.	Severe: depth to rock, large stones, slope.	Severe: seepage, slope.	Poor: large stones, thin layer, slope.
Rock outcrop.					
27---------- Mountainburg	Severe: depth to rock.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Severe: seepage.	Poor: thin layer.
28---------- Mountainburg	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: seepage.	Poor: thin layer, large stones.
29---------- Mountainburg	Severe: depth to rock, large stones.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: seepage.	Poor: thin layer, large stones.
30---------- Mountainburg	Severe: slope, depth to rock, large stones.	Severe: slope, depth to rock, large stones.	Severe: slope, depth to rock, large stones.	Severe: slope, seepage.	Poor: slope, thin layer, large stones.
31*:					
Nella	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Mountainburg	Severe: slope, depth to rock, large stones.	Severe: slope, depth to rock, large stones.	Severe: slope, depth to rock, large stones.	Severe: slope, seepage.	Poor: slope, thin layer, large stones.
32---------- Nixa	Severe: percs slowly, depth to rock.	Severe: small stones.	Severe: depth to rock.	Slight	Poor: small stones, area reclaim.
33---------- Nixa	Severe: percs slowly, depth to rock.	Severe: slope, small stones.	Severe: depth to rock.	Moderate: slope.	Poor: small stones, area reclaim.
34---------- Noark	Moderate: percs slowly.	Severe: small stones.	Severe: too clayey.	Slight	Poor: small stones, too clayey.
35---------- Noark	Moderate: slope, percs slowly.	Severe: small stones, slope.	Severe: too clayey.	Moderate: slope.	Poor: small stones, too clayey.
36---------- Noark	Severe: slope.	Severe: small stones, slope.	Severe: slope, too clayey.	Severe: slope.	Poor: slope, small stones, too clayey.
37, 38---------- Peridge	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
39---------- Portia	Moderate: percs slowly.	Moderate: slope, seepage.	Moderate: too clayey.	Slight	Good.
40---------- Portia	Moderate: percs slowly.	Severe: slope.	Moderate: too clayey.	Moderate: slope.	Fair: slope.
41*---------- Razort	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Good.
42---------- Samba	Severe: wetness, percs slowly.	Slight	Severe: wetness, too clayey.	Severe: wetness.	Poor: wetness, too clayey.

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

TABLE 12.--CONSTRUCTION MATERIALS

[Some of the terms used in this table to describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," and "unsuited." Absence of an entry means soil was not rated]

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
1, 2---------- Arkana	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: small stones.
3*, 4*: Arkana----------	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: small stones.
Moko----------	Poor: large stones, thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: large stones, thin layer.
5*: Arkana----------	Poor: low strength, slope, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: small stones, slope.
Moko----------	Poor: large stones, thin layer, slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: large stones, thin layer, slope.
6---------- Boden	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer, slope, large stones.
7*: Boden Variant--------	Poor: low strength, depth to rock.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Rock outcrop.				
8, 9---------- Britwater	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: small stones.
10, 11---------- Cane	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: small stones,
12, 13---------- Captina	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer, area reclaim.
14---------- Clarksville	Poor: slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: small stones.
15---------- Enders	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer, small stones.
16*: Enders----------	Poor: shrink-swell, low strength, large stones.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: large stones, thin layer.
Nella----------	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: small stones.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
17*:				
Enders	Poor: shrink-swell, low strength, slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, large stones, thin layer.
Nella	Poor: slope, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, small stones.
18, 19 Gassville	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: small stones.
20, 21 Leadvale	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
22, 23 Linker	Fair: low strength, thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
24*:				
Linker	Fair: low strength, thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, large stones, thin layer.
Mountainburg	Poor: thin layer, large stones.	Unsuited: excess fines.	Poor: thin layer.	Poor: large stones, thin layer.
25*, 26*:				
Moko	Poor: large stones, thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: large stones, thin layer.
Rock outcrop.				
27 Mountainburg	Poor: thin layer.	Unsuited: excess fines.	Poor: thin layer.	Poor: small stones.
28, 29 Mountainburg	Poor: thin layer, large stones.	Unsuited: excess fines.	Poor: thin layer.	Poor: large stones, thin layer.
30 Mountainburg	Poor: slope, thin layer, large stones.	Unsuited: excess fines.	Poor: thin layer.	Poor: slope, large stones, thin layer.
31*:				
Nella	Poor: slope, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, small stones.
Mountainburg	Poor: slope, thin layer, large stones.	Unsuited: excess fines.	Poor: thin layer.	Poor: slope, large stones, thin layer.
32, 33 Nixa	Poor: area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: small stones.
34, 35 Noark	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: small stones.
36 Noark	Poor: slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: small stones, slope.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
37, 38---------- Peridge	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
39---------- Portia	Fair: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
40---------- Portia	Fair: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer, slope.
41*---------- Razort	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
42---------- Samba	Poor: low strength, wetness, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.

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

TABLE 13.--WATER MANAGEMENT

[Some of the terms used in this table to describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry means soil was not evaluated]

Map symbol and soil name	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
1, 2---------- Arkana	Moderate: depth to rock.	Moderate: shrink-swell, low strength, thin layer.	Not needed----	Percs slowly, slow intake, rooting depth	Depth to rock, slope, small stones.	Erodes easily, slope, depth to rock.
3*, 4*, 5*: Arkana----------	Moderate: depth to rock.	Moderate: shrink-swell, low strength, thin layer.	Not needed----	Percs slowly, slow intake, rooting depth	Depth to rock, slope, small stones.	Erodes easily, slope, depth to rock.
Moko----------	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Not needed----	Droughty, seepage.	Depth to rock, large stones, slope.	Depth to rock, large stones, droughty.
6---------- Boden	Moderate: depth to rock, seepage.	Moderate: hard to pack.	Not needed----	Large stones, slope.	Large stones, slope.	Erodes easily, slope, large stones.
7*: Boden Variant----	Moderate: seepage, depth to rock.	Moderate: hard to pack.	Not needed----	Depth to rock, large stones, slope.	Depth to rock, large stones, slope.	Large stones, slope, depth to rock.
Rock outcrop.						
8, 9---------- Britwater	Moderate: seepage.	Slight---------	Not needed----	Slope---------	Slope---------	Slope.
10, 11---------- Cane	Slight---------	Slight---------	Percs slowly, slope.	Slope, wetness, percs slowly, rooting depth	Complex slope, wetness, rooting depth	Rooting depth, percs slowly.
12, 13---------- Captina	Moderate: depth to rock.	Moderate: thin layer, wetness.	Percs slowly, slope, depth to rock	Slope, percs slowly, rooting depth	Rooting depth, wetness, percs slowly.	Erodes easily, percs slowly.
14---------- Clarksville	Severe: seepage, slope.	Moderate: large stones.	Not needed----	Slope, droughty, fast intake.	Large stones, slope.	Droughty, large stones, slope.
15---------- Enders	Moderate: depth to rock.	Severe: low strength, hard to pack.	Not needed----	Slope, erodes easily percs slowly.	Slope, depth to rock erodes easily	Erodes easily, percs slowly, slope.
16*, 17*: Enders----------	Moderate: depth to rock.	Severe: large stones, hard to pack, low strength.	Not needed----	Slope, erodes easily percs slowly.	Large stones, slope, depth to rock	Slope, large stones, erodes easily.
Nella----------	Moderate: seepage.	Moderate: large stones.	Not needed----	Slope, large stones.	Slope, large stones.	Slope, large stones.
18, 19---------- Gassville	Moderate: depth to rock.	Moderate: hard to pack, large stones.	Not needed----	Percs slowly, erodes easily slope.	Complex slope, percs slowly, erodes easily	Erodes easily, percs slowly, slope.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
20, 21---------- Leadvale	Moderate: seepage.	Moderate: thin layer, wetness.	Percs slowly, slope.	Wetness, slow intake, percs slowly.	Wetness, erodes easily	Erodes easily, rooting depth.
22, 23---------- Linker	Severe: depth to rock.	Moderate: thin layer, hard to pack.	Not needed----	Favorable-----	Slope, depth to rock large stones.	Large stones, slope, depth to rock.
24*: Linker----------	Severe: depth to rock.	Moderate: thin layer, hard to pack.	Not needed----	Large stones	Slope, depth to rock large stones.	Large stones, slope, depth to rock.
Mountainburg-----	Severe: seepage, depth to rock.	Severe: thin layer, large stones.	Not needed----	Slope, droughty, large stones.	Large stones, depth to rock	Large stones, depth to rock, rooting depth.
25*, 26*: Moko----------	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Not needed----	Droughty, seepage.	Depth to rock, large stones.	Depth to rock, large stones, droughty.
Rock outcrop.						
27---------- Mountainburg	Severe: depth to rock, seepage.	Severe: thin layer.	Not needed----	Slope, fast intake, rooting depth	Slope, depth to rock rooting depth	Rooting depth, slope.
28---------- Mountainburg	Severe: seepage, depth to rock.	Severe: thin layer, large stones.	Not needed----	Droughty, large stones.	Large stones, depth to rock	Large stones, depth to rock, rooting depth.
29, 30---------- Mountainburg	Severe: seepage, depth to rock.	Severe: thin layer, large stones.	Not needed----	Slope, droughty, large stones.	Large stones, depth to rock	Large stones, depth to rock, rooting depth.
31*: Nella----------	Moderate: seepage.	Moderate: large stones.	Not needed----	Slope, large stones.	Slope, large stones.	Slope, large stones.
Mountainburg-----	Severe: seepage, depth to rock.	Severe: thin layer, large stones.	Not needed----	Slope, droughty, large stones.	Large stones, depth to rock	Large stones, depth to rock, rooting depth.
32, 33---------- Nixa	Moderate: depth to rock.	Severe: piping, thin layer.	Not needed----	Slope, percs slowly, rooting depth	Slope, percs slowly.	Droughty, percs slowly, slope.
34---------- Noark	Moderate: seepage.	Slight---------	Not needed----	Favorable-----	Favorable-----	Favorable.
35, 36,---------- Noark	Moderate: seepage.	Slight---------	Not needed----	Slope---------	Slope---------	Slope.
37---------- Peridge	Moderate: seepage.	Slight---------	Not needed----	Favorable-----	Favorable-----	Erodes easily.
38---------- Peridge	Moderate: seepage.	Moderate: low strength, hard to pack.	Not needed----	Erodes easily,	Favorable-----	Erodes easily.
39---------- Portia	Moderate: seepage.	Moderate: piping.	Not needed----	Slope---------	Slope---------	Favorable.
40---------- Portia	Moderate: seepage.	Moderate: piping.	Not needed----	Slope---------	Slope---------	Slope.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
41*---------- Razort	Moderate: seepage.	Moderate: unstable fill, piping, hard to pack.	Not needed----	Floods--------	Floods--------	Favorable.
42---------- Samba	Slight---------	Severe: hard to pack, wetness.	Percs slowly--	Percs slowly, wetness.	Not needed----	Wetness, erodes easily, percs slowly.

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

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS

[Absence of an entry means data were not estimated]

Map symbol and soil name	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
1---------- Arkana	0-6	Cherty silt loam	SM, SC, SM-SC	A-4, A-2, A-6	15-25	70-90	60-80	50-75	25-45	<30	NP-15
	6-10	Very cherty silty clay, cherty clay, clay.	GC, SC, CL, CH	A-2, A-7	10-30	60-90	45-80	40-70	25-55	40-65	20-35
	10-28	Clay, cherty clay.	CH	A-7	0-10	70-90	70-85	65-85	60-80	51-80	31-50
	28	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
2---------- Arkana	0-6	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
	6-10	Very cherty silty clay, cherty clay, clay.	GC, SC, CL, CH	A-2, A-7	10-30	60-90	45-80	40-70	25-55	40-65	20-35
	10-28	Clay, cherty clay.	CH	A-7	0-10	70-90	70-85	65-85	60-80	51-80	31-50
	28	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
3*, 4*, 5*: Arkana----------	0-6	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
	6-10	Very cherty silty clay, cherty clay, clay.	GC, SC, CL, CH	A-2, A-7	10-30	60-90	45-80	40-70	25-55	40-65	20-35
	10-28	Clay, cherty clay.	CH	A-7	0-10	70-90	70-85	65-85	60-80	51-80	31-50
	28	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	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
6---------- Boden	0-8	Stony sandy loam	SM	A-2, A-4	10-30	75-100	75-100	65-75	20-50	<20	NP-3
	8-12	Sandy clay loam, fine sandy loam.	ML, CL-ML, SM, SM-SC	A-2, A-4	0-10	85-100	85-100	75-90	30-60	<25	NP-7
	12-48	Sandy clay, clay	CH, CL	A-6, A-7	0-10	85-100	85-100	75-90	55-80	35-55	15-30
	48	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
7*: Boden Variant-----	0-9	Stony sandy loam	SM	A-2, A-4	10-30	75-100	75-100	65-75	20-50	<20	NP-3
	9-12	Sandy clay loam, fine sandy loam.	ML, CL-ML, SM, SM-SC	A-2, A-4	0-10	85-100	85-100	75-90	30-60	<25	NP-7
	12-32	Sandy clay, clay	CH, CL	A-6, A-7	0-10	85-100	85-100	75-90	55-80	35-55	15-30
	32	Unweathered	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--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---------- Britwater	0-12	Gravelly silt loam.	ML, CL, CL-ML	A-4	0	70-85	70-85	65-80	65-80	<30	NP-10
	12-34	Gravelly silty clay loam, gravelly clay loam.	CL, GC	A-2, A-6, A-4	0	40-75	40-75	35-70	30-65	25-40	8-18
	34-50	Very gravelly silty clay loam, very gravelly clay loam.	GC	A-2, A-6, A-4	0	25-50	25-50	20-45	15-40	25-40	8-18
	50-72	Very gravelly silty clay, very gravelly clay, very gravelly clay loam.	GC	A-2, A-6, A-7	0	20-50	20-50	15-45	12-40	35-55	15-30
10, 11---------- Cane	0-8	Loam----------	ML, CL-ML, SM, SM-SC	A-4	0-2	80-100	75-100	65-95	40-75	<30	NP-7
	8-43	Silt loam, loam, clay loam.	ML, CL-ML, CL	A-4	0-2	90-100	80-95	75-95	60-70	17-32	3-10
	43-72	Silt loam, loam, clay loam.	ML, CL-ML, CL	A-4	0-2	90-100	80-95	75-95	55-70	18-30	3-10
12, 13---------- Captina	0-7	Silt loam-------	ML, CL-ML	A-4	0	95-100	90-100	85-100	75-95	<35	NP-7
	7-20	Silty clay loam, silt loam.	CL-ML, CL	A-4, A-6, A-7	0	95-100	95-100	90-100	85-95	20-45	5-20
	20-40	Silty clay loam, silt loam, cherty silty clay loam.	CL, GM-GC, GC, CL-ML	A-4, A-6	0-20	60-100	55-100	45-100	45-95	20-40	5-20
	40-45	Very cherty silty clay loam, very cherty silty clay.	CL, GC, SC	A-6, A-7	75-85	60-95	55-90	45-90	45-85	30-50	15-30
14---------- Clarksville	0-72	Very cherty silt loam.	GC, SM-SC, GP-GC	A-1, A-2-4	5-20	30-70	10-60	5-50	5-35	20-40	5-15
15---------- Enders	0-6	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
	6-47	Silty clay, clay	MH, CH	A-7	0	95-100	85-100	85-100	70-95	65-80	35-45
	47-53	Weathered bedrock.	---	---	---	---	---	---	---	---	---
16*: Enders----------	0-6	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
	6-47	Silty clay, clay	CH	A-7	0	95-100	85-100	85-100	70-95	50-65	30-40
	47-53	Weathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--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	
16*:											
Nella	0-9	Stony loam	ML, CL, SM, SC	A-4	10-30	90-100	85-90	65-75	36-55	<30	NP-8
	9-72	Stony clay loam, stony 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
17*:											
Enders	0-5	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
	5-47	Silty clay, clay	CH	A-7	0	95-100	85-100	85-100	70-95	50-65	30-40
	47-53	Weathered bedrock, unweathered bedrock.	---	---	---	---	---	---	---	---	---
Nella	0-9	Stony loam	ML, CL, SM, SC	A-4	10-30	90-100	85-90	65-75	36-55	<30	NP-8
	9-72	Stony clay loam, stony 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
18 Gassville	0-10	Very cherty silt loam.	GM, GM-GC, GP-GM	A-1, A-2	10-30	25-40	20-40	15-35	10-30	<25	NP-5
	10-17	Cherty clay	CH	A-7	2-10	70-80	70-80	65-75	55-70	55-80	27-47
	17-38	Clay	CH	A-7	2-10	85-95	70-95	65-90	60-85	55-80	27-47
	38-50	Weathered bedrock.	---	---	---	---	---	---	---	---	---
	50	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
19 Gassville	0-10	Very cherty silt loam.	GM, GP-GM GM-GC	A-1, A-2	10-30	25-40	20-40	15-35	10-30	<25	NP-5
	10-17	Cherty clay	CH	A-7	2-10	70-80	70-80	65-75	55-70	55-80	27-47
	17-38	Clay	CH	A-7	2-10	85-95	70-95	65-90	60-85	55-80	27-47
	38-50	Weathered bedrock.	---	---	---	---	---	---	---	---	---
	50	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
20, 21 Leadvale	0-7	Silt loam	ML, CL-ML, CL	A-4	0	100	95-100	85-95	65-85	18-32	2-10
	7-21	Silt loam, silty clay loam.	CL-ML, CL, ML	A-4, A-6	0	100	95-100	90-98	75-90	22-36	3-14
	21-50	Silt loam, silty clay loam.	CL-ML, CL, ML	A-4, A-6, A-7	0	100	95-100	80-98	70-90	23-42	3-18
	50	Unweathered bedrock.	---	---	---	---	---	---	---	---	
22 Linker	0-10	Fine sandy loam	SM, ML	A-4	0	85-100	80-100	70-100	40-70	<30	NP-7
	10-32	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
	32	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--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	
23---------- Linker	0-10	Gravelly fine sandy loam.	ML, GM	A-2, A-4	0-5	60-100	60-100	55-100	25-70	<30	NP-7
	10-32	Gravelly sandy clay loam, gravelly fine sandy loam, sandy clay loam.	CL, SC, GC, ML	A-4, A-6	0-10	65-100	60-100	55-100	40-80	<40	NP-18
	32	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
24*:											
Linker----------	0-9	Stony loam------	SM, ML	A-4	5-30	80-100	70-95	55-80	40-60	<30	NP-7
	9-32	Gravelly sandy clay loam, gravelly fine sandy loam, sandy clay loam.	CL, SC, GC, ML	A-4, A-6	0-10	65-100	60-100	55-100	40-80	<40	NP-18
	32	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Mountainburg------	0-7	Very stony fine sandy loam.	GM	A-1, A-2	30-65	40-50	30-50	20-40	15-25	---	NP
	7-17	Very stony loam	GM,GC, GM-GC	A-1, A-2	30-65	40-50	30-50	20-40	15-30	<30	NP-10
	17-22	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
25*, 26*:											
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	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
27---------- Mountainburg	0-5	Very gravelly fine sandy loam.	GM	A-1, A-2	5-15	40-60	30-50	25-40	15-30	---	NP
	5-17	Very gravelly sandy clay loam, very gravelly loam, very gravelly fine sand.	GM, GC, GP-GM, GM-GC	A-1, A-2	15-30	40-60	30-50	25-50	10-25	<30	NP-10
	17	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
28, 29, 30--------- Mountainburg	0-7	Very stony fine sandy loam.	GM	A-1, A-2	30-65	40-50	30-50	20-40	15-25	---	NP
	7-17	Very stony loam	GM, GC GM, GC	A-1, A-2	30-65	40-50	30-50	20-40	15-30	<30	NP-10
	17	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
31*:											
Nella----------	0-9	Stony loam------	ML, CL, SM, SC	A-4	10-30	90-100	85-90	65-75	36-55	<30	NP-8
	9-72	Stony clay loam, stony 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

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--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	
31*:											
Mountainburg	0-7	Very stony fine sandy loam.	GM	A-1, A-2	30-65	40-50	30-50	20-40	15-25	---	NP
	7-17	Very stony loam	GM, GC, GM-GC	A-1, A-2	30-65	40-50	30-50	20-40	15-30	<30	NP-10
	17	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
32, 33 Nixa	0-13	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
	13-18	Very cherty silt loam, very cherty silty clay loam, very cherty 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
	18-36	Very cherty silt loam, very cherty silty clay loam, very cherty 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
	36-72	Very cherty silty clay, very cherty silty clay, loam, very cherty clay.	GC GP-GM	A-2, A-7	10-30	20-50	20-50	20-50	15-45	41-60	20-35
34 Noark	0-14	Very cherty silt loam.	GM	A-2, A-1, A-4	0	20-50	20-50	20-50	15-45	<20	NP-3
	14-22	Very cherty silt loam, very cherty silty clay loam.	GM, GC, GM-GC	A-2, A-4, A-6, A-1	0	20-50	20-50	20-50	15-45	20-35	5-15
	22-35	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
	35-72	Very cherty clay	GC	A-2, A-7	5-10	10-40	10-40	10-40	5-35	41-60	20-35
35 Noark	0-14	Very cherty silt loam.	GM	A-2, A-1, A-4	0	20-50	20-50	20-50	15-45	<20	NP-3
	14-22	Very cherty silt loam, very cherty silty clay loam.	GM, GC, GM-GC	A-2, A-4, A-6, A-1	0	20-50	20-50	20-50	15-45	20-35	5-15
	22-35	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
	35-72	Very cherty clay	GC	A-2, A-7	5-10	10-40	10-40	10-40	5-35	41-60	20-35
36 Noark	0-14	Very cherty silt loam.	GM	A-2, A-1, A-4	0	20-50	20-50	20-50	15-45	<20	NP-3
	14-22	Very cherty silt loam, very cherty silty clay loam.	GM, GC, GM-GC	A-2, A-4, A-6, A-1	0	20-50	20-50	20-50	15-45	20-35	5-15
	22-35	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
	35-72	Very cherty clay	GC	A-2, A-7	5-10	10-40	10-40	10-40	5-35	41-60	20-35

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--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	
37, 38----------	0-6	Silt loam-------	ML, CL-ML	A-4	0	95-100	90-100	85-90	80-85	<20	NP-5
Peridge	6-33	Silty clay loam, silt loam.	CL	A-6	0	95-100	90-100	85-95	80-95	30-40	11-20
	33-72	Silty clay, clay, gravelly silty clay.	CL, SC, GC	A-7, A-6	0	55-100	50-100	45-90	40-85	35-50	15-25
39, 40----------	0-12	Fine sandy loam	SM, ML	A-2, A-4	0	100	95-100	70-85	35-60	---	NP
Portia	12-25	Loam, silt loam, sandy clay loam.	CL, ML CL-ML	A-4, A-6	0	100	95-100	80-95	65-80	18-30	3-12
	25-72	Sandy clay, sandy clay loam, clay loam.	CL, CH, SC	A-6, A-4, A-7	0	100	95-100	80-95	36-75	25-55	8-30
41*----------	0-10	Loam----------	ML, CL-ML	A-4	0	75-100	70-100	65-90	65-90	<25	NP-7
Razort	10-49	Silt loam, loam, clay loam.	ML, CL, CL-ML	A-4, A-6	0	75-100	75-100	75-85	70-80	25-40	7-15
	49-84	Gravelly silt loam, very gravelly clay loam.	GM, SM, ML, CL-ML	A-2, A-4	0	25-75	20-70	20-65	20-60	<25	NP-7
42----------	0-13	Silt loam-------	CL, CL-ML	A-4, A-6	0	100	95-100	95-100	85-95	20-30	5-12
Samba	13-72	Silty clay, clay, silty clay loam.	CH, MH, CL	A-7, A-6	0	100	90-100	90-100	85-100	35-70	17-40

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

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS

[The erosion tolerance factor (T) is for the entire profile. Absence of an entry means data were not available or were not estimated]

Map symbol and soil name	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors	
						K	T
	In	In/hr	In/in	pH			
1----------	0-6	0.6-2.0	0.10-0.16	5.6-7.8	Low----------	0.32	2
Arkana	6-10	0.06-0.2	0.06-0.10	5.1-8.4	Moderate-------	0.24	
	10-28	<0.06	0.12-0.18	5.1-8.4	High----------	0.32	
	28-30	---	---	---	----------	---	
2----------	0-6	0.6-2.0	0.08-0.12	5.6-7.8	Low----------	0.28	2
Arkana	6-10	0.06-0.2	0.06-0.10	5.1-8.4	Moderate-------	0.24	
	10-28	<0.06	0.12-0.18	5.1-8.4	High----------	0.32	
	28-30	---	---	---	----------	---	
3*, 4*, 5*:							
Arkana----------	0-6	0.6-2.0	0.08-0.12	5.6-7.8	Low----------	0.28	2
	6-10	0.06-0.2	0.06-0.10	5.1-8.4	Moderate-------	0.24	
	10-28	<0.06	0.12-0.18	5.1-8.4	High----------	0.32	
	28-30	---	---	---	----------	---	
Moko----------	0-11	0.6-2.0	0.09-0.14	6.6-7.8	Low----------	0.32	1
	11	---	---	---	----------	---	
6----------	0-8	0.6-6.0	0.07-0.15	4.5-6.0	Low----------	0.28	3
Boden	8-12	0.6-2.0	0.09-0.17	4.5-6.0	Low----------	0.32	
	12-48	0.2-0.6	0.12-0.18	4.5-5.5	Moderate-------	0.28	
	48	---	---	---	----------	---	
7*:							
Boden Variant---	0-9	0.6-6.0	0.07-0.15	4.5-6.0	Low----------	0.28	3
	9-12	0.6-2.0	0.09-0.17	4.5-6.0	Low----------	0.32	
	12-32	0.2-0.6	0.12-0.18	4.5-5.5	Moderate-------	0.28	
	32	---	---	---	----------	---	
Rock outcrop.							
8, 9----------	0-12	0.6-2.0	0.12-0.20	5.1-6.0	Low----------	0.32	3
Britwater	12-34	0.6-2.0	0.12-0.15	5.1-6.0	Low----------	0.28	
	34-50	0.6-2.0	0.09-0.11	5.1-6.0	Low----------	0.28	
	50-72	0.6-2.0	0.07-0.09	5.1-6.0	Low----------	0.24	
10, 11----------	0-8	0.6-2.0	0.10-0.18	5.6-6.5	Low----------	0.32	3
Cane	8-43	0.6-2.0	0.14-0.19	4.5-6.0	Low----------	0.37	
	43-72	0.06-0.2	0.05-0.08	4.5-6.0	Low----------	0.37	
12, 13----------	0-7	0.6-2.0	0.16-0.24	5.1-6.5	Low----------	0.43	3
Captina	7-20	0.6-2.0	0.16-0.24	3.6-5.5	Low----------	0.37	
	20-40	0.06-0.2	0.08-0.12	3.6-5.5	Low----------	0.32	
	40-45	0.06-0.2	0.01-0.03	3.6-5.5	Low----------	0.32	
14----------	0-72	2.0-6.0	0.07-0.12	4.5-5.5	Very low-------	0.24	2
Clarksville							
15----------	0-6	0.6-2.0	0.07-0.15	3.6-5.0	Low----------	0.32	3
Enders	6-47	<0.06	0.12-0.18	3.6-5.5	High----------	0.37	
	47-53	---	---	---	----------	---	
16*:							
Enders----------	0-6	0.6-2.0	0.15-0.22	3.6-5.0	Low----------	0.43	3
	6-47	<0.06	0.09-0.13	3.6-5.5	High----------	0.24	
	47-53	---	---	---	----------	---	
Nella----------	0-9	0.6-2.0	0.08-0.15	4.5-5.5	Low----------	0.20	5
	9-72	0.6-2.0	0.07-0.14	4.5-5.5	Low----------	0.20	
17*:							
Enders----------	0-5	0.6-2.0	0.15-0.22	3.6-5.0	Low----------	0.43	3
	5-47	<0.06	0.09-0.13	3.6-5.5	High----------	0.24	
	47-53	---	---	---	----------	---	

See footnote at end of table.

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

Map symbol and soil name	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors	
						K	T
	In	In/hr	In/in	pH			
17*:							
Nella	0-9	0.6-2.0	0.08-0.15	4.5-5.5	Low	0.20	5
	9-72	0.6-2.0	0.07-0.14	4.5-5.5	Low	0.20	
18	0-10	2.0-6.0	0.06-0.10	5.1-6.5	Low	0.37	3
Gassville	10-17	<0.06	0.10-0.16	4.5-5.5	Moderate	0.32	
	17-38	<0.06	0.12-0.18	4.5-5.5	Moderate	0.37	
	38-50	---	---	---	---	0.37	
	50	---	---	---	---	---	
19	0-10	2.0-6.0	0.06-0.10	5.1-6.5	Low	0.37	3
Gassville	10-17	<0.06	0.10-0.16	4.5-5.5	Moderate	0.32	
	17-38	<0.06	0.12-0.18	4.5-5.5	Moderate	0.37	
	38-50	---	---	---	---	0.37	
	50	---	---	---	---	---	
20, 21	0-7	0.6-2.0	0.17-0.22	4.5-5.5	Low	0.43	3
Leadvale	7-21	0.6-2.0	0.17-0.20	4.5-5.5	Low	0.43	
	21-50	0.06-0.6	0.06-0.11	4.5-5.5	Low	0.43	
	50	---	---	---	---	---	
22	0-10	0.6-2.0	0.11-0.17	3.6-5.5	Low	0.28	3
Linker	10-32	0.6-2.0	0.11-0.20	3.6-5.5	Low	0.32	
	32	---	---	---	---	---	
23	0-10	0.6-2.0	0.11-0.17	3.6-5.5	Low	0.24	3
Linker	10-32	0.6-2.0	0.08-0.20	3.6-5.5	Low	0.28	
	32	---	---	---	---	---	
24*:							
Linker	0-9	0.6-2.0	0.09-0.15	3.6-5.5	Low	0.20	3
	9-32	0.6-2.0	0.08-0.20	3.6-5.5	Low	0.28	
	32	---	---	---	---	---	
Mountainburg	0-7	2.0-6.0	0.05-0.10	5.1-6.0	Low	0.17	1
	7-17	2.0-6.0	0.05-0.10	4.5-5.5	Low	0.17	
	17-22	---	---	---	---	---	
25*, 26*:							
Moko	0-11	0.6-2.0	0.09-0.14	6.6-7.8	Low	0.32	1
	11	---	---	---	---	---	
Rock outcrop.							
27	0-5	2.0-6.0	0.05-0.10	5.1-6.0	Low	0.17	1
Mountainburg	5-17	2.0-6.0	0.05-0.10	4.5-5.5	Low	0.17	
	17	---	---	---	---	---	
28, 29, 30	0-7	2.0-6.0	0.05-0.10	5.1-6.0	Low	0.17	1
	7-17	2.0-6.0	0.05-0.10	4.5-5.5	Low	0.17	
Mountainburg	17	---	---	---	---	---	
31*:							
Nella	0-9	0.6-2.0	0.08-0.15	4.5-5.5	Low	0.20	5
	9-72	0.6-2.0	0.07-0.14	4.5-5.5	Low	0.20	
Mountainburg	0-7	2.0-6.0	0.05-0.10	5.1-6.0	Low	0.17	1
	7-17	2.0-6.0	0.05-0.10	4.5-5.5	Low	0.17	
	17	---	---	---	---	---	
32, 33	0-13	0.6-2.0	0.08-0.10	4.5-5.5	Low	0.43	2
Nixa	13-18	0.2-0.6	0.08-0.10	4.5-5.5	Low	0.43	
	18-36	<0.06	0.05-0.08	4.5-5.5	Low	0.43	
	36-72	<0.06	0.03-0.06	4.5-5.5	Low	0.37	
34	0-14	0.6-2.0	0.10-0.14	4.5-6.5	Low	0.32	3
Noark	14-22	0.6-2.0	0.10-0.14	3.6-5.5	Low	0.28	
	22-35	0.6-2.0	0.09-0.13	3.6-5.5	Low	0.24	
	35-72	0.6-2.0	0.06-0.09	3.6-5.5	Low	0.24	

See footnote at end of table.

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

Map symbol and soil name	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors	
						K	T
	In	In/hr	In/in	pH			
35----------	0-14	0.6-2.0	0.10-0.14	4.5-6.5	Low----------	0.32	3
Noark	14-22	0.6-2.0	0.10-0.14	3.6-5.5	Low----------	0.28	
	22-35	0.6-2.0	0.09-0.13	3.6-5.5	Low----------	0.24	
	37-72	0.6-2.0	0.06-0.09	3.6-5.5	Low----------	0.24	
36----------	0-14	0.6-2.0	0.10-0.14	4.5-6.5	Low----------	0.32	3
Noark	14-22	0.6-2.0	0.10-0.14	3.6-5.5	Low----------	0.28	
	22-35	0.6-2.0	0.09-0.13	3.6-5.5	Low----------	0.24	
	35-72	0.6-2.0	0.06-0.09	3.6-5.5	Low----------	0.24	
37, 38----------	0-6	0.6-2.0	0.16-0.24	4.5-6.0	Low----------	0.37	5
Peridge	6-33	0.6-2.0	0.18-0.22	4.5-6.0	Low----------	0.32	
	33-72	0.6-2.0	0.09-0.18	4.5-6.0	Moderate-------	0.24	
39, 40----------	0-12	0.6-2.0	0.11-0.15	5.1-6.5	Low----------	0.24	3
Portia	12-25	0.6-2.0	0.15-0.24	4.5-5.5	Low----------	0.32	
	25-72	0.2-2.0	0.12-0.20	5.1-6.0	Moderate-------	0.28	
41*----------	0-10	0.6-2.0	0.10-0.22	6.1-7.3	Low----------	0.37	5
Razort	10-49	0.6-2.0	0.13-0.22	5.6-6.5	Low----------	0.37	
	49-84	2.0-6.0	0.08-0.12	5.6-6.5	Low----------	0.32	
42----------	0-13	0.6-2.0	0.16-0.24	5.6-6.5	Low----------	0.49	5
Samba	13-72	<0.06	0.12-0.18	5.1-7.3	High----------	0.37	

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

TABLE 16.--SOIL AND WATER FEATURES

[Absence of an entry indicates the feature is not a concern. See text for descriptions of symbols and such terms as "rare," "brief," and "perched."]

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.
3*, 4*, 5*: Arkana----------	C	None---------	---	---	>6.0	---	---	20-40	Hard	High-----	Moderate.
Moko----------	D	None---------	---	---	>6.0	---	---	6-20	Hard	Low------	Low.
6---------- Boden	C	None---------	---	---	>6.0	---	---	40-60	Hard	Low------	High.
7*: Boden Variant----	C	None---------	---	---	>6.0	---	---	35-55	Hard	Low------	High.
Rock outcrop.											
8, 9---------- Britwater	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
10, 11---------- Cane	C	None---------	---	---	2.0-3.0	Perched	Nov-Mar	>60	---	Moderate	High.
12, 13---------- Captina	C	None---------	---	---	2.0-3.0	Perched	Dec-Apr	36-60	Rippable	High-----	High.
14---------- Clarksville	B	None---------	---	---	>6.0	---	---	>60	---	Low------	High.
15---------- Enders	C	None---------	---	---	>6.0	---	---	40-60	Rippable	High-----	High.
16*, 17*: Enders----------	C	None---------	---	---	>6.0	---	---	40-60	Rippable	High-----	High.
Nella----------	B	None---------	---	---	>6.0	---	---	>60	---	Low------	Moderate.
18, 19---------- Gassville	C	None---------	---	---	>6.0	---	---	40-60	Rippable	High-----	Moderate.
20, 21---------- Leadvale	C	None---------	---	---	2.0-3.0	Perched	Jan-Apr	>48	Rippable	Moderate	Moderate.
22, 23---------- Linker	B	None---------	---	---	>6.0	---	---	20-40	Hard	Low------	High.
24*: Linker----------	B	None---------	---	---	>6.0	---	---	20-40	Hard	Low------	High.
Mountainburg-----	D	None---------	---	---	>6.0	---	---	12-20	Hard	Low------	High.
25*, 26*: Moko----------	D	None---------	---	---	>6.0	---	---	6-20	Hard	Low------	Low.
Rock outcrop.											
27, 28, 29, 30---- Mountainburg	D	None---------	---	---	>6.0	---	---	12-20	Hard	Low------	High.
31*: Nella----------	B	None---------	---	---	>6.0	---	---	>60	---	Low------	Moderate.
Mountainburg-----	D	None---------	---	---	>6.0	---	---	12-20	Hard	Low------	High.
32, 33---------- Nixa	C	None---------	---	---	>6.0	---	---	24-48	Rippable	Moderate	Moderate.

See footnote at end of table.

TABLE 16.--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			
34, 35, 36--Noark	B	None	---	---	>6.0	---	---	>60	---	Moderate	High.
37, 38--Peridge	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
39, 40--Portia	C	None	---	---	>6.0	---	---	>60	---	High	High.
41*--Razort	B	Frequent	Very brief	Jan-Apr	>6.0	---	---	>60	---	Low	Low.
42--Samba	D	None	---	---	0-1.0	Perched	Dec-Apr	>60	---	High	Moderate.

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

TABLE 17.--CLASSIFICATION OF THE SOILS

[An asterisk in the first column indicates a taxadjunct to the series. See text for a description of those characteristics of this taxadjunct that are outside the range of the series]

Soil name	Family or higher taxonomic class
Arkana	Very-fine, mixed, mesic Mollic Hapludalfs
Boden	Clayey, mixed, mesic Typic Hapludults
Boden Variant	Clayey, mixed, mesic Typic Hapludults
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
Enders	Clayey, mixed, thermic Typic Hapludults
Gassville	Clayey, mixed, mesic Typic Hapludults
Leadvale	Fine-silty, siliceous, thermic Typic Fragiudults
Linker	Fine-loamy, siliceous, thermic Typic Hapludults
Moko	Loamy-skeletal, mixed, mesic Lithic Hapludolls
Mountainburg	Loamy-skeletal, siliceous, thermic Lithic Hapludults
Nella	Fine-loamy, siliceous, thermic Typic Paleudults
Nixa	Loamy-skeletal, siliceous, mesic Glossic Fragiudults
Noark	Clayey-skeletal, mixed, mesic Typic Paleudults
Peridge	Fine-silty, mixed, mesic Typic Paleudalfs
Portia	Fine-loamy, siliceous, mesic Typic Paleudalfs
Razort	Fine-loamy, mixed, mesic Mollic Hapludalfs
Samba	Fine, mixed, thermic Typic Umbraqualfs

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