United States Department of Agriculture

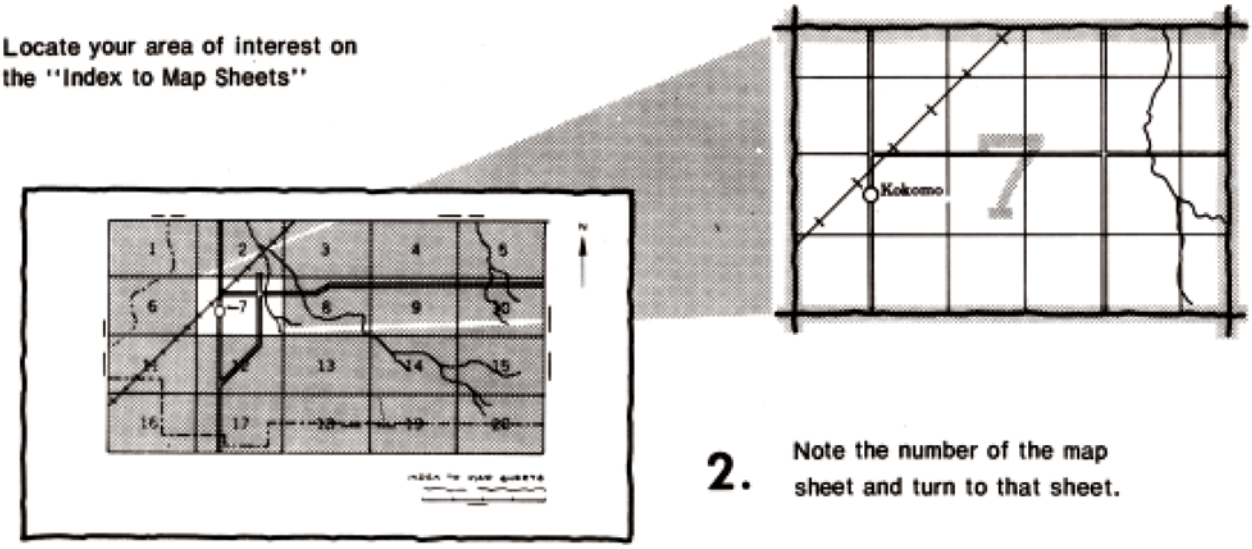
Soil Conservation Service

In Cooperation with United States Department of Agriculture Forest Service and the Arkansas Agricultural Experiment Station

Soil Survey of Stone County Arkansas

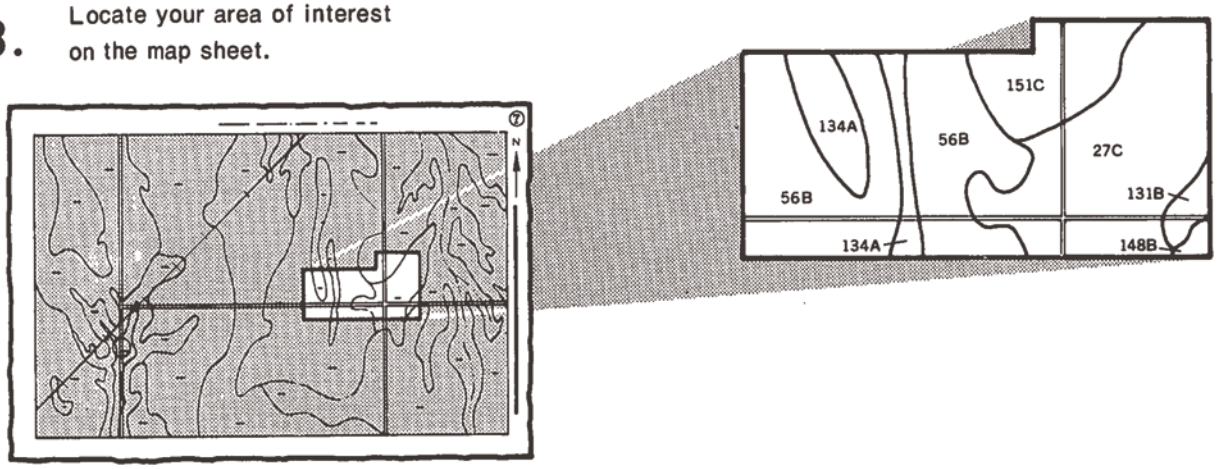
HOW TO USE

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

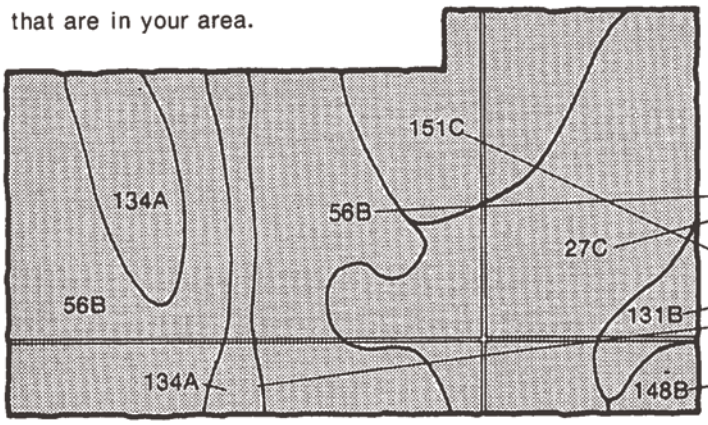


2. Note the number of the map sheet and turn to that sheet.

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



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

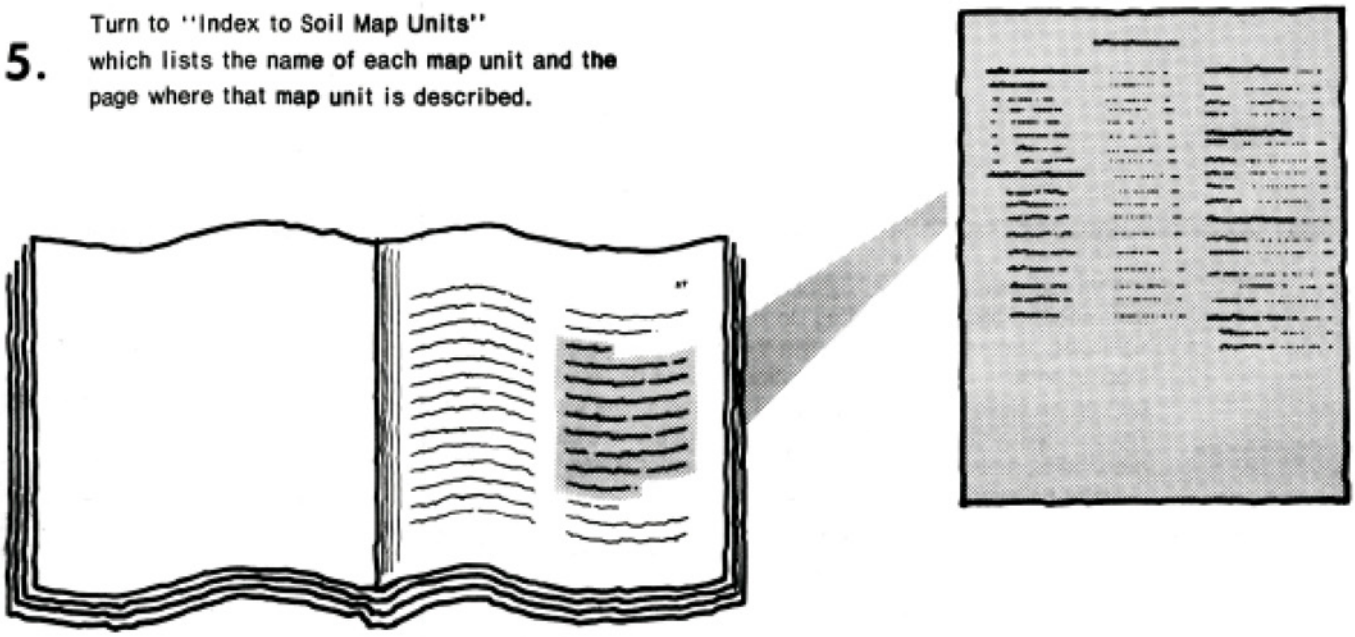


Symbols

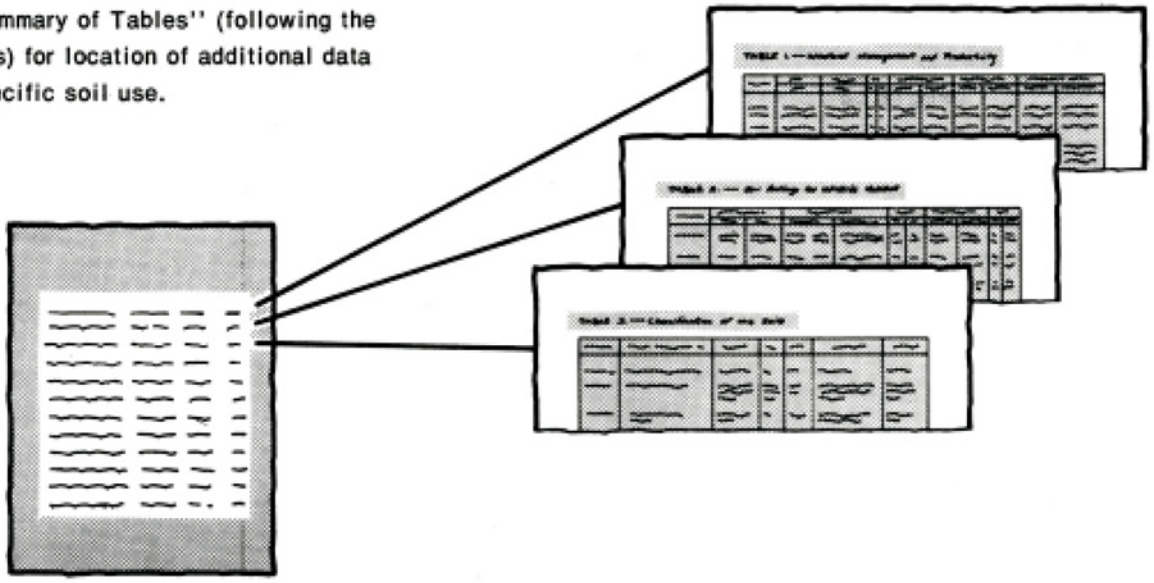
27C
56B
131B
134A
148B
151C

THIS SOIL SURVEY

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



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



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

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was completed in 1975-80. Soil names and descriptions were approved in 1981. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1981. This survey was made cooperatively by the Soil Conservation Service, the Forest Service, and the Arkansas Agricultural Experiment Station. It is part of the technical assistance furnished to the Stone 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: Forests cover 81 percent of Stone County. This well managed stand of shortleaf pine is on Portia fine sandy loam, 3 to 8 percent slopes. This soil is well suited to woodland.

Contents

Index to map units iv
Summary of tables v
Foreword vii
General nature of the survey area 1
How this survey was made 3
General soil map units 5
Detailed soil map units 11
Prime farmland 45
Use and management of the soils 47
Crops and pasture 47
Woodland management and productivity 49
Recreation 50
Wildlife habitat 51
Engineering 52
Soil properties 57
Engineering index properties 57
Physical and chemical properties 58
Soil and water features 59
Engineering index test data 60
Physical and chemical analyses of selected soils 60
Classification of the soils 61
Soil series and their morphology 61
Formation of the soils 81
Factors of soil formation 81
Soil horizon differentiation 83
References 85
Glossary 87
Tables 95

Soil series

Brockwell series 62
Ceda series 63
Clarksville series 63
Cleora series 64
Eden series 65
Elsah series 65
Enders series 66
Estate series 67
Healing series 68
Linker series 68
Moko series 69
Mountainburg series 69
Nella series 70
Newnata series 71
Nixa series 72
Noark series 73
Portia series 74
Ramsey series 74
Razort series 75
Samba series 75
Sidon series 76
Spadra series 77
Steprock series 78
Sturkie series 78
Summit series 79
Wideman series 80

Issued April 1983

Index to Map Units

1—Brockwell sandy loam, 8 to 20 percent slopes.. 11
2—Ceda gravelly fine sandy loam, frequently flooded 12
3—Clarksville very cherty silt loam, 8 to 20 percent slopes 12
4—Clarksville very cherty silt loam, 20 to 50 percent slopes 13
5—Clarksville-Nixa complex, 8 to 20 percent slopes..... 13
6—Cleora fine sandy loam, occasionally flooded ... 14
7—Eden-Moko association, very steep 14
8—Elsah cherty loam, frequently flooded 15
9—Enders gravelly fine sandy loam, 3 to 8 percent slopes 15
10—Enders very stony sandy loam, 8 to 20 percent slopes 16
11—Enders very stony sandy loam, 20 to 40 percent slopes 16
12—Estate-Portia-Moko association, rolling 16
13—Estate-Portia-Moko association, steep 18
14—Healing silt loam, 1 to 3 percent slopes 19
15—Linker fine sandy loam, 3 to 8 percent slopes.. 19
16—Linker gravelly fine sandy loam, 3 to 8 percent slopes..... 20
17—Linker gravelly fine sandy loam, 8 to 12 percent slopes 21
18—Linker-Mountainburg complex, 3 to 8 percent slopes..... 21
19—Linker-Mountainburg complex, 8 to 20 percent slopes..... 22
20—Moko-Estate complex, 40 to 60 percent slopes..... 22
21—Moko-Rock outcrop complex, 15 to 50 percent slopes..... 23
22—Mountainburg very stony sandy loam, 8 to 20 percent slopes 23
23—Mountainburg very stony sandy loam, 20 to 40 percent slopes 24
24—Nella-Enders complex, 8 to 20 percent slopes. 25
25—Nella-Enders complex, 20 to 40 percent slopes..... 26
26—Nella-Steprock complex, 8 to 20 percent slopes..... 26
27—Nella-Steprock-Mountainburg complex, 20 to 40 percent slopes..... 27
28—Newnata silt loam, 3 to 8 percent slopes 28
29—Newnata-Eden-Moko association, rolling 28
30—Newnata-Eden-Moko association, steep..... 29
31—Nixa very cherty silt loam, 3 to 8 percent slopes..... 30
32—Nixa-Noark complex, 3 to 8 percent slopes 31
33—Noark very cherty silt loam, 3 to 8 percent slopes..... 32
34—Noark very cherty silt loam, 8 to 20 percent slopes..... 32
35—Noark very cherty silt loam, 20 to 40 percent slopes..... 33
36—Noark-Nixa complex, 8 to 20 percent slopes 33
37—Portia fine sandy loam, 3 to 8 percent slopes... 34
38—Ramsey-Rock outcrop complex, 3 to 20 percent slopes 34
39—Razort fine sandy loam, frequently flooded 35
40—Razort silt loam, frequently flooded 36
41—Samba silty clay loam, occasionally flooded 37
42—Sidon fine sandy loam, 3 to 8 percent slopes... 38
43—Sidon gravelly fine sandy loam, 3 to 8 percent slopes..... 39
44—Spadra fine sandy loam, 1 to 3 percent slopes 39
45—Steprock-Nella-Mountainburg complex, 40 to 60 percent slopes..... 40
46—Sturkie silt loam, 0 to 3 percent slopes..... 40
47—Summit silty clay loam, 3 to 8 percent slopes... 41
48—Summit silty clay loam, 8 to 12 percent slopes. 42
49—Wideman fine sandy loam, 0 to 3 percent slopes..... 42

Summary of Tables

Number and size of farms in Stone County (table 1) 96

Number of livestock and poultry on farms (table 2) 96

Number of livestock and poultry sold from farms (table 3) 96

Acreage of principal crops (table 4) 96

Temperature and precipitation (table 5) 97

Freeze dates in spring and fall (table 6) 98
Probability. Temperature.

Growing season (table 7) 98

Acreage and proportionate extent of the soils (table 8) 99
Acres. Percent.

Yields per acre of crops and pasture (table 9) 100
Soybeans. Corn. Oats. Tall fescue. Improved bermudagrass.

Woodland management and productivity (table 10) 103
Woodland suitability group. Management concerns. Potential productivity. Trees to plant.

Recreational development (table 11) 108
Camp areas. Picnic areas. Playgrounds. Paths and trails.

Wildlife habitat (table 12) 113
Potential for habitat elements. Potential as habitat for—Openland wildlife, Woodland wildlife, Wetland wildlife.

Building site development (table 13) 117
Shallow excavations. Dwellings without basements. Dwellings with basements. Small commercial buildings. Local roads and streets.

Sanitary facilities (table 14) 122
Septic tank absorption fields. Sewage lagoon areas. Trench sanitary landfill. Area sanitary landfill. Daily cover for landfill.

Construction materials (table 15) 127
Roadfill. Sand. Gravel. Topsoil.

Water management (table 16) 132
Limitations for—Pond reservoir areas; Embankments, dikes, and levees. Features affecting—Drainage, Irrigation, Terraces and diversions, Grassed waterways.

Engineering index properties (table 17) 137
Depth. USDA texture. Classification—Unified, AASHTO. Fragments more than 3 inches. Percentage passing sieve—4, 10, 40, 200. Liquid limit. Plasticity index.

Physical and chemical properties of the soils (table 18) 145
Depth. Clay. Moist bulk density. Permeability. Available water capacity. Soil reaction. Shrink-swell potential. Erosion factors. Organic matter.

Soil and water features (table 19) 149
Hydrologic group. Flooding. High water table. Bedrock. Risk of corrosion.

Engineering index test data (table 20) 151
Classification. Percentage passing sieve —10, 40, 200. Liquid limit. Plasticity index. Moisture density.

Physical analyses of selected soils (table 21) 151
Depth. Horizon. Particle-size distribution.

Chemical analyses of selected soils (table 22) 151
Depth. Horizon. Extractable bases. Extractable acidity. Base saturation. Reaction. Organic matter.

Classification of the soils (table 23) 152
Family or higher taxonomic class.

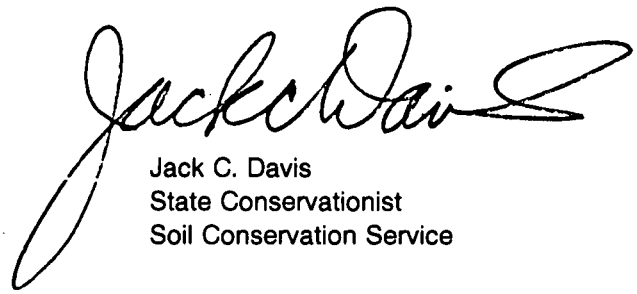
Foreword

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

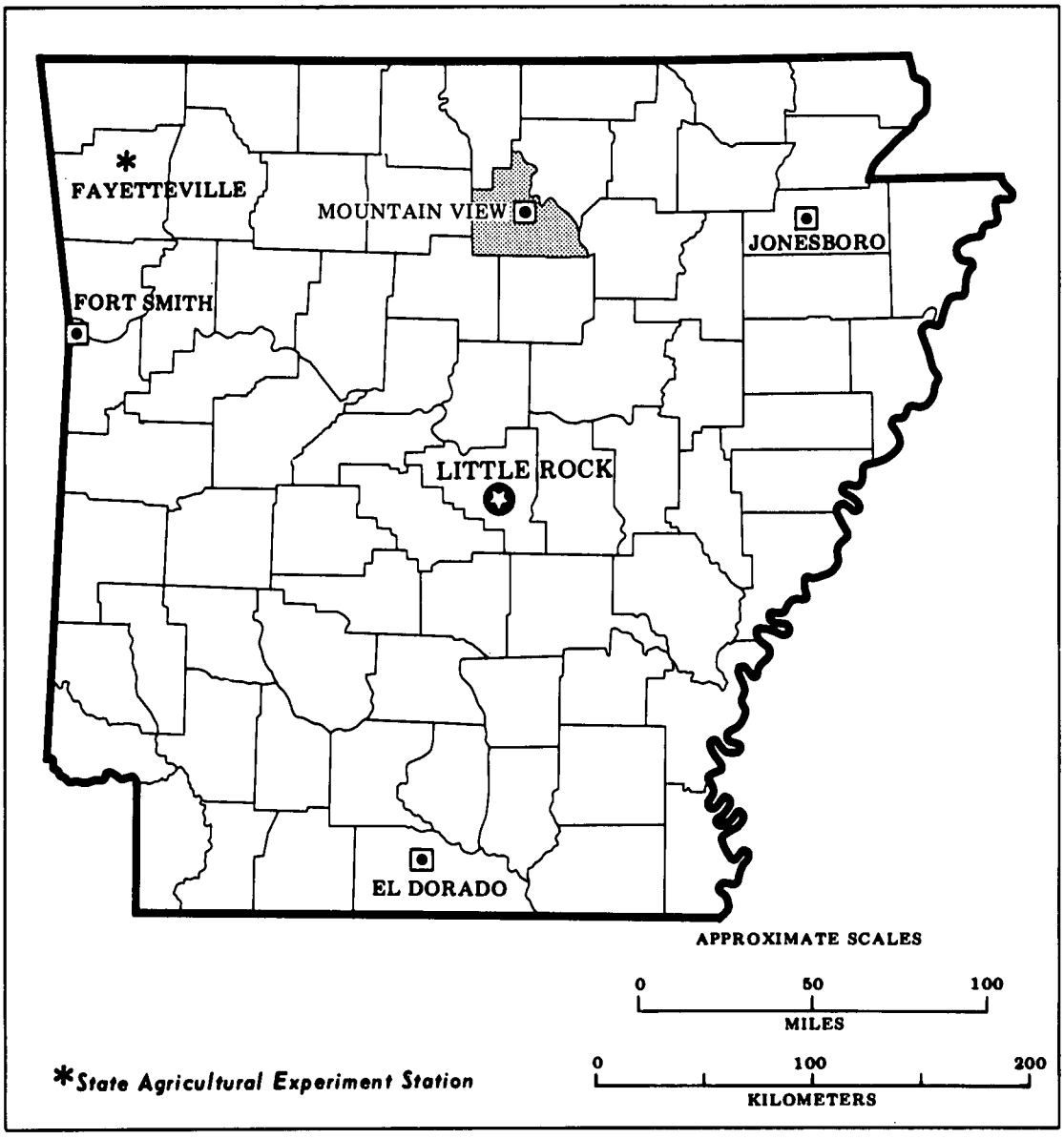
This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use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



Jack C. Davis
State Conservationist
Soil Conservation Service



Location of Stone County in Arkansas

Soil Survey of
Stone County, Arkansas

By Larry B. Ward, Soil Conservation Service

Fieldwork by Larry B. Ward and Richard T. McCright, Soil Conservation Service
and Suzanne A. Krieger and Bedford V. Cash, Forest Service

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

STONE COUNTY is in the north-central part of Arkansas. The county is irregular in shape. From east to west, it ranges in width from less than 1 mile in the extreme north to about 33 miles along its southern border. From north to south, it ranges in length from about 3 miles in the southeast corner where it joins with Independence County to approximately 29 miles through the central part. The White River is a common border with Izard County on the northeast and with Independence County on the east. The county is bounded on the south by Cleburne County, on the south and west by Van Buren County, on the west by Searcy County, and on the northwest by Baxter County.

The approximate land area of Stone County, according to the 1974 Census of Agriculture, is 389,312 acres, or about 608 square miles. The total acreage of the county is 391,680 acres, or about 612 square miles. This includes bodies of water of more than 40 acres and streams more than one-eighth of a mile wide.

In 1980, the population of the county was 9,022. Mountain View is the county seat and the main trade center.

The economy of the county is based mainly on livestock and poultry production, forestry, and tourism.

General Nature of the Survey Area

This section describes briefly the farming, physiography and drainage, and climate in Stone County.

Farming

The first settlers in Stone County were mostly subsistence farmers. They cleared and farmed small scattered areas of land on flood plains and the gently sloping uplands where the soil was deep and had little gravel and few stones. As they built roads and developed markets, they cleared more of the flood plains and uplands and produced cotton, corn, small grain, and livestock for cash sale. They also cut and sold the virgin hardwood timber.

This trend continued until about 1930. From the 1930's through the 1950's, numerous farms were abandoned. On many, land use changed from cultivated crops to pasture or meadow. In the 1970's, more of the gently sloping to moderately sloping uplands were cleared and seeded to pasture and hay crops. Most of the upland acreage that has been cleared is used for pasture and forage crops, and the bottom land, mainly along the White River, is used for cultivated crops.

According to the 1978 Census of Agriculture, about one-third of Stone County was in farms. The number of farms has increased slightly because some large farms have been divided into small operating units and more unimproved woodland has been cleared and seeded to improved pasture. The average size of a farm in Stone County was 212 acres. Table 1 shows the proportion, number, and size of farms in Stone County in selected years. The rest of the land is taken up by cities, towns, rural subdivisions, federally owned land, transportation and utility facilities, and unimproved woodland.

Most farm income is from livestock, mainly beef cattle, and broiler production. The cattle industry consists mainly of cow-calf operations. Tables 2 and 3 show the number of livestock and broilers on farms and sold in selected years. Most calves are weaned and sold or are kept and sold the following year as stockers. Most cattle produced in the county area are sold to feedlots in the

Midwest. They are raised on cool- and warm-season pastures and are fed mineral and protein supplements. Generally, grain and hay are fed only in the winter. The production of pigs and hogs has fluctuated considerably. There has been a substantial increase in the production of broilers in recent years.

The sale of forest products is also a source of farm income. Most of the woodland is on steep, stony, or shallow soils, which are poor sites for commercial timber production; however, woodland is the best use of these soils. Most privately owned woodland is in low-grade upland hardwoods, or mixed stands of oak and shortleaf pine. Most of the northern part of Stone County is in the Ozark National Forest. This area is managed for multiple uses including timber production (fig. 1). Most of the hardwood timber is sold locally and sawed into railroad ties, hardwood flooring, pallet, and furniture stock. Mill scraps are used to make charcoal. A large amount of the pine timber is treated with preservatives and sold for post and wood fencing. A small amount is sawed into lumber at local mills. Some pine is sold locally as pulpwood, which is shipped to papermills in southern Arkansas. The shallow soils of the Salem Plateau in the northern part of Stone County produce cedar trees that are used as posts or for lumber to make furniture and novelties.

The major crops in the county are improved pasture and forage crops. Table 4 shows acreage of principal crops in Stone County in selected years. The acreage in corn, other grain crops, and crops for silage fluctuates depending on the number of livestock in the county.

Figure 1.—Timber of shortleaf pine after thinning on Portia fine sandy loam, 3 to 8 percent slopes.

Only about one-third of Stone County farmowners are full-time operators. Most have off the farm jobs or are retired. Many people moving into the county buy small acreages in rural areas and farm as a hobby.

Physiography and Drainage

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

The Salem Plateau is characterized by rolling uplands and steep, stony side slopes with outcrops of sandstone and dolomite (*3*). It roughly parallels the White River to its junction with Sylamore Creek. The area has been intricately dissected by streams. Elevation is about 400 to 800 feet above sea level. There are a few broad upland flats that have a gradient of 1 to 8 percent. Portia, Estate, and Moko soils formed in this area.

The Springfield Plateau is adjacent to and higher in elevation than the Salem Plateau. This surface is younger than the Salem Plateau, and it has been strongly dissected by streams. The area is characterized by steep, V-shaped valleys that are separated by gently sloping to rolling, long, narrow, winding ridges. In some places, this plateau has karst topography that is characterized by depressions or sinkholes which are generally 1/4 acre to 3 acres in size. The hillsides on the plateau have gradients from 12 to 50 percent. The elevation at the ridgetops is about 700 feet above sea level on the east side of the county and about 1,100 feet above sea level on the west side. Clarksville, Noark, and Nixa soils formed in this area.

The Boston Mountains rise above the Springfield Plateau across the southern part of Stone County. This plateau is characterized by broad, gently sloping to rolling mountaintops and steep and very steep mountainsides. The mountaintops are capped with hard sandstone and the mountainsides are interbedded sandstone and shale (*6*). The mountainsides have gradients from 12 to 60 percent. The elevation at the mountaintops is about 1,000 to 1,800 feet above sea level; mainly, it is between 1,100 and 1,400 feet above sea level. This plateau increases in elevation from east to west. The Nella, Enders, Mountainburg, Linker, and Sidon soils formed in this area.

Roughly paralleling the northern escarpment of the Boston Mountains through the central part of Stone County is a gently sloping to moderately sloping surface capped with hard sandstone and with outcrops of calcareous shale and limestone near the base of the

escarpment (*7*). This surface was probably formed by the backwasting of the escarpment itself; it extends out from the escarpment about 1/4 mile to about 2 miles. The city of Mountain View is located on this surface. The Linker, Sidon, Summit, and Mountainburg soils formed in this area.

Stream valleys are entrenched and range from a few hundred feet in width in the Springfield Plateau to as much as 1/2 mile in width along the White River and Little Red River in the Salem Plateau and Boston Mountains. Most flood plains in the area are 100 to 1,000 feet wide. Healing, Sturkie, Razort, Elsah, Spadra, and Ceda soils formed in these valleys.

Two major streams flow in Stone County—the White River, which is the northern boundary of the county and flows in a general southeasterly direction, and the Little Red River, which winds across the southwest corner of the county. The natural drainage system of the interior of the county consists of many intermittent and perennial streams in a dentritic pattern. Springs are common in most areas, and they contribute substantially to streamflow in summer and fall.

The Springfield escarpment is roughly in a line north of Allison along Arkansas Highway 5 to Optimus and then west to the county line. The area north and east of this scarp is drained by mainly Jacks Creek, Sugarloaf Creek, Sylamore Creek, Bear Branch, and East and West Livingston Creek; all flow north or east into the White River.

The Boston Mountains escarpment is generally in a line that runs east and west across the county and roughly along Arkansas Highway 66 from the Searcy County line to Mountain View, then east along Arkansas Highway 14 to the Independence County line. The area between the Boston Mountains escarpment and the Springfield escarpment is drained by many intermittent streams. These flow north directly to the White River or northeast to the north and south forks of Sylamore Creek that flows eastwardly to the White River at Allison. The main tributaries in this area are Wolf Bayou, Rocky Bayou, South Sylamore Creek, Roasting Ear Creek, and North Sylamore Creek.

The southern part of Stone County is drained by many intermittent and perennial streams which flow south to the Beech Fork or Middle Fork of the Little Red River. The main tributaries that flow into the Beech Fork of the Little Red River are Raccoon Creek, Tomahawk Creek, and Turkey Creek. The main streams that flow into the Middle Fork of the Little Red River are Tick Creek, Meadow Creek, and Little Tick Creek.

Domestic water sources are the White River, drilled or dug wells, and springs. Mountain View and Fifty-Six have public water systems. Water for livestock is mainly from farm ponds and creeks.

Climate

Prepared by the National Climatic Center, Asheville, N.C.

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

Table 5 gives data on temperature and precipitation for the county, as recorded at Mountain View, Ark., for the period 1962 to 1978. Table 6 shows probable dates of the first freeze in fall and the last freeze in spring. Table 7 provides data on length of the growing season.

In winter the average temperature is 38° F, and the average daily minimum temperature is 27°. The lowest temperature on record, which occurred at Mountain View on January 11, 1977, is -12°. In summer the average temperature is 77°, and the average daily maximum temperature is 89°. The highest recorded temperature, which occurred on July 10, 1966, is 107°.

Growing degree days, shown in table 5, 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° 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.

Of the total annual precipitation, 24 inches, or 50 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 20 inches. The heaviest 1-day rainfall during the period of record was 8.23 inches at Mountain View on September 22, 1965. Thunderstorms occur on about 60 days each year, and most occur in summer.

Average seasonal snowfall is 6 inches. The greatest snow depth at any one time during the period of record was 12 inches. On the average, 5 days have at least 1 inch of snow on the ground.

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 percentage of possible sunshine is 70 in summer and 50 in winter. The prevailing wind is from the south- southeast. Average windspeed is highest, 9 miles per hour, in summer.

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 units" and "Detailed soil map units."

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, woodland managers, engineers, planners, developers and builders, home buyers, and others.

General Soil Map Units

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

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

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

The soils in the survey area vary widely in their potential for major land uses. Soil suitability 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 are those grown for livestock forage. Woodland refers to areas of native or introduced trees. Urban uses include residential, commercial, and industrial developments.

Descriptions of the general soil map units follow.

1. Moko-Estate-Portia

Deep and shallow, gently sloping to very steep, well drained very stony, stony, and loamy soils that formed in residuum of limestone or dolomite or that formed in residuum or colluvium of interbedded sandstone and limestone

These soils are in the northern part of the county. They are on gently sloping to steep hilltops and hillsides of the Salem Plateau and on gently sloping to moderately sloping foot slopes to very steep hillsides in lower positions of the Springfield Plateau.

This map unit makes up about 10 percent of the county. It consists of about 33 percent Moko soils, 22 percent Estate soils, 13 percent Portia soils, and 32 percent soils of minor extent.

The very stony Moko soils are on hillsides near outcrops of limestone or dolomite. They have a surface layer of black and very dark gray very stony silt loam or very stony loam over hard limestone or dolomite bedrock.

The stony Estate soils are on hilltops and hillsides. They have a dark brown stony fine sandy loam surface layer and a yellowish brown stony fine sandy loam subsurface layer. The subsoil is yellowish red gravelly fine sandy loam, red cobbly clay, and red cobbly clay loam. The underlying material is hard, undulating limestone.

The loamy Portia soils are on hilltops and foot slopes. They have a brown fine sandy loam surface layer. The subsoil is yellowish red fine sandy loam, red sandy clay loam, and red sandy clay.

Of minor extent in this map unit are the very cherty Clarksville and Noark soils on steep hillsides at higher elevation, the Razort soils on flood plains, the Ramsey and Brockwell soils in similar positions, and outcrops and escarpments of sandstone and limestone.

The soils making up this unit are used mainly for pasture or as woodland. Most areas of the gently sloping to moderately steep Portia soils have been cleared and are used for pasture or are idle. The Estate and Moko soils are in mixed hardwoods, pine, and redcedar. Slope, stoniness, outcrops of rock, and the hazard of erosion are the main limitations to farming and most other uses.

The Moko and Estate soils are not suited to cultivated crops, and Portia soils are moderately suited to not suited to cultivated crops. Estate soils are poorly suited to improved pasture. Moko soils are not suited to improved pasture. Portia soils are well suited to improved pasture. Portia soils are well suited to woodland. Estate soils are moderately suited to woodland; Moko soils have low productivity as woodland, but this is their best use.

Moko and Estate soils are poorly suited to most urban uses. Slope, depth to bedrock, slow permeability, low strength, and surface stoniness are the main limitations. Portia soils are moderately suited to most urban uses. Slope, low strength, and moderate permeability are the main limitations. Some of these limitations generally can be overcome by using special design and construction.

The limitation of depth to bedrock is difficult and often impractical to overcome.

2. Noark-Clarksville

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

These soils are in the northern part of the county on ridges and hillsides of the Springfield Plateau.

This map unit makes up about 30 percent of the county. It consists of about 47 percent Noark soils, 33 percent Clarksville soils, and 20 percent soils of minor extent.

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

The somewhat excessively drained Clarksville soils are on rolling ridges and steep and very steep hillsides. They have a brown very cherty silt loam surface layer and a grayish brown very cherty silt loam subsurface layer. The subsoil is light yellowish brown very cherty silt loam, yellowish red very cherty silty clay loam, and red very cherty silty clay.

Of minor extent in this map unit are the Nixa, Elsah, and Moko soils. The very cherty Nixa soils are on ridgetops and uplands. The frequently flooded, cherty Elsah soils are on narrow flood plains. The very stony Moko soils are on lower hillsides near outcrops of limestone.

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

Noark soils are moderately suited to not suited to cultivated crops. Clarksville soils are not suited to cultivated crops. Slope, the hazard of erosion, and chert on the surface are the main limitations. Noark soils are moderately suited to poorly suited to improved pasture depending on slope. Clarksville soils are poorly suited or not suited to improved pasture because of slope and droughtiness. Noark and Clarksville soils are moderately suited to woodland.

Noark and Clarksville soils are moderately suited to poorly suited to most urban uses. Slope and the moderate permeability of the subsoil are the main limitations. These limitations generally can be overcome, but the difficulty increases as the slope increases. Special design and construction are needed to overcome these limitations.

3. Linker-Mountainburg-Sidon

Deep, moderately deep, and shallow, gently sloping to moderately steep, well drained and moderately well drained loamy, stony, or gravelly soils that formed in residuum of weathered acid sandstone

These soils are in the central and southern parts of the county. These soils are on mountaintops and benches of the Boston Mountains.

This map unit makes up about 24 percent of the county. It consists of about 53 percent Linker soils, 10 percent Mountainburg soils, 8 percent Sidon soils, and 29 percent soils of minor extent.

The moderately deep, well drained Linker soils are on mountaintops and benches. They have a brown fine sandy loam or gravelly fine sandy loam surface layer. The subsoil is strong brown fine sandy loam or gravelly fine sandy loam; yellowish red sandy clay loam; yellowish red, mottled sandy clay loam; and yellowish red, mottled loam. The underlying material is hard, level-bedded sandstone bedrock.

The shallow, well drained Mountainburg soils are on rims of mountaintops. They have a very dark grayish brown stony sandy loam surface layer and a yellowish brown very gravelly sandy loam subsurface layer. The subsoil is strong brown very gravelly sandy loam. The underlying material is hard, level-bedded sandstone bedrock.

The deep, moderately well drained Sidon soils are on broad mountaintops and benches. They have a dark yellowish brown fine sandy loam surface layer. The subsoil is strong brown silty clay loam; yellowish brown silty clay loam; compact and brittle, mottled, strong brown, light yellowish brown, light brownish gray loam; and mottled, light brownish gray, strong brown, and red clay loam. The underlying material is hard, level-bedded sandstone bedrock.

Of minor extent in this map unit are the poorly drained Samba soils in depressions and along drainageways, Ceda soils along drainageways, Enders soils on uplands and mountainsides, and Summit soils on foot slopes.

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

Linker soils are moderately suited to not suited to cultivated crops because of slope. They are well suited to pasture and are moderately suited to woodland. The Mountainburg soils are not suited to cultivated crops. They are poorly suited to pasture. These soils have low productivity as woodland, but this is their best use. Sidon soils are moderately suited to cultivated crops because of slope. They are well suited to pasture and moderately suited to woodland.

Linker soils are moderately suited to most urban uses. Depth to bedrock is the main limitation. Mountainburg soils are poorly suited to most urban uses. Depth to bedrock is the main limitation. Sidon soils are moderately suited to most urban uses. Low strength, wetness, and the slow permeability are the main limitations. Some of these limitations generally can be overcome by using special design and construction. The limitation of depth to bedrock is difficult and often impractical to overcome.

4. Eden-Newnata-Moko

Deep, moderately deep and shallow, gently sloping to very steep, well drained flaggy, stony, very stony, or loamy soils that formed in residuum of interbedded calcareous shale and limestone

These soils are primarily in the central part of the county. They are in the gently sloping to steep Richwoods Valley and on the steep and very steep mountainsides and foot slopes of the north face of the Boston Mountains escarpment.

This map unit makes up about 8 percent of the county. It consists of about 25 percent Eden soils, 22 percent Newnata soils, 19 percent Moko soils, and 34 percent soils of minor extent.

The moderately deep, flaggy Eden soils are on moderately sloping to steep foot slopes and steep and very steep mountainsides. They have a very dark grayish brown flaggy silty clay loam surface layer. The subsoil is brown clay and dark yellowish brown very shaly clay. The underlying material is grayish brown very shaly clay and very dark gray soft shale.

The deep Newnata soils are on gently sloping to moderately steep foot slopes in valleys and on steep mountainsides. They have a very dark grayish brown stony silt loam or silt loam surface layer. The subsoil is yellowish brown flaggy clay loam; strong brown silty clay loam; and strong brown, mottled clay. The underlying material is black and gray shale and strong brown clay. The material below that is hard, gray limestone bedrock.

The shallow, very stony Moko soils are on moderately sloping to very steep mountainsides near outcrops of limestone. They consist of black and very dark gray very stony silty clay loam over hard, limestone bedrock.

Of minor extent in this map unit are Samba soils in depressions and along drainageways, Enders and Summit soils on foot slopes, small areas of outcrops of shale, and outcrops and escarpments of limestone.

These soils are used for pasture or as woodland. Most of the nonstony, gently sloping to moderately steep areas of Newnata and a few moderately sloping to moderately steep areas of Eden soils have been cleared and are used for pasture. Most areas of the Moko soils and steep areas of Newnata soils are in mixed, upland hardwoods and redcedar. Slope, depth to bedrock, and surface stoniness are the main limitations for farming and most other uses.

The flaggy Eden and stony areas of Newnata soils are not suited to cultivated crops. The gently sloping, nonstony areas of Newnata soils are moderately suited to cultivated crops. Eden soils are poorly suited or not suited to improved pasture. The nonstony areas of Newnata soils are well suited to pasture and stony areas are poorly suited or not suited. Eden and Newnata soils are moderately suited to woodland. Moko soils are not suited to cultivated crops or improved pasture. The soils have low productivity as woodland, but this is their best use.

Eden, Newnata, and Moko soils are poorly suited or not suited to most urban uses. Low strength, depth to bedrock, surface stoniness, slow permeability, slope, and the high shrink-swell potential are the main limitations. Some of these limitations generally can be overcome by using special design and construction. The limitation of depth to bedrock is difficult and often impractical to overcome.

5. Nella-Enders

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

These soils are in the southern part of the county. They are on benches, foot slopes, and mountainsides of the Boston Mountains.

This map unit makes up about 13 percent of the county. It consists of about 45 percent Nella soils, 43 percent Enders soils, and 12 percent soils of minor extent.

The stony Nella soils are on benches and mountainsides. They have a dark grayish brown stony sandy loam surface layer and a yellowish brown gravelly sandy loam subsurface layer. The subsoil is strong brown gravelly loam; yellowish red gravelly sandy clay loam; and red, mottled sandy clay loam and clay loam.

The very stony Enders soils are on mountainsides and foot slopes. They have a dark grayish brown very stony sandy loam surface layer and a yellowish brown very stony sandy subsurface layer. The subsoil is red, mottled clay and red, mottled very shaly clay. The underlying material is soft, weathered, rippable, yellowish red and black shale. Below that is dark gray shale bedrock.

Of minor extent in this map unit are Linker, Mountainburg, and Sidon soils on plateaus, mountaintops, and ridges and Ceda and Spadra soils on flood plains and terraces. Also of minor extent are outcrops of sandstone, which form prominent bluffs in places.

Most of these soils are in forests of low-grade hardwoods. A few of the less sloping areas of the soils have been cleared of trees and stones and are used for pasture. Originally, Enders and Nella soils had a dense stand of hardwood trees. Most of the desirable trees have been cut; the harvesting left a stand of undesirable

species and young trees. Stoniness and slope are the main limitations of these soils for farming and for most other uses.

This map unit is not suited to cultivated crops. These soils are poorly suited or not suited to pasture. They are moderately suited to woodland.

This map unit is poorly suited to most urban uses. Low strength, high shrink-swell potential, slope, and surface stoniness are the main limitations. Some of these limitations generally can be overcome by using special design and construction.

6. Sturkie-Wideman-Healing

Deep, level and nearly level, well drained and excessively drained silty and sandy soils that formed in alluvium

These soils are on terraces and natural levees along the White River.

This map unit makes up about 1 percent of the county. About 37 percent of this unit is Sturkie soils, 33 percent Wideman soils, 27 percent Healing soils, and 3 percent soils of minor extent.

The well drained Sturkie soils are on terraces. They have a dark brown and very dark grayish brown silt loam surface layer. The subsoil is dark brown silt loam.

The excessively drained Wideman soils are on natural levees. They have a brown fine sandy loam surface layer. The underlying material is dark yellowish brown loamy fine sand, dark yellowish brown fine sandy loam, yellowish brown loamy fine sand, and dark yellowish brown fine sandy loam.

The well drained Healing soils are on terraces. They have a dark brown silt loam surface layer. The subsoil is brown silt loam, brown silty clay loam, and reddish brown silt loam.

Of minor extent in this map unit are small gravelly and sandy islands and bars in the river channel, areas with several inches of sandy overwash, and Razort soils along small intersecting streams.

Soils of this map unit are protected from flooding by upstream dams. Most areas of this unit are in pasture, hay meadows, or cultivated crops (fig.2). Originally, the area was in a dense stand of bottom land hardwood trees and bamboo cane. A slight to moderate hazard of erosion is the main limitation to farming the Sturkie and Healing soils. A slight to moderate hazard of erosion and a low available water capacity are the main limitations to farming the Wideman soils.

Sturkie and Healing soils are well suited to cultivated crops, pasture, and woodland. Wideman soils are moderately suited to cultivated crops and pasture, and they are well suited to woodland.

The soils of this map unit are poorly suited to most urban uses because of the possibility of flooding. Although these soils are protected from flooding by floodwater-retarding structures upstream, flooding could occur under abnormal conditions. The possibility of flooding increases as distance from these structures increases and the number of tributaries that flow into the White River increases. Generally, the hazard of flooding increases from west to east along the course of the river on the northern boundary of the county.

7. Steprock-Nella-Mountainburg

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

These soils are in the southern part of the county. They are on moderately sloping to very steep benches and mountainsides of the Boston Mountains.

This map unit makes up about 13 percent of the county. It consists of about 43 percent Steprock soils, 30 percent Nella soils, 19 percent Mountainburg soils, and 8 percent soils of minor extent.

The moderately deep Steprock soils are on moderately sloping benches and steep and very steep mountainsides. They have a brown very stony sandy loam surface layer and a light yellowish brown very gravelly sandy loam subsurface layer. The subsoil is strong brown very gravelly sandy loam and yellowish red very gravelly loam and very gravelly sandy loam. The underlying material is soft, thin-bedded sandstone bedrock.

The deep Nella soils are on moderately sloping uplands and benches and steep and very steep mountainsides. They have a dark grayish brown stony sandy loam surface layer and a yellowish brown gravelly sandy loam subsurface layer. The subsoil is strong brown gravelly loam; yellowish red gravelly sandy clay loam; and mottled, red gravelly sandy clay loam.

The shallow Mountainburg soils are on steep and very steep mountainsides. They have a very dark grayish brown very stony sandy loam surface layer and a yellowish brown very gravelly sandy loam subsurface layer. The subsoil is strong brown very gravelly sandy loam. The underlying material is hard, level-bedded sandstone bedrock.

Of minor extent in this unit are moderately sloping to steep Enders soils on side slopes and foot slopes, Ceda and Spadra soils on flood plains and terraces, and outcrops of sandstone that form prominent bluffs in places.

These soils are mainly in woodland of mixed, low-grade hardwoods. Originally, Steprock and Mountainburg soils had an open stand of hardwood trees with prairie plants in open areas, and Nella soils had a dense stand of hardwood trees. Most of the desirable trees have been cut; the harvesting left a stand of undesirable species and young trees. Surface stoniness, slope, and the depth to bedrock are the main limitations of these soils to farming and most other uses.

These soils are not suited to cultivated crops. The stony or very stony surface layer and slope limit the use

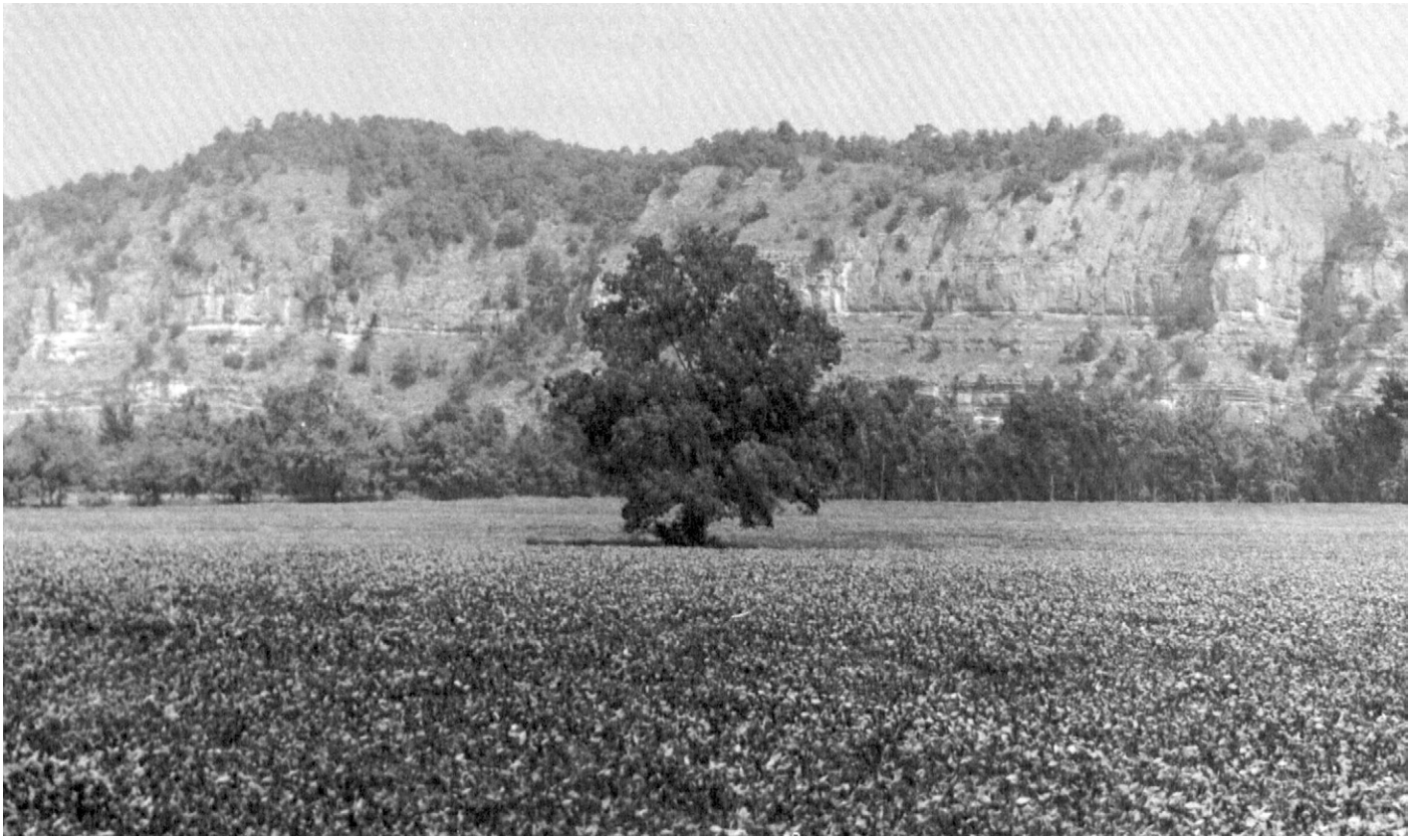


Figure 2.—Most of the row crops in the county are grown on the White River flood plain. These soybeans are on Wideman fine sandy loam, 0 to 3 percent slopes.

of these soils to mainly woodland, pasture, or habitat for wildlife. A few small areas of Nella and Steprock soils have been cleared of timber and the stones removed; the areas are now in pasture. These soils are poorly suited or not suited to improved pasture depending on slope. Nella and Steprock soils are moderately suited to woodland; Mountainburg soils have low productivity as woodland, but this is their best use.

Steprock and Nella soils are moderately suited to not suited to most urban uses, and Mountainburg soils are poorly suited or not suited to urban uses. Slope, surface stoniness, and the depth to bedrock are the main limitations. Special design and construction are needed to overcome the limitations, some of which become more difficult as slope gradient increases. The limitation of depth to bedrock is difficult and often impractical to overcome.

8. Ceda-Cleora-Spadra

Deep, level to gently sloping, well drained loamy and gravelly soils that developed in alluvium

These soils are on terraces and flood plains along the Middle Fork of the Little Red River, Meadow Creek, Turkey Creek, Tomahawk Creek, Raccoon Creek, Mill Creek, Wolf Bayou, and other small streams in the Boston Mountains.

This map unit makes up about 1 percent of the county. It consists of about 65 percent Ceda soils, 17 percent Cleora soils, 15 percent Spadra soils, and 3 percent soils of minor extent.

The frequently flooded Ceda soils are on flood plains. They have a brown gravelly sandy loam surface layer. The underlying material is dark yellowish brown very gravelly fine sandy loam and brown and strong brown very gravelly clay loam.

The occasionally flooded Cleora soils are on flood plains. They have a dark brown fine sandy loam surface layer. The underlying material is brown fine sandy loam.

The rarely flooded Spadra soils are on stream terraces. They have a dark yellowish brown fine sandy loam surface layer. The subsoil is yellowish red loam, yellowish red sandy clay loam, and yellowish red, mottled loam. The underlying material is brown gravelly sandy loam.

Of minor extent in this map unit are Nella, Enders, Steprock, and Mountainburg soils. These stony and very stony soils are on adjacent steep and very steep side

slopes. Also included are gravel bars, overflow channels, and areas that have a cobbly and stony surface layer.

These soils are mainly used for pasture and hay. The hazards of flooding and of erosion are the main limitations to farming and most other uses.

Ceda soils are not suited to cultivated crops because of frequent flooding. Cleora soils are moderately suited to cultivated crops because of occasional flooding. Cleora and Spadra soils are well suited to pasture and hay, and Ceda soils are poorly suited. The soils of this unit are well suited to woodland.

These soils are not suited to most urban use. Flooding is the main limitation. Major flood control systems are needed to overcome this limitation.

Detailed Soil Map Units

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

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

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

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

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Linker fine sandy loam, 3 to 8 percent slopes, is one of several phases in the Linker series.

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

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. Nixa-Noark complex, 3 to 8 percent slopes, is an example.

A *soil association* is made up of two or more geographically associated soils that are shown as one unit on the maps. Because of present or anticipated soil uses in the survey area, it was not considered practical or necessary to map the soils separately. The pattern and relative proportion of the soils are somewhat similar. Newnata-Eden-Moko association, rolling, is an example.

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

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

Table 8 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.

Descriptions of the detailed soil map units follow.

1—Brockwell sandy loam, 8 to 20 percent slopes. This is a deep, well drained, moderately sloping to moderately steep soil on hilltops and hillsides. Slopes are convex. Individual areas are about 10 to 150 acres.

Typically, the surface layer is dark grayish brown sandy loam about 1 inch thick. The subsurface layer is pale brown sandy loam to a depth of about 4 inches. The subsoil is light yellowish brown sandy loam to a depth of about 10 inches; yellowish brown sandy loam to a depth of about 27 inches; strong brown sandy clay loam to a depth of about 52 inches; and strong brown gravelly sandy clay loam to a depth of 61 inches. The underlying material is hard, level-bedded sandstone bedrock.

This soil is low in natural fertility and organic matter content. Reaction ranges from medium acid to very strongly acid throughout. Permeability is moderate, and the available water capacity is medium. The rooting zone is deep and is easily penetrated by plant roots.

Included in mapping are small areas of soils that have a gravelly or stony surface layer and small areas of soils that have bedrock at a depth of less than 60 inches. Also included are small areas of Estate and Portia soils.

This soil is not suited to cultivated crops because of slope, rapid runoff, or a very severe hazard of erosion. The soil is mainly used as woodland or for pasture.

This soil is moderately suited to use as pasture. Suitable pasture plants include tall fescue, bahiagrass, white clover, lespedeza, and bermudagrass. Concerns in management include proper stocking, deferred grazing, and weed and brush control.

This soil is well suited to use as woodland, and this is the main use. Suitable trees include shortleaf pine, loblolly pine, white oak, and southern red oak. There are no significant limitations to woodland use and management.

This soil is moderately suited to most urban uses. Slope is a moderate limitation for dwellings, local roads and streets, and septic tank absorption fields. Slope is a severe limitation for small commercial buildings. This limitation generally can be overcome by using special design and construction.

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

2—Ceda gravelly fine sandy loam, frequently flooded. This is a deep, well drained, level to nearly level soil on flood plains that generally parallel small streams. Individual areas are about 5 to 200 acres. Slopes are 0 to 3 percent.

Typically, the surface layer is brown gravelly fine sandy loam about 13 inches thick. The underlying material is dark yellowish brown very gravelly fine sandy loam to a depth of about 24 inches, brown very gravelly clay loam to a depth of about 48 inches, and strong brown very gravelly clay loam to a depth of about 72 inches or more.

This soil is low in natural fertility and organic matter content. Reaction is slightly acid or medium acid throughout. Permeability is rapid. Because of the high content of gravel and cobbles, the available water capacity is low, and the soil is droughty during summer months. The rooting zone is deep and is easily penetrated by plant roots.

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

This soil is flooded at least once in the winter and spring in most years. If the soil does not have a vegetative cover, fast-moving floodwaters, which occur for very brief periods, can cause severe damage in a short time.

This soil is not suited to cultivated crops because of frequent flooding, low available water capacity, and gravel and cobbles. The soil is mainly used as woodland or for pasture.

This Ceda soil is moderately suited to use as pasture. Suitable pasture plants include bermudagrass, bahiagrass, and lespedeza. Concerns in management include proper stocking, deferred grazing, and weed and brush control.

This soil is well suited to use as woodland. Suitable trees include loblolly pine, shortleaf pine, American sycamore, and sweetgum. Seedling mortality is a moderate limitation to woodland use and management.

This soil is not suited to most urban uses. Flooding is a severe hazard for use of this soil for dwellings, small commercial buildings, local roads and streets, and as septic tank absorption fields. A major flood control system is needed to overcome this limitation.

This Ceda soil is in capability subclass VIw and in woodland suitability group 3f8.

3—Clarksville very cherty silt loam, 8 to 20 percent slopes. This is a deep, somewhat excessively drained, moderately sloping to moderately steep soil on ridges. Slopes are convex. Individual areas are about 5 to 100 acres.

Typically, the surface layer is brown very cherty silt loam about 2 inches thick. The subsurface layer is grayish brown very cherty silt loam to a depth of about 11 inches. The subsoil is light yellowish brown very cherty silt loam to a depth of about 22 inches; yellowish red very cherty silty clay loam to a depth of about 40 inches; red very cherty silty clay loam to a depth of about 58 inches; and red very cherty silty clay to a depth of about 78 inches or more.

This soil is low in natural fertility and organic matter content. Reaction ranges from medium acid to very strongly acid in the surface layer and strongly acid or very strongly acid 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. Chert in the surface layer and slope limit the use of farm equipment. The rooting zone is deep.

Included in mapping are small areas of Nixa and Noark soils and small areas of soils that have cherty limestone bedrock within 3 feet of the surface.

This soil is not suited to cultivated crops because of slope, rapid runoff, chert in the surface layer, and a very severe hazard of erosion. This soil is used mainly as woodland or for pasture.

This soil is poorly suited to pasture. Tame pasture plants are difficult to establish and maintain. Suitable pasture plants include tall fescue, lovegrass, lespedeza, and white clover. Concerns in management include proper stocking, deferred grazing, and weed and brush control.

This Clarksville soil is moderately suited to woodland, and this is the main use, primarily upland hardwoods and pine. Suitable trees include shortleaf pine and white oak. Seedling mortality is a moderate limitation to woodland use and management.

This soil is moderately suited to most urban uses. Slope is a moderate limitation for dwellings, local roads and streets, and septic tank absorption fields. Slope is a

severe limitation for small commercial buildings. This limitation generally can be overcome by using special design and construction.

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

4—Clarksville very cherty silt loam, 20 to 50 percent slopes. This is a deep, somewhat excessively drained, steep to very steep soil on hillsides. Slopes are convex. Individual areas are about 10 to 500 acres.

Typically, the surface layer is brown very cherty silt loam about 2 inches thick. The subsurface layer is grayish brown very cherty silt loam to a depth of about 11 inches. The subsoil is light yellowish brown very cherty silt loam to a depth of about 22 inches, yellowish red very cherty silty clay loam to a depth of about 40 inches, red very cherty silty clay loam to a depth of about 58 inches, and red very cherty silty clay to a depth of about 78 inches or more.

This soil is low in natural fertility and organic matter content. Reaction is medium acid to very strongly acid in the surface layer and strongly acid or very strongly acid 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. Chert in the surface layer and slope limit the use of farm equipment. The rooting zone is deep.

Included in mapping are small areas of Elsah, Estate, Moko, and Noark soils; very narrow areas of cobbly soils on flood plains; small areas of Rock outcrop; small areas of soils where cherty limestone bedrock is within 3 feet of the surface; and areas of soils that have slopes of more than 50 percent.

This soil is not suited to cultivated crops or improved pasture because of slope, rapid runoff, and a very severe hazard of erosion. This soil is mainly used as woodland or wildlife habitat.

This soil is moderately suited to woodland, and this is the main use, primarily upland hardwoods and pine. Suitable trees include shortleaf pine and white oak. The hazard of erosion is a moderate limitation, and seedling mortality and restricted use of equipment are severe limitations to woodland use and management.

This soil is poorly suited to most urban uses. Steepness of slope is a severe limitation for dwellings, roads and streets, small commercial buildings, and for use as septic tank absorption fields. This limitation generally can be overcome by using special design and construction. The difficulty increases as slope increases.

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

5—Clarksville-Nixa complex, 8 to 20 percent slopes. This complex consists of Clarksville and Nixa soils on ridges. These moderately sloping to moderately steep soils are somewhat excessively drained and moderately well drained. These soils are so intricately mixed, or the areas are so small, that it was not practical to map them separately. The areas range from about 10 to 400 acres. Individual areas of each soil are about 3 to 5 acres.

The somewhat excessively drained Clarksville soils make up about 60 percent of the map unit. Typically, the surface layer is brown very cherty silt loam about 2 inches thick. The subsurface layer is grayish brown very cherty silt loam to a depth of about 11 inches. The subsoil is light yellowish brown very cherty silt loam to a depth of about 22 inches; yellowish red very cherty silty clay loam to a depth of about 40 inches; red very cherty silty clay loam to a depth of about 58 inches; and red very cherty silty clay to a depth of about 78 inches or more.

Clarksville soils are low in natural fertility and organic matter content. They are medium acid to very strongly acid in the surface layer and strongly acid or very strongly acid 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. The rooting zone is deep.

The moderately well drained Nixa soils make up about 30 percent of the map unit. Typically, the surface layer is dark brown very cherty silt loam about 2 inches thick. The subsurface layer is pale brown very cherty silt loam to a depth of about 8 inches. The subsoil extends to a depth of about 78 inches or more. It is light yellowish brown very cherty silt loam to a depth of about 15 inches. A fragipan of mottled, yellowish brown, strong brown, and pale brown very cherty silt loam extends to a depth of about 38 inches. Below that the subsoil is cherty silty clay mottled in shades of red, brown, and gray.

Nixa soils are low in natural fertility and organic matter content. Reaction is strongly acid or very strongly acid throughout. Permeability is very slow. Because of the high content of chert, the available water capacity is low, and the soil is droughty. The fragipan restricts root penetration and slows the movement of water through the soil.

The remaining 10 percent of this complex consists of small areas of Noark soils and areas of soils that have cherty limestone bedrock within 3 feet of the surface.

These soils are not suited to cultivated crops because of slope, chert on the surface, and a very severe hazard of erosion. These soils are suitable for woodland or pasture. Most areas of these soils are in mixed upland hardwood and pine trees, but a few small areas have been cleared of trees and are used for pasture.

Clarksville soils are poorly suited to pasture, and Nixa soils are moderately suited to pasture. Suitable pasture plants include tall fescue, white clover, lovegrass, and lespedeza. Concerns in management include proper stocking, deferred grazing, and weed and brush control.

These soils are moderately suited to woodland. Suitable trees include shortleaf pine, white oak, and

southern red oak. Seedling mortality is a moderate limitation to woodland use and management.

These soils are moderately suited to most urban uses. Slope is a moderate limitation for dwellings and local roads and streets, and it is a severe limitation for small commercial buildings. Slope is also a moderate limitation for use of Clarksville soils as septic tank absorption fields. This limitation generally can be overcome by using specially designed systems. The very slow permeability is a severe limitation for use of Nixa soils as septic tank absorption fields. This limitation is difficult to overcome; however, it can be partly overcome by increasing the size of the absorption field or by modifying the field itself.

These soils are in capability unit VIs and in woodland suitability group 4f8.

6—Cleora fine sandy loam, occasionally flooded. This is a deep, well drained, level to nearly level soil on the flood plain and low terraces of the Little Red River. Individual areas are about 20 to 80 acres. Slopes are 0 to 3 percent.

Typically, the surface layer is dark brown fine sandy loam about 13 inches thick. The next layer is brown fine sandy loam to a depth of about 34 inches. The underlying material is brown fine sandy loam to a depth of 72 inches or more.

The soil is moderate in natural fertility and organic matter content. Reaction ranges from medium acid to neutral throughout. Permeability is moderately rapid, and the available water capacity is medium. The soil has good tilth and can be worked within a wide range of moisture content. The rooting zone is deep and is easily penetrated by plant roots.

Included in mapping are small areas of Ceda and Spadra soils, small areas of soils that have gravel on the surface, and small areas that have silty overwash.

This soil is flooded occasionally late in winter or early in spring about once every 4 to 7 years. If the soil does not have a vegetative cover, fast-moving floodwaters, which occur for very brief periods, can cause severe damage in a short time.

This soil is well suited to cultivated crops, mainly corn, small grains, soybeans, and truck crops. However, if cultivated crops are grown, occasional flooding and a slight to moderate hazard of erosion are limitations. Under management that includes minimum tillage, contour farming, and terraces, crops that leave a large amount of residue can be safely grown year after year. Conservation measures need to be intensified as slope length and gradient increase.

This soil is well suited to use as pasture, and this is the main use. Suitable pasture plants include bermudagrass, tall fescue, white clover, alfalfa, lespedeza, and bahiagrass. Concerns in management include proper stocking, rotation grazing, and weed control.

This soil is well suited to use as woodland. Suitable trees include sweetgum, cottonwood, black walnut, and sycamore. There are no significant limitations to woodland use or management.

This soil is poorly suited to urban uses. Flooding is a severe limitation for dwellings, small commercial buildings, and for use as septic tank absorption fields. Flooding and low strength are moderate limitations for local roads and streets. A major flood control system is needed to overcome these limitations.

This Cleora soil is in capability subclass IIw and in woodland suitability group 2o4.

7—Eden-Moko association, very steep. This association consists of moderately deep and shallow, well drained, very steep soils on mountainsides of the north escarpment of the Boston Mountains. Slopes are 40 to 60 percent. Areas of this association are about 25 to 1,000 acres or more, and the composition is variable; however, the detail of mapping is adequate for the expected uses of the soils.

Eden soils formed in residuum of weathered interbedded calcareous shale and fossiliferous limestone. These soils are on the lower slopes. Moko soils formed in residuum of weathered limestone and generally are on upper slopes and other areas where the limestone strata are thick and massive.

The shallow to moderately deep Eden soils make up about 50 percent of this map unit. Typically, the surface layer is very dark grayish brown flaggy silty clay loam about 4 inches thick. The subsoil is brown clay to a depth of about 9 inches; it is dark yellowish brown very shaly clay to a depth of about 20 inches. The underlying material is grayish brown very shaly clay to a depth of about 28 inches and very dark gray soft shale to a depth of 50 inches or more.

Eden soils are moderate in natural fertility and organic matter content. Reaction ranges from medium acid to mildly alkaline throughout. Permeability is slow, and the available water capacity is low. The rooting zone is shallow.

The shallow Moko soils make up about 30 percent of this map unit. Typically, the soil is black very stony silty clay loam and very dark gray very stony silty clay loam to a depth of about 9 inches. The underlying material is gray hard limestone bedrock.

Moko soils are moderate to high in natural fertility and organic matter content. Reaction is neutral or mildly alkaline throughout. Permeability is moderate, and the available water capacity is very low. The rooting zone is shallow.

The remaining 20 percent of this association consists of small areas of Newnata and Summit soils, eroded areas, massive outcrops of limestone, and small areas of outcrops of shale.

These soils are not suited to cultivated crops or improved pasture because of the depth to bedrock,

slope, and surface stoniness. These soils are mainly used for woodland and as habitat for wildlife.

These soils are mainly in woodland, primarily upland hardwoods and redcedar. Eden soils are moderately suited to woodland and Moko soils have low productivity as woodland, but this is the best use. A suitable species is eastern redcedar. Limited use of equipment, the hazard of erosion, and seedling mortality are severe limitations to woodland use and management.

These soils are not suited to most urban uses. —Eden soils have severe limitations for dwellings and small commercial buildings because of slope. Slope and low strength are severe limitations for local roads and streets. Slow permeability, slope, and depth to bedrock are severe limitations for use of the soils as septic tank absorption fields. —Moko soils have severe limitations for dwellings, small commercial buildings, local roads and streets, and for use as septic tank absorption fields because of slope, depth to bedrock, and large stones. These limitations are very difficult and often impractical to overcome on these Eden and Moko soils.

Eden soils are in capability subclass VIIe and in woodland suitability group 4c3. Moko soils are in capability subclass VIIs and in woodland suitability group 5x3.

8—Elsah cherty loam, frequently flooded. This is a deep, somewhat excessively drained, level to nearly level soil on narrow flood plains. Individual areas range from about 10 to 50 acres. Slopes are 0 to 3 percent.

Typically, the surface layer is dark brown cherty loam about 6 inches thick. The subsurface layer is dark yellowish brown cherty loam to a depth of about 13 inches. The underlying material is dark brown very cherty loam to a depth of about 22 inches, dark yellowish brown very cherty silt loam to a depth of about 46 inches, and strong brown very cherty loam to a depth of 63 inches or more.

This soil is moderate in natural fertility and organic matter content. Reaction ranges from neutral to medium acid throughout. Permeability is moderately rapid, and available water capacity is low. The rooting zone is deep and is easily penetrated by plant roots.

Included in mapping are small areas of Razort soils, gravel bars, narrow overflow channels, and areas of soils that are free of chert on the surface.

This soil is flooded at least once in the winter and spring in most years. If the soil does not have a vegetative cover, fast-moving floodwaters, which occur for very brief periods, can cause severe damage in a short time.

This soil is not suited to cultivated crops because of the hazard of frequent flooding, chert on the surface, and the low available water capacity. The soil is mainly used as woodland or for improved pasture.

This soil is well suited to pasture. Suitable pasture plants include bermudagrass, tall fescue, alfalfa, white clover, and lespedeza. Concerns in management include proper stocking, deferred grazing, and weed control.

This soil is well suited to use as woodland. Suitable species include sweetgum, ash, and black walnut. Seedling mortality is a moderate limitation to woodland use and management.

This soil is not suited to most urban uses. Flooding is a severe hazard for dwellings, small commercial buildings, local roads and streets, and use of this soil as septic tank absorption fields. A major flood control system is needed to overcome this limitation.

This Elsah soil is in capability subclass Vw and in woodland suitability group 2f5.

9—Enders gravelly fine sandy loam, 3 to 8 percent slopes. This is a deep, well drained, gently sloping soil on upland crests. Slopes are convex. Individual areas are about 10 to 30 acres.

Typically, the surface layer is brown gravelly fine sandy loam about 6 inches thick. The subsoil is mottled, red clay to a depth of about 35 inches; it is mottled, red very shaly clay to a depth of about 48 inches. The underlying material is yellowish red and black weathered soft shale to a depth of about 60 inches or more. The material below that is dark gray shale bedrock. Hardness of the shale increases as depth increases.

Included in mapping are some eroded spots; outcrops of shale; areas of soils similar to Enders soils except that they have shale bedrock at a depth of more than 60 inches; and small areas of Linker, Mountainburg, and Sidon soils.

This soil is low in natural fertility and organic matter content. Reaction ranges from strongly acid through extremely acid throughout. Permeability is very slow, and the available water capacity is medium. Plant root penetration is restricted by the clayey subsoil.

This soil is poorly suited to cultivated crops. If cultivated crops are grown, runoff is medium to rapid, and the hazard of erosion is very severe. Under management that includes minimum tillage, contour farming, and terraces, crops that leave a large amount of residue can be grown occasionally. The cropping system needs a close-growing cover crop on the soil most of the time.

This soil is moderately suited to pasture, and this is the main use. Suitable pasture plants include bermudagrass, tall fescue, lespedeza, and white clover. Concerns in management include proper stocking rates, proper grazing, and brush and weed control.

This soil is moderately suited to woodland. Suitable species include loblolly pine, shortleaf pine, and southern red oak. There are no significant limitations to woodland use and management.

This soil is poorly suited to most urban uses. The high shrink-swell potential is a severe limitation for dwellings and small commercial buildings. Low strength and the high shrink-swell potential are severe limitations for local

roads and streets. These limitations generally can be overcome by using special design and construction. The very slow permeability is a severe limitation for use of this soil as septic tank absorption fields. This limitation is difficult to overcome; however, it can be partly overcome by increasing the size of the absorption field or by modifying the field itself.

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

10—Enders very stony sandy loam, 8 to 20 percent slopes. This is a deep, well drained, moderately sloping to moderately steep soil on upland crests, foot slopes, and mountainsides. Slopes are convex on crests and concave on foot slopes and mountainsides. Individual areas are about 20 to 150 acres.

Typically, the surface layer is dark grayish brown very stony sandy loam about 2 inches thick. The subsurface layer is yellowish brown very stony sandy loam to a depth of about 9 inches. The subsoil is mottled, red clay to a depth of about 35 inches and is mottled, red very shaly clay to a depth of 48 inches. The underlying material is yellowish red and black weathered soft shale to a depth of about 60 inches. The material below that is dark gray shale bedrock.

Included in mapping are some eroded areas of soils; outcrops of shale or sandstone bedrock; areas of soils similar to Enders soils except that they have shale bedrock at a depth of more than 60 inches; and areas of Linker, Mountainburg, Nella, and Steprock soils.

This soil is low in natural fertility and organic matter content. Reaction ranges from strongly acid through extremely acid throughout. Permeability is very slow, and the available water capacity is medium. Plant root penetration is restricted by the clayey subsoil.

This soil is not suited to cultivated crops or to use for improved pasture. Small areas of this soil are in native pasture. Surface stoniness and slope are severe limitations.

This soil is moderately suited to woodland, and this is the main use. Trees are primarily upland hardwoods. Suitable species to plant include loblolly pine, shortleaf pine, and southern red oak. Use of equipment is severely limited in woodland use and management.

This soil is poorly suited to most urban uses. The high shrink-swell potential is a severe limitation for dwellings. The high shrink-swell potential and slope are severe limitations for small commercial buildings. Low strength and the high shrink-swell potential are severe limitations for local roads and streets. These limitations generally can be overcome by using special design and construction. The very slow permeability is a severe limitation for the use of this soil as septic tank absorption fields. This limitation is difficult to overcome; however, it can be partly overcome by increasing the size of the field or by modifying the field itself.

This Enders soil is in capability subclass VIIs and in woodland suitability group 4x3.

11—Enders very stony sandy loam, 20 to 40 percent slopes. This is a deep, well drained, steep soil on mountainsides. Individual areas are about 50 to 250 acres.

Typically, the surface layer is dark grayish brown very stony sandy loam about 2 inches thick. The subsurface layer is yellowish brown very stony sandy loam to a depth of about 9 inches. The subsoil is mottled, red clay to a depth of about 35 inches and is mottled, red very shaly clay to a depth of about 48 inches. The underlying material is yellowish red and black weathered soft shale to a depth of about 60 inches. The material below that is dark gray shale bedrock.

Included in mapping are a few outcrops of shale or sandstone; areas of soils similar to Enders soils except that they have shale bedrock at a depth of more than 60 inches; and areas of Mountainburg, Nella, and Steprock soils.

This soil is low in natural fertility and organic matter content. Reaction ranges from strongly acid through extremely acid throughout. Permeability is very slow, and the available water capacity is medium. Plant root penetration is restricted by the clayey subsoil.

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

This soil has low productivity as woodland, but this is the best use. Trees are mainly upland hardwoods. Suitable species include loblolly pine, shortleaf pine, and eastern redcedar. The use of equipment is severely limited. The hazard of erosion and seedling mortality are moderate limitations to woodland use and management.

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

This Enders soil is in capability subclass VIIs and in woodland suitability group 5r3.

12—Estate-Portia-Moko association, rolling. This association consists of deep and shallow, well drained soils on hilltops and hillsides. Slopes are 8 to 20 percent. Areas of this association are about 20 to 1,000 acres, and the composition is variable; however, the detail of mapping is adequate for the expected uses of the soils.

Estate soils formed in residuum of weathered interbedded sandstone and limestone. Portia soils formed in residuum or colluvium of weathered

interbedded sandstone and limestone. Moko soils formed in residuum of weathered limestone.

The deep Estate soils make up about 30 percent of the map unit. Typically, the surface layer is dark brown stony fine sandy loam about 3 inches thick. The subsurface layer is yellowish brown stony fine sandy loam to a depth of about 6 inches. The upper part of the subsoil is yellowish red gravelly fine sandy loam to a depth of about 10 inches; it is red cobbly clay to a depth of about 46 inches; and the lower part is red cobbly clay loam to a depth of about 55 inches. The underlying material is hard, undulating limestone bedrock.

Estate soils are low in natural fertility and moderate to high in organic matter content. Permeability is slow, and the available water capacity is medium. Reaction ranges from strongly acid to neutral in the surface layer and upper part of the subsoil and medium acid to neutral in the middle and lower parts of the subsoil. The rooting zone is deep and is easily penetrated by plant roots.

The deep Portia soils make up about 30 percent of the map unit. Typically, the surface layer is brown fine sandy loam about 7 inches thick. The upper part of the subsoil is yellowish red fine sandy loam to a depth of about 13 inches; it is red sandy clay loam to a depth of about 42 inches; it is red sandy clay to a depth of about 56 inches; and the lower part of the subsoil is red sandy clay loam to a depth of 78 inches or more.

Portia soils are low in natural fertility and organic matter content. Permeability is moderate, and the available water capacity is medium. Reaction ranges from strongly acid to slightly acid in the surface layer and upper part of the subsoil and very strongly acid to medium acid in the lower part of the subsoil. The soil has good tilth and can be worked within a wide range of moisture content. The rooting zone is deep and is easily penetrated by plant roots.

The shallow Moko soils make up about 30 percent of the map unit. Typically, the soil is black very stony loam to a depth of about 5 inches and very dark gray very stony loam to a depth of about 9 inches. The underlying material is hard limestone bedrock.

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

The remaining 10 percent of this association consists of small areas of Brockwell, Clarksville, Noark, and Ramsey soils; a few outcrops of sandstone or limestone; and areas of soils that have slopes of less than 8 percent.

Estate and Moko soils are not suited to cultivated crops. Slope, rapid runoff, surface stoniness, and depth to bedrock are severe limitations. Portia soils, however, are poorly suited to cultivated crops. If cultivated crops are grown, slope, rapid runoff, and a very severe hazard of erosion are the main limitations. Suitable crops include small grains. Good management includes minimum tillage, contour farming, and terracing. Small grains or no-till planted crops can be grown occasionally in a cropping system that includes close-growing cover crops most of the time. Conservation measures need to be intensified as slope and length and gradient increase.

In some places, the Portia soils are used for improved pasture. Portia soils are well suited to improved pasture, Estate soils are poorly suited, and Moko soils are not suited to improved pasture. Suitable pasture plants include bermudagrass, bahiagrass, lespedeza, tall fescue, and white clover. Concerns in management include proper stocking and weed and brush control.

These soils are used mainly as woodland.

—Estate soils are moderately suited to woodland and are mainly in upland hardwoods, pine, and cedar. Suitable species to plant include southern red oak, shortleaf pine, loblolly pine, and eastern redcedar. Limited use of equipment and the hazard of erosion are moderate limitations to woodland use and management.

—Portia soils are well suited to woodland, mainly pine. Suitable species to plant include shortleaf pine, loblolly pine, and sweetgum. There are no significant limitations for woodland use and management.

—Moko soils have low productivity as woodland, but this is the best use. These soils are mainly in upland hardwoods, pine, and cedar. A suitable species to plant is eastern redcedar. Limited use of equipment, seedling mortality, and the hazard of erosion are severe limitations to woodland use and management.

These soils are moderately suited or not suited to most urban uses.

—Estate soils have moderate limitations for dwellings because of slope and the moderate shrink-swell potential. Slope is a severe limitation for small commercial buildings. Low strength is a severe limitation for local roads and streets. These limitations generally can be overcome by using special design and construction. The slow permeability is a severe limitation for use of these soils as septic tank absorption fields. This limitation is difficult to overcome, but it can be partly overcome by increasing the size of the filter field or by modifying the field itself.

—Portia soils have a moderate limitation for dwellings and a severe limitation for small commercial buildings because of slope. Low strength and slope are moderate limitations for roads and streets. These limitations generally can be overcome by using special design and construction. The moderate permeability is a moderate limitation for use of the soils as septic tank absorption fields. This limitation is difficult to overcome, but it can be partly overcome by increasing the size of the filter field or by modifying the field itself.

—Moko soils have severe limitations for dwellings, small commercial buildings, and local roads and streets and for use as septic tank absorption fields because of large stones and the depth to bedrock. These limitations are difficult or often impractical to overcome.

Estate soils are in capability subclass VIs and in woodland suitability group 4x8. Portia soils are in capability subclass IVe and in woodland suitability group 3o7. Moko soils are in capability subclass VIIs and in woodland suitability group 5x3.

13—Estate-Portia-Moko association, steep. This association consists of deep and shallow, well drained soils on hillsides. Slopes are 20 to 40 percent. Areas of this association are about 20 to 750 acres or more, and the composition is variable; however, the detail of mapping is adequate for the expected uses of the soils.

Estate soils formed in residuum of weathered interbedded sandstone and limestone. These soils are on upper side slopes. Portia soils formed in residuum or colluvium of weathered interbedded sandstone and limestone. These soils are on the less sloping foot slopes. Moko soils formed in residuum of weathered limestone. These soils are on side slopes near outcrops of limestone.

The deep Estate soils make up about 40 percent of the map unit. Typically, the surface layer is dark brown stony fine sandy loam about 3 inches thick. The subsurface layer is yellowish brown stony fine sandy loam to a depth of about 6 inches. The upper part of the subsoil is yellowish red gravelly fine sandy loam to a depth of about 10 inches; it is red cobbly clay to a depth of about 46 inches; and the lower part is red cobbly clay loam to a depth of about 55 inches. The underlying material is hard, undulating limestone bedrock.

Estate soils are low in natural fertility and moderate to high in organic matter content. Permeability is slow, and the available water capacity is medium. Reaction ranges from strongly acid to neutral in the surface layer and upper part of the subsoil and medium acid to neutral in the middle and lower parts of the subsoil. The rooting zone is deep and is easily penetrated by plant roots.

The deep Portia soils make up about 20 percent of the map unit. Typically, the surface layer is brown fine sandy loam about 7 inches thick. The upper part of the subsoil is yellowish red fine sandy loam to a depth of about 13 inches; it is sandy clay loam to a depth of about 42 inches; it is red sandy clay to a depth of about 56 inches; and the lower part is red sandy clay loam to a depth of 78 inches or more.

Portia soils are low in natural fertility and organic matter content. Permeability is moderate, and the available water capacity is medium. Reaction ranges from strongly acid to slightly acid in the surface layer and upper part of the subsoil and very strongly acid to medium acid in the lower part. The rooting zone is deep and is easily penetrated by plant roots.

The shallow Moko soils make up about 20 percent of the map unit. Typically, the soil is black very stony loam to a depth of about 5 inches and very dark gray very stony loam to a depth of about 9 inches. The underlying material is hard limestone bedrock.

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

The remaining 20 percent of this association consists of small areas of Brockwell, Clarksville, Noark, and Ramsey soils; massive, near vertical escarpments of interbedded sandstone and limestone; and small areas of outcrops of sandstone or limestone.

Soils of this association are not suited to cultivated crops or improved pasture. Steep slopes, surface stoniness, Rock outcrop, and escarpments are the main limitations. The soils are suitable for woodland, for recreation, and for use as habitat for wildlife.

These soils are mainly used as woodland.

—Estate soils are moderately suited to woodland. Suitable species include southern red oak, white oak, shortleaf pine, loblolly pine, and eastern redcedar. The hazard of erosion and limited use of equipment are severe limitations to woodland use and management. Seedling mortality is a moderate limitation.

—Portia soils are well suited to woodland. Suitable species include shortleaf pine, loblolly pine, and sweetgum. The hazard of erosion and restrictions on the use of equipment are moderate limitations to woodland use and management.

—Moko soils have low productivity as woodland, but this is the best use. A suitable tree is eastern redcedar. The hazard of erosion, seedling mortality, and limited use of equipment are severe limitations to woodland use and management.

These soils are poorly suited or not suited to most urban uses.

—Estate soils have severe limitations for dwellings and small commercial buildings because of slope. Low strength and slope are severe limitations for local roads and streets. The slow permeability and slope are severe limitations for use of the soils as septic tank absorption fields.

—Portia soils have severe limitations for dwellings and small commercial buildings because of slope. Slope is a severe limitation for local roads and streets. Slope is also a severe limitation for use of the soils as septic tank absorption fields.

—Moko soils have severe limitations for dwellings, small commercial buildings, and local roads and streets as well as for use as septic tank absorption fields because of depth of bedrock, large stones, and slope. The limitations on Estate and Moko soils are difficult and often impractical to overcome. Limitations on Portia soils generally can be overcome by using special design and construction.

Estate soils are in capability subclass VIIs and in woodland group 4x9. Portia soils are in capability subclass VIe and in woodland suitability group 3r8. Moko soils are in capability subclass VIIs and in woodland suitability group 5x3.

14—Healing silt loam, 1 to 3 percent slopes. This is a deep, well drained, nearly level soil on the flood plain and low terraces along the White River. Slopes are smooth and convex. Areas can be at two or more levels, as on a series of terraces. The areas are long and narrow, usually less than 1/4 mile wide, and parallel the river. Individual areas are about 40 to 200 acres.

Typically, the surface layer is dark brown silt loam about 12 inches thick. The subsoil is brown silt loam to a depth of about 29 inches, brown silty clay loam to a depth of about 58 inches, and reddish brown silt loam to a depth of 76 inches or more.

This soil is moderate in natural fertility and organic matter content. Reaction is medium acid or slightly acid throughout. Permeability is moderate, and the available water capacity is high. The soil has good tilth and can be worked within a wide range of moisture conditions. The rooting zone is deep and is easily penetrated by plant roots.

Included in mapping are small areas of Wideman and Sturkie soils and small areas of soils that have light colored loam or fine sandy loam overwash. Also included are small areas of soils on steeper slopes along bisecting streams.

The general area in which this soil is located is protected by floodwater-retarding structures upstream, but flooding could occur on the soils under abnormal conditions. The possibility of flooding increases as distance from these structures increases and as the number of tributaries that flow into the White River increase. Generally, the hazard of flooding increases from west-to-east along the course of the river.

This soil is well suited to cultivated crops. Suitable crops include soybeans, corn, small grains, and truck crops. Erosion is a slight hazard if cultivated crops are grown. Under management that includes minimum tillage, crops that leave large amounts of residue can be safely grown year after year. Conservation treatments need to be intensified as slope length and gradient increase. Some small streams, which flow perpendicular to the long, narrow areas of this soil are deeply entrenched into the soil and cannot be crossed with farm machinery.

This soil is well suited to pasture. The soil is used mainly for improved pasture or hay (fig. 3). Suitable pasture plants include alfalfa, clover, lespedeza, bermudagrass, bahiagrass, and tall fescue. Concerns in management include proper stocking, rotation grazing, and weed control.

The soil is well suited to woodland. Suitable species to plant include black walnut, eastern cottonwood, American sycamore, white oak, southern red oak, and shortleaf pine. There are no significant limitations for woodland use or management.

This soil is poorly suited to most urban uses. The soil is rarely flooded, but this is a severe limitation for dwellings and small commercial buildings. Low strength of the soil is a severe limitation for local roads and streets. Flooding and moderate permeability are moderate limitations for use of this soil as septic tank absorption fields. The limitation of flooding can be overcome by a major flood control system. Low strength can be overcome by adding fill material during construction. Permeability is difficult to overcome, but it can be partly overcome by increasing the size of absorption fields or by modifying the field itself.

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

15—Linker fine sandy loam, 3 to 8 percent slopes. This is a moderately deep, well drained, gently sloping soil on mountaintops and benches. Slopes are convex. Individual areas are about 6 to 100 acres.

Typically, the surface layer is brown fine sandy loam about 5 inches thick. The subsoil is strong brown fine sandy loam to a depth of about 10 inches; mottled, yellowish red sandy clay loam to a depth of about 27 inches; and mottled, yellowish red loam to a depth of about 35 inches. The underlying material is hard, level-bedded acid sandstone bedrock.

This soil is low in natural fertility and organic matter content. Reaction ranges from strongly acid to extremely acid throughout except where the surface has been limed. Permeability is moderate, and the available water capacity is low. The rooting zone is moderately deep and easily penetrated by plant roots.

Included in mapping are small areas of soils that have a stony or gravelly surface layer and soils similar to Linker soils except that they have bedrock at a depth of more than 40 inches. Also included are small areas of Sidon and Mountainburg soils.

This soil is moderately suited to cultivated crops. Suitable crops include corn and small grains. If cultivated crops are grown, runoff is moderate to rapid, and erosion is a severe hazard. Under management that includes contour farming and terraces, crops that leave a large amount of residue can be safely grown year after year on the less sloping areas. Conservation measures need to be intensified as slope length and gradient increase.

This soil is moderately suited to pasture, and this is the main use. Suitable pasture plants include bermudagrass, lovegrass, bahiagrass, and lespedeza. Concerns in management include proper stocking, rotation grazing, and brush and weed control.

This soil is moderately suited to woodland. Suitable species include shortleaf pine and loblolly pine. There are no significant limitations to woodland use and management.

This soil is moderately suited to most urban uses. The depth to bedrock is a moderate limitation for dwellings and local roads and streets. Slope and depth to bedrock are moderate limitations for small commercial buildings. These limitations generally can be overcome by using special design and construction. The depth to bedrock is

Figure 3.—Round bales of bermudagrass hay that was grown on Healing silt loam, 1 to 3 percent slopes.

a severe limitation for use of this soil as septic tank absorption fields. This limitation is difficult or impractical to overcome.

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

16—Linker gravelly fine sandy loam, 3 to 8 percent slopes. This is a moderately deep, well drained, gently sloping soil on mountaintops and benches. Slopes are convex. Individual areas are about 20 to 300 acres.

Typically, the surface layer is brown gravelly fine sandy loam about 5 inches thick. The subsoil is strong brown gravelly fine sandy loam to a depth of about 10 inches; mottled, yellowish red sandy clay loam to a depth of about 27 inches; and mottled, yellowish red loam to a depth of about 35 inches. The underlying material is hard, level-bedded acid sandstone bedrock.

Included in mapping are small areas of soils that have a fine sandy loam or stony surface layer and soils similar to Linker soils except that they have bedrock at a depth of more than 40 inches. Also included are small areas of Sidon and Mountainburg soils.

This soil is low in natural fertility and organic matter content. Reaction ranges from strongly acid to extremely acid throughout except where the surface has been limed. Permeability is moderate, and the available water capacity is low. Gravel at the surface hinders some tillage operations. The root zone is moderately deep and is easily penetrated by plant roots.

This soil is moderately suited to cultivated crops. Suitable crops include corn and small grains. If cultivated crops are grown, runoff is moderate to rapid, and erosion is a severe hazard. Under management that includes contour farming and terraces, crops that leave large amounts of residue can be safely grown year after year. Conservation measures need to be intensified as slope length and gradient increase.

This soil is moderately suited to pasture, and this is the main use. Suitable pasture plants include bermudagrass, lovegrass, bahiagrass, and lespedeza. Concerns in management include proper stocking, rotation grazing, and brush and weed control.

This soil is moderately suited to woodland. Suitable species include shortleaf pine and loblolly pine. There are no significant limitations to woodland use and management.

This soil is moderately suited to most urban uses. The depth to bedrock is a moderate limitation for dwellings

and local roads and streets. Slope and the depth to bedrock are moderate limitations for small commercial buildings. These limitations generally can be overcome by using special design and construction. The depth to bedrock is a severe limitation for use of this soil as septic tank absorption fields. This limitation is difficult or impractical to overcome.

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

17—Linker gravelly fine sandy loam, 8 to 12 percent slopes. This is a moderately deep, well drained, moderately sloping soil on mountaintops and benches. Slopes are convex. Individual areas are about 20 to 300 acres.

Typically, the surface layer is brown gravelly fine sandy loam about 5 inches thick. The subsoil is strong brown gravelly fine sandy loam to a depth of about 10 inches; mottled, yellowish red sandy clay loam to a depth of about 27 inches; and mottled, yellowish red loam to a depth of about 35 inches. The underlying material is hard, level-bedded acid sandstone bedrock.

Included in mapping are small areas of soils that have a stony or fine sandy loam surface layer and soils similar to Linker soils except that they have bedrock at a depth of more than 40 inches. Also included are small areas of Sidon and Mountainburg soils.

This soil is low in natural fertility and organic matter content. Reaction ranges from strongly acid to extremely acid throughout except where the surface layer has been limed. Permeability is moderate, and the available water capacity is low. Gravel in the surface layer hinders some tillage operations. The rooting zone is moderately deep and is easily penetrated by plant roots.

This soil is poorly suited to cultivated crops. Suitable crops include corn and small grains. If cultivated crops are grown, runoff is rapid, and erosion is a very severe hazard. Under management that includes minimum tillage, contour farming and terraces, tilled crops can be grown occasionally. The cropping system needs a close-growing cover crop on the soil most of the time. Conservation measures need to be intensified as slope length and gradient increase.

This soil is used mainly for pasture and as woodland. The soil is moderately suited to pasture. Suitable pasture plants include bermudagrass, lovegrass, bahiagrass, and lespedeza.

This soil is moderately suited to woodland. Suitable species include shortleaf pine and loblolly pine. There are no significant limitations to woodland use and management.

This soil is moderately suited to poorly suited to most urban uses. The depth to bedrock and slope are moderate limitations for dwellings and local roads and streets. Slope is a severe limitation for small commercial buildings. These limitations generally can be overcome by using special design and construction. The depth to bedrock is a severe limitation of this soil for use as septic tank absorption fields. This limitation is difficult or impractical to overcome.

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

18—Linker-Mountainburg complex, 3 to 8 percent slopes. This complex consists of Linker and Mountainburg soils on mountaintops and benches. These gently sloping soils are well drained. These soils are so intricately mixed, or the areas are so small, that it was not practical to map them separately. Areas range from about 10 to 300 acres. Individual areas of each soil are about 2 to 5 acres.

Linker soils make up about 60 percent of the map unit. Typically, the surface layer is brown gravelly fine sandy loam about 5 inches thick. The subsoil is strong brown gravelly fine sandy loam to a depth of about 10 inches; mottled, yellowish red sandy clay loam to a depth of about 27 inches; and mottled, yellowish red loam to a depth of about 35 inches. The underlying material is hard, level-bedded acid sandstone bedrock.

Linker soils are low in natural fertility and organic matter content. Reaction ranges from strongly acid to extremely acid throughout except where the surface has been limed. Permeability is moderate, and the available water capacity is low. The root zone is moderately deep and easily penetrated by plant roots.

Mountainburg soils make up about 30 percent of the map unit. Typically, the surface layer is very dark grayish brown stony sandy loam about 2 inches thick. The subsurface layer is yellowish brown very gravelly sandy loam to a depth of about 5 inches. The subsoil is strong brown very gravelly sandy loam to a depth of about 13 inches. The underlying material is hard, level-bedded acid sandstone bedrock.

Mountainburg soils are low in natural fertility and organic matter content. Reaction 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 content of coarse fragments. Tillage is not practical because of the high content of stones in the surface layer. The rooting zone is less than 20 inches deep, but it is easily penetrated by plant roots.

The remaining 10 percent of this complex consists of small areas of soil that are free of surface stoniness and small areas of Enders and Sidon soils.

These soils are not suited to cultivated crops because of the moderate to rapid runoff, surface stoniness, and a severe hazard of erosion. These soils are mainly used as woodland of low-grade hardwood trees or for pasture.

Linker soils are moderately suited to pasture and Mountainburg soils are poorly suited to pasture. Suitable pasture plants include bermudagrass, lovegrass,

lespedeza, and bahiagrass. Concerns in management include weed and brush control.

Linker soils are moderately suited to woodland. Mountainburg soils have low productivity as woodland, but this is the best use. Suitable species include shortleaf pine, loblolly pine, and eastern redcedar. Linker soils have no significant limitations to woodland use or management. Limited use of equipment and seedling mortality are moderate limitations on Mountainburg soils.

Linker soils are moderately suited to most urban uses. The depth to bedrock is a moderate limitation for dwellings and local roads and streets. Slope and depth to bedrock are moderate limitations for small commercial buildings. These limitations generally can be overcome by using special design and construction. The depth to bedrock is a severe limitation for use of this soil as septic tank absorption fields. This limitation is difficult or impractical to overcome. Mountainburg soils are poorly suited to most urban uses. The depth to bedrock and large stones at the surface are severe limitations for dwellings, small commercial buildings, roads and streets, and use of this soil as septic tank absorption fields. These limitations are difficult or impractical to overcome.

These Linker and Mountainburg soils are in capability subclass VIs. Linker soils are in woodland suitability group 4o1 and Mountainburg soils are in 5x2.

19—Linker-Mountainburg complex, 8 to 20 percent slopes. This complex consists of Linker and Mountainburg soils on mountaintops and benches. These moderately sloping to moderately steep soils are well drained. These soils are so intricately mixed, or the areas are so small, that it was not practical to map them separately. Areas are about 20 to 1,000 acres. Individual areas of each soil are about 2 to 5 acres.

Linker soils make up about 50 percent of the map unit. Typically, the surface layer is brown gravelly fine sandy loam about 5 inches thick. The subsoil is strong brown fine sandy loam to a depth of about 10 inches; mottled, yellowish red sandy clay loam to a depth of about 27 inches; and mottled, yellowish red loam to a depth of about 35 inches. The underlying material is hard, level-bedded acid sandstone bedrock.

Linker soils are low in natural fertility and organic matter content. Reaction ranges from strongly acid to extremely acid throughout except where the surface has been limed. Permeability is moderate, and the available water capacity is low. The rooting zone is moderately deep and easily penetrated by plant roots.

Mountainburg soils make up about 25 percent of the map unit. Typically, the surface layer is very dark grayish brown stony sandy loam about 2 inches thick. The subsurface layer is yellowish brown very gravelly sandy loam to a depth of about 5 inches. The subsoil is strong brown very gravelly sandy loam to a depth of about 13 inches. The underlying material is hard, level-bedded acid sandstone bedrock.

Mountainburg soils are low in natural fertility and organic matter content. Reaction 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 content of coarse fragments. The rooting zone is less than 20 inches deep, but it is easily penetrated by plant roots.

The remaining 25 percent of this complex consists of small areas of soil that do not have stones on the surface and small areas of Enders, Nella, Steprock, and Sidon soils.

These soils are not suited to cultivated crops because of surface stoniness, slope, rapid runoff, and a very severe hazard of erosion. These soils are used mainly for woodland or pasture. Linker soils are moderately suited to pasture, and Mountainburg soils are poorly suited to pasture. Suitable pasture plants include bermudagrass, lovegrass, lespedeza, and bahiagrass.

Linker soils are moderately suited to woodland. Suitable species include shortleaf pine and loblolly pine. Linker soils have no significant limitations to woodland use or management. Mountainburg soils have low productivity as woodland, but this is the best use. Suitable species include shortleaf pine, loblolly pine, and eastern redcedar. Limited use of equipment, the hazard of erosion, and seedling mortality are moderate limitations to woodland use and management on Mountainburg soils.

Linker soils are moderately suited to most urban uses. The depth to bedrock and slope are moderate limitations for dwellings and local roads and streets. Slope is a severe limitation for small commercial buildings. These limitations generally can be overcome by using special design and construction. The depth to bedrock is a severe limitation for septic tank absorption fields. This limitation is difficult or impractical to overcome. Mountainburg soils are poorly suited to most urban uses. The depth to bedrock and large stones at the surface are severe limitations for dwellings and local roads and streets and for use as septic tank absorption fields. These limitations are very difficult or impractical to overcome.

These Linker and Mountainburg soils are in capability subclass VIs. Linker soils are in woodland suitability group 4o1 and Mountainburg soils are in 5x2.

20—Moko-Estate complex, 40 to 60 percent slopes. This complex consists of Moko and Estate soils on hillsides. These very steep soils are shallow and deep. These soils are so intricately mixed, or the areas are so small, that it was not practical to map them separately. Areas are about 50 to 500 acres or more. Individual areas of each soil are about 2 to 5 acres.

The shallow very stony Moko soils make up about 50 percent of the map unit. Typically, the soil is black very

stony loam to a depth of about 5 inches and very dark gray very stony loam to a depth of about 9 inches. The underlying material is hard limestone bedrock.

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

The deep stony Estate soils make up about 30 percent of the map unit. Typically, the surface layer is dark brown stony fine sandy loam about 3 inches thick. The subsurface layer is yellowish brown stony fine sandy loam to a depth of about 6 inches. The subsoil extends to a depth of 55 inches. The upper part is yellowish red gravelly fine sandy loam to a depth of about 10 inches; it is red cobbly clay to a depth of about 46 inches; and the lower part is red cobbly clay loam. The underlying material is hard, undulating limestone bedrock.

Estate soils are low in natural fertility and moderate to high in organic matter content. Reaction ranges from strongly acid to neutral in the surface layer and upper part of the subsoil and medium acid to neutral in the lower part of the subsoil. Permeability is slow, and the available water capacity is medium. The rooting zone is deep and easily penetrated by plant roots.

The remaining 20 percent of this complex consists of small areas of Clarksville, Noark, and Ramsey soils; escarpments of massive, vertical interbedded sandstone and limestone; and small areas of outcrops of interbedded limestone and sandstone.

These soils are not suited to cultivated crops or improved pasture because of the very steep slopes, depth to bedrock, surface stoniness, and escarpments. These soils are suitable for woodland, habitat for wildlife, and recreation uses.

These soils are used mainly for woodland. Moko soils have low productivity as woodland, but this is the best use. A suitable tree is eastern redcedar. The hazard of erosion, seedling mortality, and use of equipment are severe limitations to woodland use and management. Estate soils are moderately suited to woodland. Suitable species include shortleaf pine, loblolly pine, and eastern redcedar. The hazard of erosion and limited use of equipment are severe limitations, and seedling mortality is a moderate limitation to woodland use and management.

The Moko soils are not suited to most urban uses. Depth to bedrock, large stones, and slope are severe limitations for dwellings, small commercial buildings, local roads and streets, and for use of these Moko soils as septic tank absorption fields. Estate soils are not suited to urban uses. Slope is a severe limitation for dwellings and small commercial buildings. Slope and low strength are severe limitations for local roads and streets. Slope and slow permeability are severe limitations for use of these Estate soils as septic tank absorption fields. The limitations of both soils are difficult and often impractical to overcome.

These Moko and Estate soils are in capability subclass VIIs. Moko soils are in woodland suitability group 5x3 and Estate soils are in 4x9.

21—Moko-Rock outcrop complex, 15 to 50 percent slopes. This complex consists of Moko soils and Rock outcrop of limestone or dolomite on hilltops and steep to very steep hillsides. These areas are so intricately mixed, or so small, that it was not practical to map them separately. Areas are about 10 to 200 acres. Individual areas of each component are about 1 to 4 acres.

Moko soils make up about 60 percent of the map unit. Typically, the soil is black very stony silt loam to a depth of about 5 inches and very dark gray very stony silt loam to a depth of about 9 inches. The underlying material is hard limestone bedrock.

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

Rock outcrop makes up about 30 percent of the map unit. Typically, it is hard, level-bedded dolomite or limestone bedrock.

The remaining 10 percent of this complex consists of small areas of Estate soils, quarries, soils that have slopes of more than 50 percent, and vertical bluffs and escarpments of dolomite, limestone, or interbedded limestone and sandstone.

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

Moko soils have low productivity as woodland, but this is the best use. Trees are mainly mixed redcedar and low-grade upland hardwoods. A suitable tree to plant is eastern redcedar (fig. 4). The limited use of equipment, the severe hazard of erosion, and seedling mortality are severe limitations to woodland use and management.

The soils are not suited to most urban uses. The depth to bedrock, slope, large stones, and Rock outcrop are severe limitations for dwellings, small commercial buildings, local roads and streets, and for use of these soils as septic tank absorption fields. These limitations are difficult or impractical to overcome.

Moko soils are in capability subclass VIIs and in woodland suitability group 5x3.

22—Mountainburg very stony sandy loam, 8 to 20 percent slopes. This is a shallow, well drained, moderately sloping to moderately steep soil on mountaintops and benches. Slopes are complex. Individual areas are about 15 to 100 acres.

Figure 4.—Eastern redcedar and Ashe juniper that have an understory of little bluestem are common vegetation on Moko-Rock outcrop complex, 15 to 50 percent slopes.

Typically, the surface layer is very dark grayish brown very stony sandy loam to a depth of about 2 inches. The subsurface layer is yellowish brown very gravelly sandy loam to a depth of about 5 inches. The subsoil is strong brown very gravelly sandy loam to a depth of about 13 inches. The underlying material is hard, level-bedded acid sandstone bedrock.

This soil is low in natural fertility and organic matter content. Reaction 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 content of coarse fragments. The rooting zone is shallow but is easily penetrated by plant roots.

Included in mapping are small areas of Linker and Sidon soils, areas of soils that have a sandy loam or gravelly sandy loam surface layer, and occasional outcrops of sandstone.

This soil is not suited to cultivated crops or improved pasture. The main limitations are surface stoniness, the shallow depth to bedrock, and the very low available water capacity. The soil is best suited to use as native pasture, woodland, habitat for wildlife, or for recreation.

This soil has low productivity as woodland, but this is the best use. Trees are mainly low-grade upland hardwoods and redcedar. Suitable species to plant include shortleaf pine, loblolly pine, and eastern redcedar. Use of equipment is severely limited; the hazard of erosion and seedling mortality are moderate limitations to woodland use and management.

This soil is poorly suited to most urban uses. The depth of bedrock and surface stoniness are severe limitations for dwellings, small commercial buildings, local roads and streets, and for use as septic tank absorption fields. Slope is a severe limitation for small commercial buildings. These limitations are very difficult or impractical to overcome.

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

23—Mountainburg very stony sandy loam, 20 to 40 percent slopes. This is a shallow, well drained, steep soil on mountainsides. Slopes are broken and irregular. Individual areas are about 25 to 75 acres.

Typically, the surface layer is very dark grayish brown very stony sandy loam to a depth of about 2 inches. The subsurface layer is yellowish brown very stony sandy

loam to a depth of about 5 inches. The subsoil is strong brown very gravelly sandy clay loam to a depth of about 13 inches. The underlying material is hard, level-bedded acid sandstone bedrock.

This soil is low in natural fertility and organic matter content. Reaction 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 content of coarse fragments. The rooting zone is shallow, but it is easily penetrated by plant roots.

Included in mapping are soils that have a gravelly sandy loam surface layer, outcrops and escarpments of sandstone, and small areas of soils that have slopes of more than 40 percent.

This soil is not suited to cultivated crops or improved pasture. The main limitations are surface stoniness, depth to bedrock, steep slopes, and the very low available water capacity. The soil is best suited to use as native pasture, woodland, habitat for wildlife, or for recreation. Erosion is a very severe hazard if the native vegetation is disturbed.

This soil has low productivity as woodland, but this is the best use. Suitable species include shortleaf pine, loblolly pine, and eastern redcedar. Limited use of equipment and a severe hazard of erosion are severe limitations, and seedling mortality is a moderate limitation to woodland use and management.

This soil is not suited to urban uses. The depth to bedrock, large stones at the surface, and steep slopes are severe limitations for dwellings, small commercial buildings, local roads and streets, and for use as septic tank absorption fields. These limitations are very difficult or impractical to overcome.

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

24—Nella-Enders complex, 8 to 20 percent slopes. This complex consists of Nella and Enders soils on foot slopes. These moderately sloping to moderately steep soils are deep and well drained. These soils are so intricately mixed, or the areas are so small, that it was not practical to map them separately. The areas range from about 20 to 300 acres. Individual areas of each soil are about 2 to 5 acres.

The stony Nella soils make up about 40 percent of the map unit. Typically, the surface layer is dark grayish brown stony sandy loam about 2 inches thick. The subsurface layer is yellowish brown gravelly sandy loam to a depth of about 8 inches. The subsoil is strong brown gravelly loam to a depth of about 16 inches; yellowish red gravelly sandy clay loam to a depth of about 28 inches; mottled, red sandy clay loam to a depth of about 50 inches; and mottled, red clay loam to a depth of 80 inches or more.

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

The very stony Enders soils make up about 40 percent of the map unit. Typically, the surface layer is dark grayish brown very stony sandy loam about 2 inches thick. The subsurface layer is yellowish brown very stony loam to a depth of about 9 inches. The subsoil is mottled, red clay to a depth of about 35 inches and mottled, red very shaly clay to a depth of about 48 inches. The underlying material is yellowish red and black soft weathered shale to a depth of 60 inches or more. The material below this is dark gray shale bedrock.

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

The remaining 20 percent of the complex consists of small areas of Mountainburg and Steprock soils, Rock outcrop, and areas of soils that have large boulders on the surface.

The soils of this complex are not suited to cultivated crops because of the stony or very stony surface. In a few small areas, the trees have been cleared, stones removed, and pasture planted.

Nella soils are poorly suited to pasture and Enders soils are not suited to pasture. Suitable pasture plants include bermudagrass, lovegrass, lespedeza, bahiagrass, and white clover. Most areas of these soils have a stony or very stony surface, which limits the use of farm equipment. Concerns in management include weed and brush control.

Nella and Enders soils are moderately suited to woodland. Trees are mainly low-grade hardwoods. Suitable species to plant include shortleaf pine and loblolly pine. Limited use of equipment is a moderate limitation on Nella soils and a severe limitation on Enders soils for woodland use and management.

Nella soils are moderately suited to most urban uses. Slope is a moderate limitation for dwellings and local roads and streets, and it is a severe limitation for small commercial buildings. Slope and moderate permeability are moderate limitations for use of these soils as septic tank absorption fields. Enders soils are poorly suited to most urban uses. The high shrink-swell potential is a severe limitation for dwellings and small commercial buildings. Slope is a severe limitation for small commercial buildings. Low strength and the high shrink-swell potential are severe limitations for roads and streets. The very slow permeability is a severe limitation for use of these soils as septic tank absorption fields. Most of the limitations of these Nella and Enders soils generally can be overcome by using special design and

construction. The severity of septic tank absorption field limitations is difficult to overcome; however, it can be partly overcome by increasing the size of the field or by modifying the field itself.

The Nella and Enders soils are in capability subclass VIs. Nella soils are in woodland suitability group 4x8 and Enders soils are in 4x3.

25—Nella-Enders complex, 20 to 40 percent slopes. This complex consists of Nella and Enders soils on mountainsides. These steep soils are deep and well drained. These soils are so intricately mixed, or the areas are so small, that it was not practical to map them separately. The areas range from about 60 to 300 acres or more. Individual areas of each soil are about 2 to 5 acres.

The stony Nella soils make up about 50 percent of the map unit. Typically, the surface layer is dark grayish brown stony sandy loam about 2 inches thick. The subsurface layer is yellowish brown gravelly sandy loam to a depth of about 8 inches. The subsoil is strong brown gravelly loam to a depth of about 16 inches; yellowish red gravelly sandy clay loam to a depth of about 28 inches; mottled, red sandy clay loam to a depth of about 50 inches; and mottled, red clay loam to a depth of 80 inches or more.

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

The very stony Enders soils make up about 35 percent of the map unit. Typically, the surface layer is dark grayish brown very stony sandy loam about 2 inches thick. The subsurface layer is yellowish brown very stony sandy loam to a depth of about 9 inches. The subsoil is mottled, red clay to a depth of about 35 inches and mottled, red very shaly clay to a depth of about 48 inches. The underlying material is yellowish red and black soft weathered shale to a depth of 60 inches or more. The material below this is dark gray shale bedrock.

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

The remaining 15 percent of this complex consists of small areas of Mountainburg and Steprock soils, Rock outcrop, and areas of soils that have large boulders on the surface.

The soils of this complex are not suited to cultivated crops or improved pasture because of steep slopes and surface stoniness. These soils are mainly used for woodland.

Nella soils are moderately suited to woodland. Enders soils have low productivity as woodland, but this is the best use. Trees are mainly low-grade hardwoods. Suitable species to plant include shortleaf pine and loblolly pine. Equipment use limitations are severe on Enders soils and moderate on Nella soils. The hazard of erosion is moderate for Nella soils and severe for Enders soils. Seedling mortality is a moderate limitation to woodland use and management on Enders soils.

These Nella and Enders soils are poorly suited to most urban uses. Slope of these Nella soils is a severe limitation for dwellings, local roads and streets, small commercial buildings, and use of the soils as septic tank absorption fields. Slope and the high shrink-swell potential are severe limitations of these Enders soils for dwellings, small commercial buildings, and local roads and streets. Low strength is a severe limitation for local roads and streets. The very slow permeability and slope are severe limitations for use of Enders soils as septic tank absorption fields. Most of the limitations are difficult and expensive to overcome. Most will require special design and construction. The severity of septic tank absorption field limitations is difficult to overcome; however, it can be partly overcome by increasing the size of the field or by modifying the field itself.

These Nella and Enders soils are in capability subclass VIIs. Nella soils are in woodland suitability group 4x8 and Enders soils are in 5r3.

26—Nella-Steprock complex, 8 to 20 percent slopes. This complex consists of Nella and Steprock soils on benches and mountainsides. These moderately sloping to moderately steep soils are deep and moderately deep and well drained. These soils are so intricately mixed, or areas are so small, that it was not practical to map them separately. The areas range from about 20 to 300 acres. Individual areas of each soil are about 2 to 5 acres.

The deep stony Nella soils make up about 45 percent of the map unit. Typically, the surface layer is dark grayish brown stony sandy loam about 2 inches thick. The subsurface layer is yellowish brown gravelly sandy loam to a depth of about 8 inches. The subsoil is strong brown gravelly loam to a depth of about 16 inches; yellowish red gravelly sandy clay loam to a depth of about 28 inches; mottled, red sandy clay loam to a depth of about 50 inches; and mottled, red clay loam to a depth of about 80 inches or more.

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

The moderately deep very stony Steprock soils make up about 35 percent of the map unit. Typically, the surface layer is brown very stony sandy loam about 3 inches thick. The subsurface layer is light yellowish brown very gravelly sandy loam to a depth of about 11 inches. The subsoil is strong brown very gravelly sandy

loam to a depth of about 17 inches, yellowish red very gravelly loam to a depth of about 28 inches, and yellowish red very gravelly sandy loam to a depth of about 35 inches. The underlying material is thin-bedded, soft sandstone that has yellowish red and strong brown sandy loam between beds to a depth of 60 inches or more.

Steprock soils are low in natural fertility and organic matter content. Reaction is strongly acid or very strongly acid throughout. Permeability is moderate, and the available water capacity is very low. The rooting zone is moderately deep, but in places, roots are restricted by the fractured sandstone.

The remaining 20 percent of the complex consists of small areas of Mountainburg, Enders, and Linker soils, Rock outcrop, and areas of soils that have large boulders on the surface.

These soils are not suited to cultivated crops because of the stony or very stony surface. These soils are mainly used for woodland. In a few small areas, the trees have been cleared, stones removed, and pasture planted.

Nella soils are poorly suited to pasture, and Steprock soils are not suited. However, suitable pasture plants include bermudagrass, lovegrass, lespedeza, bahiagrass, and white clover. Most areas have a stony or very stony surface, which limits the use of farm equipment. Concerns in management include weed and brush control.

Nella and Steprock soils are moderately suited to woodland. Trees are mainly low-grade hardwoods. Suitable species to plant include shortleaf pine, white oak, and southern red oak. Equipment use limitations are moderate on Nella soils. Limited use of equipment and seedling mortality are moderate limitations to woodland use and management on Steprock soils.

Nella and Steprock soils are moderately to poorly suited to most urban uses. Slope of Nella soils is a moderate limitation for dwellings and local roads and streets and is a severe limitation for small commercial buildings. This limitation generally can be overcome by using special design and construction. Slope and the moderate permeability are moderate limitations for use of these soils as septic tank absorption fields. These limitations are difficult to overcome; but they can be partly overcome by increasing the size of the absorption field or by modifying the field itself on Nella soils. Steprock soils have moderate limitations for dwellings and local roads and streets because of slope and large stones. Slope is a severe limitation for small commercial buildings. These limitations generally can be overcome by using special design and construction. Depth to bedrock is a severe limitation for use of these Steprock soils as septic tank absorption fields. This limitation is difficult and generally impractical to overcome.

These Nella and Steprock soils are in capability subclass VIs and in woodland suitability group 4x8.

27—Nella-Steprock-Mountainburg complex, 20 to 40 percent slopes. This complex consists of Nella, Steprock, and Mountainburg soils on side slopes. These steep soils are deep, moderately deep, and shallow and are well drained. These soils are so intricately mixed, or the areas are so small, that it was not practical to map them separately. The areas range from about 40 to 500 acres or more. Individual areas of each soil are about 2 to 5 acres.

The deep stony Nella soils make up about 50 percent of the map unit. Typically, the surface layer is dark grayish brown stony sandy loam about 2 inches thick. The subsurface layer is yellowish brown gravelly sandy loam to a depth of about 8 inches. The subsoil is strong brown gravelly loam to a depth of about 16 inches; yellowish red gravelly sandy clay loam to a depth of about 28 inches; mottled, red sandy clay loam to a depth of about 50 inches; and mottled, red clay loam to a depth of about 80 inches or more.

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

The moderately deep very stony Steprock soils make up about 30 percent of the map unit. Typically, the surface layer is brown very stony sandy loam about 3 inches thick. The subsurface layer is light yellowish brown very gravelly sandy loam to a depth of about 11 inches. The subsoil is strong brown very gravelly sandy loam to a depth of about 17 inches, yellowish red very gravelly loam to a depth of about 28 inches, and yellowish red very gravelly sandy loam to a depth of about 35 inches. The underlying material is thin-bedded, soft sandstone that has yellowish red and strong brown sandy loam between beds to a depth of 60 inches or more.

Steprock soils are low in natural fertility and organic matter content. Reaction is strongly acid or very strongly acid throughout. Permeability is moderate, and the available water capacity is very low. The rooting zone is moderately deep, but in places, roots are restricted by fractured sandstone.

The shallow very stony Mountainburg soils make up about 15 percent of the map unit. Typically, the surface layer is very dark grayish brown very stony sandy loam about 2 inches thick. The subsurface layer is yellowish brown very gravelly fine sandy loam to a depth of about 5 inches. The subsoil is strong brown very gravelly sandy loam to a depth of about 13 inches. The underlying material is hard, level-bedded acid sandstone bedrock.

Mountainburg soils are low in natural fertility and organic matter content. Reaction 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

content of stones. The rooting zone is less than 20 inches deep and easily penetrated by plant roots.

The remaining 5 percent of this complex consists of small areas of Enders soils and outcrops and escarpments of sandstone.

These soils are not suited to cultivated crops or improved pasture because of surface stoniness and slope.

These soils are mainly in low-grade hardwoods. Suitable species to plant include shortleaf pine, loblolly pine, and eastern redcedar. Nella and Steprock soils are moderately suited to woodland. Equipment use limitations are severe on Steprock soils and moderate on Nella soils. Seedling mortality is a moderate limitation to woodland use and management on Steprock soils. Erosion is a moderate hazard on Nella and Steprock soils. Mountainburg soils have low productivity as woodland, but this is the best use. Equipment use limitations and the hazard of erosion are severe for Mountainburg soils, and seedling mortality is a moderate limitation to woodland use and management.

The soils in this complex are poorly suited to most urban uses. Slope of Nella soils is a severe limitation for dwellings, small commercial buildings, local roads and streets and septic tank absorption fields. Slope of Steprock soils is a severe limitation for dwellings, small commercial buildings, and local roads and streets. Slope and depth to bedrock are severe limitations for use of these Steprock soils as septic tank absorption fields. Slope, large stones, and depth to bedrock of Mountainburg soils are severe limitations for dwellings, small commercial buildings, local roads and streets, and use of these soils as septic tank absorption fields. These limitations are difficult to overcome, but some can be partly overcome by using special design and construction. The depth to bedrock limitation is extremely difficult and most times is impractical to overcome.

These Nella, Steprock, and Mountainburg soils are in capability subclass VIIs. Nella soils are in woodland suitability group 4x8, Steprock soils are in 4x9, and Mountainburg soils are in 5x3.

28—Newnata silt loam, 3 to 8 percent slopes. This is a deep, well drained, gently sloping soil on foot slopes. Slopes are smooth and concave. Individual areas range from 10 to 30 acres.

Typically, the surface layer of dark yellowish brown silt loam is about 5 inches thick. The subsoil is yellowish brown clay loam to a depth of about 8 inches; strong brown silty clay loam to a depth of about 24 inches; mottled, strong brown silty clay loam to a depth of about 36 inches; and mottled, strong brown clay to a depth of about 48 inches. The underlying material is black and gray weathered shale. The material below this is hard limestone bedrock.

This soil is moderate in natural fertility and organic matter content. Reaction ranges from strongly acid to slightly acid in the surface layer and strongly acid to mildly alkaline in the subsoil. Permeability is slow, and the available water capacity is medium. The rooting zone is deep, but plant roots can not easily penetrate the clayey subsoil.

Included in mapping are small areas of Moko, Samba, and Summit soils; small eroded areas of soils; and areas of soils that have a flaggy silt loam surface layer.

This soil is moderately suited to cultivated crops. Suitable crops include corn and small grains. If cultivated crops are grown, erosion is a severe hazard. Under management that includes contour farming, minimum tillage, and terraces, crops that leave a large amount of residue can be safely grown year after year. Conservation measures need to be intensified as slope length and gradient increase.

This soil is mainly used for pasture and hay. This soil is moderately suited to pasture. Suitable pasture plants include bermudagrass, lovegrass, fescue, and lespedeza. Concerns in management include proper stocking, rotation grazing, and weed and brush control.

This soil is moderately suited to woodland. Suitable species include white oak, northern red oak, and shortleaf pine. There are no significant limitations to woodland use and management.

This soil is poorly suited to most urban uses. The high shrink-swell potential is a severe limitation for dwellings and small commercial buildings. Low strength and the high shrink-swell potential are severe limitations for local roads and streets. These limitations are difficult to overcome, but they generally can be overcome by using special design and construction. The slow permeability is a severe limitation for use of this soil as septic tank absorption fields. This limitation is difficult to overcome, but it can be partly overcome by increasing the size of the absorption field or by modifying the field itself.

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

29—Newnata-Eden-Moko association, rolling. This association consists of deep to shallow, well drained soils on mountainsides and foot slopes. Slopes are 8 to 20 percent. Areas of this association are 10 to 250 acres or more, and the composition is variable; however, the detail of mapping is adequate for the expected uses of the soils.

Newnata soils formed in residuum of weathered interbedded limestone and shale. These soils are on the upper side slopes. Eden soils formed in residuum of weathered interbedded shale and fossiliferous limestone. These soils are on the lower side slopes. Moko soils formed in residuum of weathered limestone. These soils are on points and near outcrops of limestone.

The deep Newnata soils make up about 30 percent of this map unit. Typically, the surface layer is very dark

grayish brown stony silt loam to a depth of about 4 inches. The subsoil is yellowish brown flaggy clay loam to a depth of about 8 inches; strong brown silty clay loam to a depth of about 36 inches; and mottled, strong brown clay to a depth of about 48 inches. The underlying material is black and gray, soft, platy shale that has strong brown clay between plates to a depth of about 51 inches. The material below this is gray hard limestone bedrock.

Newnata soils are moderate in natural fertility and organic matter content. Reaction ranges from strongly acid to slightly acid in the surface layer and strongly acid to mildly alkaline in the subsoil. Permeability is slow, and the available water capacity is medium. The rooting zone is deep, but plant roots do not easily penetrate the clayey subsoil.

The moderately deep Eden soils make up about 25 percent of the map unit. Typically, the surface layer is very dark grayish brown flaggy silty clay loam about 4 inches thick. The subsoil is brown clay to a depth of about 9 inches and dark yellowish brown very shaly clay to a depth of about 20 inches. The underlying material is grayish brown very shaly clay to a depth of about 28 inches and very dark gray, soft shale to a depth of 50 inches or more.

Eden soils are moderate in natural fertility and organic matter content. Reaction ranges from medium acid to mildly alkaline throughout. Permeability is slow, and the available water capacity is low. The rooting zone is shallow.

The shallow Moko soils make up about 25 percent of the map unit. Typically, the soil is black very stony silty clay loam to a depth of about 5 inches and very dark gray very stony silty clay loam to a depth of about 9 inches. The underlying material is gray, hard limestone bedrock.

Moko soils are moderate to high in natural fertility and organic matter content. Reaction ranges from slightly acid to mildly alkaline throughout. Permeability is moderate, and the available water capacity is low. The rooting zone is shallow.

The remaining 20 percent of this map unit consists of small areas of Summit and Samba soils, small eroded areas of soil, and outcrops of limestone and shale.

These soils are not suited to cultivated crops because of the stony and flaggy surface layer and slope.

A few small areas of the soils are in pasture. Newnata and Eden soils are poorly suited to improved pasture and Moko soils are not suited to improved pasture. Suitable pasture plants include tall fescue and bermudagrass. Concerns in management include weed and brush control.

These soils are mainly in upland hardwoods and cedars.

—Newnata soils are moderately suited to woodland. Suitable species include northern red oak, white oak, and eastern redcedar. Limited use of equipment and the hazard of erosion are moderate limitations to woodland use and management.

—Eden soils are moderately suited to woodland. A suitable tree is eastern redcedar. Limited use of equipment and seeding mortality are moderate limitations to woodland use and management.

—Moko soils have low productivity as woodland, but this is the best use. A suitable tree is eastern redcedar. Limited use of equipment, seedling mortality, and the hazard of erosion are severe limitations for woodland use and management.

These soils are poorly suited to most urban uses.

—Newnata soils have severe limitations for dwellings and small commercial buildings because of the high shrink-swell potential. Slope is a severe limitation for small commercial buildings. The low strength of the soil and high shrink-swell potential are severe limitations for local roads and streets. The slow permeability is a severe limitation for use of soils as septic tank absorption fields.

—Eden soils have moderate limitations for dwellings because of the moderate shrink-swell potential and slope. Slope is a severe limitation for small commercial buildings. The low strength is a severe limitation for local roads and streets. The slow permeability and depth to bedrock are severe limitations for use of the soils as septic tank absorption fields.

—Moko soils have severe limitations for dwellings, local roads and streets, and for use as septic tank absorption fields because of large stones and depth to bedrock. Slope, depth to bedrock, and large stones are severe limitations for small commercial buildings.

Limitations for dwellings, small commercial buildings, and local roads and streets generally can be overcome on Newnata and Eden soils by using special design and construction. Limitations for septic tank absorption fields are difficult to overcome. Increasing the size of the absorption field or modifying the field can partly overcome the severity of the limitations on these soils. The limitations of Moko soils, mainly the depth to bedrock, are difficult and usually impractical to overcome.

Newnata soils are in capability subclass VIs and in woodland suitability group 4x8. Eden soils are in capability subclass VIe and in woodland suitability group 4c2. Moko soils are in capability subclass VIIs and in woodland suitability group 5x3.

30—Newnata-Eden-Moko association, steep. This association consists of deep to shallow, well drained soils on steep mountainsides. Slope ranges form 20 to 40 percent. Areas of this association are 50 to 1,000 acres or more, and the composition is variable; however, the detail of mapping is adequate for the expected use of the soils.

Newnata soils formed in residuum of weathered interbedded limestone and shale. These soils are on the

upper slopes. Eden soils formed in residuum of weathered interbedded shale and fossiliferous limestone. These soils are on the lower slopes. Moko soils formed in residuum of weathered limestone. These soils are near outcrops of limestone.

The deep Newnata soils make up about 30 percent of the map unit. Typically, the surface layer is very dark grayish brown stony silt loam to a depth of about 4 inches. The subsoil is yellowish brown flaggy clay loam to a depth of about 8 inches; strong brown silty clay loam to a depth of about 36 inches; and mottled, strong brown clay to a depth of about 48 inches. The underlying material is black and gray, soft, platy shale that has strong brown clay between plates to a depth of about 51 inches. The material below this is gray hard limestone bedrock.

Newnata soils are moderate in natural fertility and organic matter content. Reaction ranges from slightly acid to strongly acid in the surface layer and strongly acid to mildly alkaline in the subsoil. Permeability is slow, and the available water capacity is medium. The rooting zone is deep, but plant roots do not easily penetrate the clayey subsoil.

The moderately deep Eden soils make up about 20 percent of the map unit. Typically, the surface layer is very dark grayish brown flaggy silty clay loam about 4 inches thick. The subsoil is brown clay to a depth of about 9 inches, and dark yellowish brown very shaly clay to a depth of about 20 inches. The underlying material is grayish brown very shaly clay to a depth of about 28 inches and very dark gray, soft shale to a depth of 50 inches or more.

Eden soils are moderate in natural fertility and organic matter content. Reaction ranges from medium acid to mildly alkaline throughout. Permeability is slow, and the available water capacity is low. The rooting zone is shallow.

The shallow Moko soils make up about 20 percent of the map unit. Typically, the soil is black very stony silty clay loam to a depth of about 5 inches and very dark gray very stony silty clay loam to a depth of about 9 inches. The underlying material is gray, hard limestone bedrock.

Moko soils are moderate to high in natural fertility and organic matter content. Reaction ranges from slightly acid to mildly alkaline throughout. Permeability is moderate, and the available water capacity is very low. The rooting zone is shallow.

The remaining 30 percent of this association consists of small areas of Summit soils and outcrops of shale and limestone.

These soils are not suited to cultivated crops or improved pasture. The stony and flaggy surface layer, depth to bedrock, and steep slopes are the main limitations.

These soils are mainly in woodland of upland hardwoods and cedars.

—Newnata soils are moderately suited to woodland. Suitable species include northern red oak, white oak, and eastern redcedar. Limited use of equipment and the hazard of erosion are severe limitations to woodland use and management.

—Eden soils are moderately suited to woodland. A suitable tree is eastern redcedar. Limited use of equipment is a severe limitation, and the hazard of erosion and seedling mortality are moderate limitations for woodland use and management.

—Moko soils have low productivity as woodland, but this is the best use. A suitable tree is eastern redcedar. The hazard of erosion, limited use of equipment, and seedling mortality are severe limitations for woodland use and management.

These soils are poorly suited to most urban uses.

—Newnata soils have severe limitations for dwellings and small commercial buildings because of slope and the high shrink-swell potential. Slope, low strength and the high shrink-swell potential are severe limitations for local roads and streets. The slow permeability and slope are severe limitations for use of these soils as septic tank absorption fields.

—Eden soils have severe limitations for dwellings and small commercial buildings because of slopes. Slope and low strength are severe limitations for local roads and streets. The slow permeabilty, depth to bedrock, and slope are severe limitations for use of the soils as septic tank absorption fields.

—Moko soils have severe limitations for dwellings, small commercial buildings, local roads and streets, and septic tank absorption fields because of slope, depth to bedrock, and large stones. On all of these soils some of the limitations for urban uses may be overcome by using special design and construction. Slope and depth to bedrock are very difficult and often impractical to overcome.

Newnata soils are in capability subclass VIIs and in woodland suitability group 4x9. Eden soils are in capability subclass VIIe and in woodland suitability group 4c3. Moko soils are in capability subclass VIIs and in woodland suitability group 5x3.

31—Nixa very cherty silt loam, 3 to 8 percent slopes. This is a deep, moderately well drained, gently sloping soil on narrow ridgetops. Individual areas are about 10 to 200 acres.

Typically, the surface layer is dark brown very cherty silt loam about 2 inches thick. The subsurface layer is pale brown very cherty silt loam to a depth of about 8 inches. The subsoil extends to a depth of about 78 inches or more. It is light yellowish brown very cherty silt loam to a depth of about 15 inches. A fragipan of mottled, yellowish brown, strong brown, and pale brown very cherty silt loam extends to a depth of about 38 inches. Below that the subsoil is cherty silty clay mottled in shades of red, brown, and gray.

This soil is low in natural fertility and organic matter content. Reaction is strongly acid or very strongly acid throughout. Permeability is very slow, and the available water capacity is low. Tilth is difficult to maintain, and the high content of chert fragments makes the soil droughty and tillage difficult. The fragipan restricts root penetration and slows the movement of water through the soil.

Included in mapping are small areas of Noark soils, areas of soils that have less than 35 percent chert in the surface layer, and small areas of soils that have slopes of less than 3 percent or more than 8 percent.

This soil is moderately suited to cultivated crops. Suitable crops include corn and small grains. If cultivated crops are grown, surface chert, medium to rapid runoff, slope, low available water capacity, and a very severe hazard of erosion are limitations. Under management that includes minimum tillage, contour farming, and terraces, crops that leave a large amount of residue can be grown on the less sloping areas of this soil year after year. Conservation measures need to be intensified as slope length and gradient increase.

This soil is well suited to pasture and hay, and this is the main use. Suitable pasture plants include tall fescue, white clover, bermudagrass, and lespedeza. Concerns in management include proper stocking, rotation grazing, and brush and weed control.

This soil is moderately suited to woodland. Suitable species include shortleaf pine, loblolly pine, southern red oak, and white oak. Seedling mortality is a moderate limitation to woodland use and management.

Nixa soils are moderately suited to most urban uses. There are no significant limitations for dwellings or for local roads and streets. Slope is a moderate limitation for small commercial buildings. This limitation generally can be overcome by using special design and construction. The very slow permeability is a severe limitation for use of the soil as septic tank absorption fields. This limitation is difficult to overcome, but it can be partly overcome by expanding the absorption fields or by modifying the field itself.

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

32—Nixa-Noark complex, 3 to 8 percent slopes. This complex consists of Nixa and Noark soils on ridges. These gently sloping very cherty soils are well drained and moderately well drained and moderately permeable and very slowly permeable. These soils are so intricately mixed, or the areas are so small, that it was not practical to map them separately. Areas range from about 20 to 200 acres. The individual areas of each soil are about 3 to 5 acres.

The moderately well drained Nixa soils make up about 50 percent of the map unit. Typically, the surface layer is dark brown very cherty silt loam about 2 inches thick. The subsurface layer is pale brown very cherty silt loam to a depth of about 8 inches. The subsoil extends to a depth of about 78 inches or more. It is light yellowish brown very cherty silt loam to a depth of about 15 inches. A fragipan of mottled, yellowish brown, strong brown, and pale brown very cherty silt loam extends to a depth of about 38 inches. Below that the subsoil is cherty silty clay mottled in shades of red, brown, and gray.

Nixa soils are low in natural fertility and organic matter content. Reaction is strongly acid or very strongly acid throughout. Permeabilty is very slow, and the available water capacity is low. Tilth is difficult to maintain, and the high content of chert fragments makes the soil droughty and tillage difficult. The fragipan restricts root penetration and slows the movement of water through the soil.

The well drained Noark soils make up about 40 percent of the map unit. Typically, the surface layer is dark grayish brown very cherty silt loam about 4 inches thick. The subsurface layer is pale brown very cherty silt loam to a depth of about 12 inches. The subsoil is yellowish red very cherty silty clay loam to a depth of about 16 inches; red very cherty silty clay to a depth of about 24 inches; and mottled, red and dark red very cherty silty clay to a depth of about 78 inches or more.

Noark soils are low in natural fertility and organic matter content. Reaction ranges from slightly acid to strongly acid in the surface layer and is strongly acid or very strongly acid in the subsoil. Permeability is moderate, and the available water capacity is low. Tilth is difficult to maintain, and the high content of chert fragments makes tillage difficult. The rooting zone is deep and easily penetrated by plant roots.

The remaining 10 percent of this map unit consists of small areas of Clarksville soils, areas of soils that have less than 35 percent chert in the surface layer, and small areas of soils that have slopes of more than 8 percent.

These soils are moderately suited to cultivated crops. Suitable crops include corn and small grains. If cultivated crops are grown, slope, moderate to rapid runoff, chert on the surface, and a severe hazard of erosion are the main limitations. Under management that includes minimum tillage, terraces, and contour farming, crops that leave a large amount of residue can be safely grown year after year. Conservation treatments need to be intensified as slope length and gradient increase.

These soils are used mainly as woodland or for improved pasture. These soils are moderatly suited to pasture. Suitable pasture plants include tall fescue, white clover, bermudagrass, and lespedeza. Concerns in management include proper grazing, proper stocking, and weed and brush control.

These soils are moderately suited to woodland. Suitable species include shortleaf pine, loblolly pine, white oak, and southern red oak. Seedling mortality is a moderate limitation to woodland use and management.

Nixa and Noark soils are moderately suited to most urban uses. These soils have no significant limitations for dwellings and local roads and streets. Slope is a

moderate limitation for small commercial building sites. This limitation generally can be overcome by using special design and construction. For use of these soils as septic tank absorption fields, the very slow permeability of Nixa soils is a severe limitation, and moderate permeability of Noark soils is a moderate limitation. This limitation is difficult to overcome, but it can be partly overcome by increasing the size of the field or by modifying the field itself.

Nixa and Noark soils are in capability subclass IIIe and in woodland suitability group 4f8.

33—Noark very cherty silt loam, 3 to 8 percent slopes. This is a deep, well drained, gently sloping soil on ridges. Slopes are smooth and convex. Individual areas range from 10 to 80 acres.

Typically, the surface layer is dark grayish brown very cherty silt loam about 4 inches thick. The subsurface layer is pale brown very cherty silt loam to a depth of about 12 inches. The subsoil is yellowish red very cherty silty clay loam to a depth of about 16 inches, red very chery silty clay to a depth of about 24 inches, and mottled, dark red and red very cherty silty clay to a depth of 78 inches or more.

This soil is low in natural fertility and organic matter content. Reaction ranges from slightly acid to strongly acid in the surface layer and is strongly acid or very strongly acid in the subsoil. Permeability is moderate, and the available water capacity is low. Tilth is difficult to maintain, and the high content of chert fragments makes tillage difficult. The rooting zone is deep and is easily penetrated by plant roots.

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

This soil is moderately suited to cultivated crops. Suitable crops include small grains. Runoff is moderate to rapid, and if cultivated crops are grown, the hazard of erosion is severe. Under management that includes minimum tillage, contour farming, and terraces, crops that leave a large amount of residue can be grown year after year. Conservation measures need to be intensified as slope length and gradient increase.

This soil is used mainly as woodland or for pasture. This soil is moderately suited to pasture. Suitable pasture plants include tall fescue, white clover, and bermudagrass. Concerns in management include proper stocking and weed control.

This soil is moderately suited to woodland. Suitable species include shortleaf pine, southern red oak, and white oak. Seedling mortality is a moderate limitation to woodland use and management.

This Noark soil is moderately suited to most urban uses. There are no significant limitations for dwellings or for local roads and streets. Slope is a moderate limitation for small commercial buildings. This limitation generally can be overcome by using special design and construction. Moderate permeability is a moderate limitation for use of this soil as septic tank absorption fields. This limitation is difficult to overcome, but it can be partly overcome by increasing the size of the field or by modifying the field itself.

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

34—Noark very cherty silt loam, 8 to 20 percent slopes. This is a deep, well drained, moderately sloping to moderately steep soil on hillsides. Slopes are convex. Individual areas are about 20 to 400 acres.

Typically, the surface layer is dark grayish brown very cherty silty loam about 4 inches thick. The subsurface layer is pale brown very cherty silt loam to a depth of about 12 inches. The subsoil is yellowish red very cherty silty clay loam to a depth of about 16 inches; red very cherty silty clay to a depth of about 24 inches; and mottled, dark red and red very cherty silty clay to a depth of 78 inches or more.

This soil is low in natural fertility and organic matter content. Reaction ranges from slightly acid to strongly acid in the surface layer and is strongly acid or very strongly acid in the subsoil. Permeability is moderate, and the available water capacity is low. The rooting zone is deep and can be easily penetrated by plant roots.

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

This soil is not suited to cultivated crops. Surface chert, slope, rapid runoff, low available water capacity and a very severe erosion hazard are the main limitations. This soil is mainly used for pasture or woodland.

This soil is moderately suited to pasture. Suitable pasture plants include tall fescue, white clover, lespedeza, and bermudagrass. Concerns in management include proper stocking and brush control.

Noark soils are moderately suited to woodland. Suitable species include shortleaf pine, loblolly pine, southern red oak, and white oak. Seedling mortality is a moderate limitation to woodland use and management.

This soil is moderately suited to most urban uses. Slope is a moderate limitation for dwellings and for local roads and streets. Slope is a severe limitation for small commercial buildings. This limitation generally can be overcome by using special design and construction. Slope and moderate permeability are moderate limitations for use of this soil as septic tank absorption fields. These limitations are difficult to overcome, but they can be partly overcome by increasing the size of the absorption field or by modifying the field itself.

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

35—Noark very cherty silt loam, 20 to 40 percent slopes. This is a deep, well drained, steep soil on hillsides. Slopes are smooth and convex. Individual areas are about 10 to 500 acres.

Typically, the surface layer is dark grayish brown very cherty silt loam about 4 inches thick. The subsurface layer is pale brown very cherty silt loam to a depth of about 12 inches. The subsoil is yellowish red very cherty silty clay loam to a depth of about 16 inches; red very cherty silty clay to a depth of about 24 inches; and mottled, dark red and red very cherty silty clay to a depth of about 78 inches or more.

This soil is low in natural fertility and organic matter content. Reaction ranges from slightly acid to strongly acid in the surface layer and is strongly acid or very strongly acid in the subsoil. Permeability is moderate, and the available water capacity is low. The rooting zone is deep and is easily penetrated by plant roots.

Included in mapping are small areas of soils similar to Noark soils, except that they have chert or limestone bedrock at a depth of less than 60 inches, and small areas of soils that have slopes of more than 40 percent. Also included are small areas of Clarksville, Estate, and Moko soils and outcrops of limestone.

This soil is not suited to cultivated crops or improved pasture because of steep slopes, rapid runoff, and a very severe hazard of erosion. Improved pasture plants are difficult to establish and maintain.

This soil is mainly in upland hardwoods and pines. It is moderately suited to woodland. Suitable species include shortleaf pine, southern red oak, and white oak. In woodland use and management, the hazard of erosion and seedling mortality are moderate limitations, and the use of equipment is severely limited.

This soil is poorly suited to urban uses. Slope is a severe limitation for dwellings, small commercial buildings, local roads and streets, and for use of this soil as septic tank absorption fields. This limitation generally can be overcome by using special design and construction, but the difficulty increases as slope increases

This Noark soil is in capability subclass VIIe and in woodland suitability group 4r9.

36—Noark-Nixa complex, 8 to 20 percent slopes. This complex consists of well drained and moderately well drained, moderately sloping to moderately steep, very cherty soils on rolling ridges. These soils are so intricately mixed, or the areas are so small, that it was not practical to map them separately. Areas range from about 40 to 500 acres. The individual areas of each soil are about 3 to 5 acres.

The well drained Noark soils make up about 50 percent of the map unit. Typically, the surface layer is dark grayish brown very cherty silt loam about 4 inches thick. The subsurface layer is pale brown very cherty silt loam to a depth of about 12 inches. The subsoil is yellowish red very cherty silty clay loam to a depth of about 16 inches; red very cherty silty clay to a depth of about 24 inches; and mottled, dark red and red very cherty silty clay to a depth of about 78 inches or more.

Noark soils are low in natural fertility and organic matter content. Reaction ranges from slightly acid to strongly acid in the surface layer and is strongly acid or very strongly acid in the subsoil. Permeability is moderate, and the available water capacity is low.

The moderately well drained Nixa soils make up about 30 percent of the map unit. Typically, the surface layer is dark brown very cherty silt loam about 2 inches thick. The subsurface layer is pale brown very cherty silt loam to a depth of about 8 inches. The subsoil extends to a depth of about 78 inches or more. It is light yellowish brown very cherty silt loam to a depth of about 15 inches. A fragipan of mottled, yellowish brown, strong brown, and pale brown very cherty silt loam extends to a depth of about 38 inches. Below that the subsoil is cherty silty clay mottled in shades of red, brown, and gray.

Nixa soils are low in natural fertility and organic matter content. Reaction is strongly acid or very strongly acid throughout. Permeability is very slow, and the available water capacity is low. The high content of chert fragments makes the soil droughty. The fragipan restricts root penetration and slows the movement of water through the soil.

The remaining 20 percent of this complex consists of small areas of Clarksville and Moko soils, areas of soils where slopes are more than 20 percent, and areas of soils where chert or limestone bedrock is at a depth of less than 60 inches.

These soils are not suited to cultivated crops because of slope, rapid runoff, chert on the surface, and a very severe hazard of erosion. These soils are mainly used as woodland or for pasture.

These soils are moderately suited to pasture. A few areas of these soils are used for improved pasture. Suitable pasture plants include tall fescue, white clover, bermudagrass, and lespedeza. Concerns in management include proper stocking and brush and weed control.

Noark and Nixa soils are moderately suited to woodland, and this is the main use. Suitable species include shortleaf pine, loblolly pine, white oak, and southern red oak. Seedling mortality is a moderate limitation to woodland use and management for both soils.

These soils are moderately suited to most urban uses. Slope is a moderate limitation for dwellings and local roads and streets. Slope is a severe limitation for small commercial buildings. This limitation generally can be overcome by using special design and construction. The very slow permeability is a severe limitation for use of Nixa soils as septic tank absorption fields and slope and the moderate permeability are moderate limitations for Noark soils. These limitations are difficult to overcome,

but they can be partly overcome by increasing the size of the absorption field or by modifying the field itself.

These Noark and Nixa soils are in capability subclass VIe and in woodland suitability group 4f8.

37—Portia fine sandy loam, 3 to 8 percent slopes. This is a deep, well drained, gently sloping soil on hilltops. Slopes are convex. Individual areas are about 10 to 150 acres.

Typically, the surface layer is brown fine sandy loam about 7 inches thick. The upper part of the subsoil is yellowish red fine sandy loam to a depth of about 13 inches; it is red sandy clay loam to a depth of about 42 inches; it is red sandy clay to a depth of about 56 inches; and the lower part of the subsoil is sandy clay loam to a depth of 78 inches or more.

This soil is low in natural fertility and organic matter content. Reaction ranges from strongly acid to slightly acid in the surface layer, very strongly acid to medium acid in the upper part of the subsoil, and strongly acid or medium acid in the lower part of the subsoil. Permeability is moderate, and the available water capacity is medium. This soil has good tilth and can be worked throughout a wide range of moisture content. The rooting zone is deep and is easily penetrated by plant roots.

Included in mapping are small areas of soils that have a stony and gravelly surface layer, small areas of Estate and Ramsey soils, occasional shallow gullies, and small areas of eroded soils.

This soil is moderately suited to cultivated crops. Suitable crops include corn, small grains, and truck crops. Runoff is medium to rapid, and if cultivated crops are grown, the hazard of erosion is severe. Under management that includes minimum tillage, contour farming, and terraces, crops that leave a large amount of residue can be safely grown year after year. Conservation measures need to be intensified as slope length and gradient increase.

This soil is used mainly for pasture or hay. It is well suited to pasture. Suitable pasture plants include tall fescue, white clover, bahiagrass, bermudagrass, and lespedeza. Concerns in management include rotation grazing, proper stocking, and weed and brush control.

This soil is well suited to woodland. Suitable species include shortleaf pine, loblolly pine, and sweetgum. There are no significant limitations for woodland use and management.

This soil is moderately suited to most urban uses. There are no significant limitations for dwellings. Slope is a moderate limitation for small commercial buildings. Low strength is a moderate limitation for local roads and streets. These limitations generally can be overcome by using special design and construction. The moderate permeability is a limitation for use of this soil as septic tank absorption fields. This limitation is difficult to overcome, but it can be partly overcome by increasing the size of the field or by modifying the field itself.

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

38—Ramsey-Rock outcrop complex, 3 to 20 percent slopes. This complex consists of Ramsey soils and Rock outcrop on hilltops and hillsides. These components are so intricately mixed, or so small, that it was not practical to map them separately. Areas are about 5 to 250 acres. Individual areas of each soil are 1 to 3 acres.

Ramsey soils make up about 40 percent of the map unit. Typically, the surface layer is very dark grayish brown stony fine sandy loam about 2 inches thick. The subsurface layer is brown stony fine sandy loam to a depth of about 5 inches. The subsoil is yellowish brown fine sandy loam to a depth of about 12 inches. The underlying material is hard, level-bedded sandstone bedrock.

Ramsey soils are low in natural fertility and moderate in organic matter content. Reaction is strongly acid or very strongly acid throughout. Permeability is rapid, and the available water capacity is very low.

Rock outcrop makes up about 30 percent of the map unit area. Typically, Rock outcrop is hard, level-bedded sandstone bedrock.

The remaining 30 percent of this complex consists of soils that are 2 to 7 inches thick and do not have genetic horizonation; otherwise, they are similar to Ramsey soils in behavior. These soils are capable of supporting some grasses, shrubs, and trees. Also included are small areas of Brockwell, Estate, and Portia soils; areas of soils that have large massive sandstone boulders at the surface; and areas of soils that have slopes of more than 20 percent.

The soils in this complex are not suited to cultivated crops or improved pasture. Depth to bedrock, surface stoniness, and Rock outcrop limit the use of the soils as habitat for wildlife, as woodland, or for recreation. These soils should not be cleared. The hazard of erosion is very severe if the native vegetation is disturbed (fig. 5). These soils are mainly in woodland of scattered, low-grade scrub cedar, pine, and hardwoods. In openings in the canopy, vegetation is a sparse stand of native prairie plants, shrubs, lichens, mosses, and cacti and other succulents.

Ramsey soils have low productivity as woodland, but this is the best use. Suitable species include shortleaf pine and loblolly pine. Limited use of equipment and the hazard of erosion are severe limitations, and seedling mortality is a moderate limitation to woodland use and management.

The soils in this complex are poorly suited to most urban uses. Depth to bedrock and Rock outcrop are severe limitations for dwellings, small commercial buildings, local roads and streets, and septic tank absorption fields. Slope is also a severe limitation for

Figure 5.—Exposed sandstone bedrock in an area of Ramsey-Roch outcrop complex, 3 to 20 percent slopes.

small commercial buildings. These limitations are difficult and generally impractical to overcome.

Ramsey soils are in capability subclass VIIs and in woodland suitability group 5x9.

39—Razort fine sandy loam, frequently flooded. This is a deep, level to nearly level, well drained soil on flood plains that parallel small streams. Individual areas range from about 5 to 40 acres. Slopes range from 0 to 3 percent.

Typically, the surface layer is dark brown fine sandy loam about 8 inches thick. The subsoil is dark brown silt loam to a depth of 24 inches, dark brown loam to a depth of 39 inches, and brown gravelly clay loam to a depth of 49 inches. The underlying material is brown very gravelly silt loam to a depth of 60 inches or more.

This soil is moderate in natural fertility and organic matter content. Reaction is slightly acid or neutral in the surface layer and medium acid or slightly acid in the subsoil. Permeability is moderate, and the available water capacity is high. The soil has good tilth and can be worked within a wide range of moisture content. The rooting zone is deep and is easily penetrated by plant roots.

This soil is flooded at least once in the winter and spring in most years. If the soil does not have a vegetative cover, the fast-moving floodwaters, which occur for very brief periods, can cause severe damage in a short time.

Included in mapping are small areas of Elsah and Healing soils, small areas of soils that have a sandy overwash, and areas of soils that have a gravelly surface layer.

This soil is not suited to cultivated crops because it is frequently flooded.

This soil is mainly used for pasture or hay (fig. 6). It is well suited to pasture. Suitable pasture plants include bermudagrass, tall fescue, white clover, alfalfa, and lespedeza. Concerns in management include proper stocking, rotation grazing, and weed control.

This soil is well suited to woodland. Suitable species include shortleaf pine, loblolly pine, red oak, white oak,

Figure 6.—Razort fine sandy loam, frequently flooded, on a narrow flood plain is used mainly for pasture.

sweetgum, cottonwood, black walnut, and sycamore. There are no significant limitations to woodland use and management.

This soil is not suited to most urban uses. Flooding is a severe hazard for dwellings, small commercial buildings, local roads and streets, and use of this soil as septic tank absorption fields. A major flood control system is needed to overcome this limitation.

This Razort soil is in capability subclass Vw and in woodland suitability group 2o7

40—Razort silt loam, frequently flooded. This is a deep, level to nearly level, well drained soil on flood plains that parallel small streams. Individual areas range from about 5 to 40 acres. Slopes range from 0 to 3 percent.

Typically, the surface layer is dark brown silt loam about 8 inches thick. The subsoil is dark brown silt loam to a depth of 24 inches, dark brown loam to a depth of 39 inches, and brown gravelly clay loam to a depth of 49 inches. The underlying material is brown very gravelly silt loam to a depth of 60 inches or more.

This soil is moderate in natural fertility and organic matter content. Reaction is slightly acid or neutral in the surface layer and medium acid to slightly acid in the subsoil. Permeability is moderate, and available water capacity is high. The soil has good tilth and can be worked within a wide range of moisture content. The

rooting zone is deep and is easily penetrated by plant roots.

This soil is flooded at least once in the winter and spring in most years. If the soil does not have a vegetative cover, fast-moving floodwaters, which occur for very brief periods, can cause severe damage in a short time.

Included in mapping are small areas of Elsah and Healing soils, small areas of soils that have a sandy overwash, and areas of soils that have a gravelly surface layer.

This soil is not suited to cultivated crops because it is frequently flooded.

This soil is used mainly for pasture or hay. It is well suited to pasture (fig. 7). Suitable pasture plants include bermudagrass, tall fescue, white clover, alfalfa, and lespedeza. Concerns in management include proper stocking, rotation grazing, and weed control.

This soil is well suited to woodland. Suitable species include shortleaf pine, loblolly pine, red oak, white oak, sweetgum, cottonwood, black walnut, and sycamore. There are no significant limitations to woodland use and management.

This soil is not suited to most urban uses. Flooding is a severe hazard for dwellings, small commercial buildings, local roads and streets, and use of this soil as septic tank absorption fields. A major flood control system is needed to overcome this limitation.

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

41—Samba silty clay loam, occasionally flooded. This is a deep, poorly drained, level soil in depressions

Figure 7.—Cattle grazing tall fescue on Razort silt loam, frequently flooded. Cow-calf operations are a major source of farm income in the county.

and along upland drainageways. Individual areas range from about 10 to 40 acres. Slope is 0 to 1 percent.

Typically, the surface layer is very dark grayish brown silty clay loam about 7 inches thick. The layer below that is very dark gray silty clay loam to a depth of about 19 inches. The subsoil is mottled, grayish brown clay to a depth of about 46 inches and mottled, gray clay to a depth of about 55 inches. The underlying material is gray, mottled silty clay to a depth of about 65 inches or more.

This soil is moderate in natural fertility and organic matter content. Reaction is slightly acid or medium acid in the surface layer and medium acid to neutral in the subsoil. Permeability is very slow, and the available water capacity is high. The surface layer is friable and easily tilled through a moderate range of moisture conditions. The rooting zone is deep, but the clayey subsoil restricts root penetration and slows the downward movement of water. A perched high water table is near the surface late in winter and in spring.

Included in mapping are small areas of Newnata and Summit soils.

This soil is flooded occasionally late in winter and early in spring. If the soil does not have a vegetative cover, the fast-moving floodwaters, which occur for very brief periods, can cause severe damage in a short time.

This soil is moderately suited to cultivated crops. Suitable crops include soybeans and small grains. However, if cultivated crops are grown, the very slow runoff, wetness, and occasional flooding are the main limitations. Farming operations are often delayed for several days after a rain unless a surface drainage system has been installed. With adequate drainage, crops that leave a large amount of residue can be safely grown year after year.

Most areas of this soil are used for pasture or hay. This soil is well suited to pasture. Suitable pasture plants include tall fescue, white clover, bermudagrass, and lespedeza. Concerns in management include proper stocking, rotation grazing, and weed control.

This soil is moderately suited to woodland. Suitable species include cottonwood, sycamore, and sweetgum. Use of equipment and seedling mortality are moderate limitations to woodland use and management.

This soil is poorly suited to most urban uses. The high shrink-swell potential, flooding, and wetness are severe limitations for dwellings and small commercial buildings. Flooding, low strength, and wetness are severe limitations for local roads and streets. These limitations are difficult and expensive to overcome. Wetness, flooding, and very slow permeability are severe limitations for use of this soil as septic tank absorption fields. These limitations are very difficult to overcome.

This Samba soil is in capability subclass IIIw and in woodland suitability group 4w8.

42—Sidon fine sandy loam, 3 to 8 percent slopes. This is a deep, moderately well drained, gently sloping soil on mountaintops and benches. Slopes are convex. Individual areas are about 20 to 600 acres.

Typically, the surface layer is dark yellowish brown fine sandy loam about 6 inches thick. The subsoil is strong brown and yellowish brown silty clay loam to a depth of about 23 inches. The layer below that is a fragipan of mottled, strong brown loam to a depth of about 34 inches and mottled, strong brown, light brownish gray and yellowish brown loam to a depth of about 48 inches. Below the pan, the subsoil is mottled, light brownish gray, strong brown, and red clay loam to a depth of about 57 inches. The underlying material is hard, level-bedded acid sandstone.

This soil is low in natural fertility and organic matter content. Reaction is strongly acid or very strongly acid throughout except where the surface layer has been limed. Permeability is slow, and the available water capacity is medium. This soil has good tilth and can be worked within a wide range of moisture conditions. The fragipan restricts root penetration and slows the movement of water through the soil. A perched high water table is often above the fragipan during the winter and early in spring.

Included in mapping are small areas of Mountainburg and Linker soils, small areas of soils that have a gravelly surface layer, and areas of soils that have slopes of less than 3 percent.

This soil is moderately suited to cultivated crops. Suitable crops include corn and small grains. Runoff is medium to rapid, and erosion is a severe hazard if cultivated crops are grown. Under management that includes minimum tillage, contour farming, and terraces, crops that leave a large amount of residue can be safely grown year after year. Conservation measures need to be intensified as slope length and gradient increase.

This soil is used mainly for hay or pasture. This soil is well suited to pasture. Suitable pasture plants include bermudagrass, bahiagrass, lespedeza, tall fescue, and white clover. Concerns in management include proper stocking, rotation grazing, and brush and weed control.

This soil is well suited to woodland. Suitable species include shortleaf pine, red oak, white oak, and loblolly pine. There are no significant limitations to woodland use and management.

This soil is moderately suited to most urban uses. Wetness is a moderate limitation for dwellings. Low strength and wetness are moderate limitations for local roads and streets. Wetness and slope are moderate limitations for small commercial buildings. These limitations generally can be overcome by using special design and an adequate drainage system. The slow permeability and wetness are severe limitations for use of the soil as septic tank absorption fields. These limitations are difficult to overcome, but they can be

partly overcome by increasing the size of the absorption area or by modifying the absorption field itself.

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

43—Sidon gravelly fine sandy loam, 3 to 8 percent slopes. This is a deep, moderately well drained, gently sloping soil on mountaintops and benches. Slopes are smooth and convex. Individual areas are about 5 to 25 acres.

Typically, the surface layer is dark yellowish brown gravelly fine sandy loam about 6 inches thick. The subsoil is strong brown and yellowish brown silty clay loam to a depth of about 23 inches. The layer below that is a fragipan of strong brown, mottled loam to a depth of about 34 inches and mottled, strong brown, light brownish gray, and yellowish brown loam to a depth of about 48 inches. Below the pan is mottled, light brownish gray, strong brown, and red clay loam to a depth of about 57 inches. The underlying material is hard, level-bedded acid sandstone.

This soil is low in natural fertility and organic matter content. Reaction is strongly acid or very strongly acid throughout except where the surface layer has been limed. Permeability is slow, and the available water capacity is medium. The soil has good tilth and can be worked within a wide range of moisture conditions, but surface gravel may hinder some tillage operations. The fragipan restricts root penetration and slows the movement of water through the soil. A perched high water table is often above the fragipan during the winter and early in spring.

Included in mapping are small areas of Mountainburg and Linker soils, small areas of soils that do not have a gravelly surface layer, small stony areas, and areas of soils that have slopes of less than 3 percent or more than 8 percent.

This soil is moderately suited to cultivated crops. Suitable crops include corn and small grains. Runoff is medium to rapid, and erosion is a severe hazard if cultivated crops are grown. Under management that includes minimum tillage, contour farming and terraces, crops that leave a large amount of residue can be safely grown year after year. Conservation measures need to be intensified as slope length and gradient increase.

This soil is used mainly for hay or pasture. This soil is well suited to pasture. Suitable pasture plants include bermudagrass, bahiagrass, lespedeza, tall fescue, and white clover. Concerns in management include proper stocking, rotation grazing, and brush and weed control.

This soil is well suited to woodland. Suitable species include shortleaf pine, red oak, white oak, and loblolly pine. There are no significant limitations to woodland use and management.

This soil is moderately suited to most urban uses. Wetness is a moderate limitation for dwellings. Low strength and wetness are moderate limitations for local roads and streets. Wetness and slope are moderate limitations for small commercial buildings. All of these limitations generally can be overcome by using special design and by adequate drainage. The slow permeability and wetness are severe limitations for use of this soil as septic tank absorption fields. This limitation is difficult to overcome, but it can be partly overcome by increasing the size of the absorption field or by modifying the field itself.

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

44—Spadra fine sandy loam, 1 to 3 percent slopes. This is a deep, well drained, nearly level soil on stream terraces. Individual areas are about 5 to 40 acres. This soil is flooded under abnormal conditions.

Typically, the surface layer is dark yellowish brown fine sandy loam about 8 inches thick. The subsoil is yellowish red loam to a depth of about 16 inches; yellowish red sandy clay loam to a depth of about 29 inches; mottled, yellowish red loam to a depth of about 46 inches; and brown gravelly sandy loam to a depth of 72 inches or more.

This soil is moderate in natural fertility and organic matter content. Reaction ranges from medium acid to very strongly acid throughout. The available water capacity is medium, and permeability is moderate. Tilth is good, and the soil can be worked within a wide moisture range. The rooting zone is deep and is easily penetrated by plant roots.

Included in mapping are small areas of Ceda and Cleora soils, small areas that are poorly drained, and areas that have a gravelly surface layer.

This soil is well suited to cultivated crops. Suitable crops include corn, soybeans, truck crops, sorghum, and other small grains. If cultivated crops are grown, erosion is a moderate hazard. Under management that includes minimum tillage, crops that leave a large amount of residue can be grown safely year after year. Conservation measures need to be intensified as slope length and gradient increase.

This soil is used mainly for pasture or hay. It is well suited to pasture. Suitable pasture plants include bermudagrass, tall fescue, white clover, and lespedeza. Concerns in management include proper stocking, rotation grazing, and weed control.

This soil is well suited to woodland. Suitable species include shortleaf pine, loblolly pine, black walnut, and southern red oak. There are no significant limitations to woodland use and management.

This soil is moderately suited to poorly suited to most urban uses. Flooding is a severe limitation for dwellings and small commercial buildings and is a moderate limitation for local roads and streets. Flooding and moderate permeability are moderate limitations for use of this soil as septic tank absorption fields. The limitations of flooding can be overcome by a major flood control

system. Limitations caused by the moderate permeability are difficult to overcome, but they can be partly overcome by increasing the size of the filter field or by modifying the field itself.

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

45—Steprock-Nella-Mountainburg complex, 40 to 60 percent slopes. This complex consists of Steprock, Nella, and Mountainburg soils on mountainsides. These very steep soils are deep, moderately deep, and shallow. These soils are so intricately mixed, or the areas are so small, that it was not practical to map them separately. Areas are about 40 to 500 acres or more. Individual areas of each soil are about 2 to 5 acres.

The moderately deep very stony Steprock soils make up about 35 percent of the map unit. Typically, the surface layer is brown very stony sandy loam about 3 inches thick. The subsurface layer is light yellowish brown very gravelly sandy loam to a depth of about 11 inches. The subsoil is strong brown very gravelly sandy loam to a depth of about 17 inches, yellowish red very gravelly loam to a depth of about 28 inches, and yellowish red very gravelly sandy loam to a depth of about 35 inches. The underlying material is thin-bedded, soft sandstone that has yellowish red and strong brown sandy loam between beds to a depth of 60 inches or more.

Steprock soils are low in natural fertility and organic matter content. Reaction is strongly acid or very strongly acid throughout. Permeability is moderate, and the available water capacity is very low. The rooting zone is moderately deep but somewhat restricted by the fractured sandstone.

The deep stony Nella soils make up about 25 percent of the map unit. Typically, the surface layer is dark grayish brown stony sandy loam about 2 inches thick. The subsurface layer is yellowish brown gravelly sandy loam to a depth of about 8 inches. The subsoil is strong brown gravelly loam to a depth of about 16 inches; yellowish red gravelly sandy clay loam to a depth of about 28 inches; mottled, red sandy clay loam to a depth of about 50 inches; and mottled, red clay loam to about 80 inches or more.

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

The shallow very stony Mountainburg soils make up about 20 percent of the map unit. Typically, the surface layer is very dark grayish brown very stony sandy loam about 2 inches thick. The subsurface layer is yellowish brown very gravelly sandy loam to a depth of about 5 inches. The subsoil is strong brown very gravelly sandy loam to a depth of about 13 inches. The underlying material is hard, level-bedded acid sandstone bedrock.

Mountainburg soils are low in natural fertility and organic matter content. Reaction 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 content of stones. The rooting zone is less than 20 inches deep and is easily penetrated by plant roots.

The remaining 20 percent of this complex consists of small areas of Enders soils, outcrops of sandstone bluffs, and escarpments.

These soils are not suited to cultivated crops or improved pasture. The very steep slopes, very severe hazard of erosion, and stony or very stony surface layer are the main limitations.

These soils are mainly in low-grade hardwood trees. Nella and Steprock soils are moderately suited to woodland. Suitable species include shortleaf pine, loblolly pine, and eastern redcedar. Equipment limitations and the hazard of erosion are severe, and seedling mortality is moderate in the use and management of the Nella and Steprock soils. Mountainburg soils have low productivity as woodland, but woodland is the best use. Suitable species include shortleaf pine, loblolly pine, and eastern redcedar. Equipment limitation and the hazard of erosion are severe, and seedling mortality is moderate in the use and management of the Mountainburg soils.

The soils of this complex are generally not suited to most urban uses. On Steprock soils slope is a severe limitation for dwellings, small commercial buildings, and local roads and streets. Slope and depth to bedrock are severe limitations for use as septic tank absorption fields. On Nella soils slope is a severe limitation for dwellings, small commercial buildings, and local roads and streets and for use as septic tank absorption fields. On Mountainburg soils, slope, large stones, and depth to bedrock are severe limitations for dwellings, small commercial buildings, local roads and streets, and use as septic tank absorption fields. The limitations on all of the soils in this complex are difficult and expensive to overcome.

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

46—Sturkie silt loam, 0 to 3 percent slopes. This is a deep, well drained, level to nearly level soil on low terraces along the White River. Areas of this soil are long and narrow and parallel the river. This soil is rarely flooded. Individual areas are about 40 to 250 acres.

Typically, the surface layer is dark brown silt loam about 6 inches thick. The layer below that is very dark grayish brown silt loam to a depth of about 28 inches. The subsoil is dark brown silt loam to a depth of about 56 inches and dark brown and brown to a depth of 80 inches or more.

This soil is moderate in natural fertility and organic matter content. Reaction is slightly acid or neutral in the surface layer and ranges from slightly acid to moderately alkaline in the subsoil. Permeability is moderate, and the available water capacity is high. Crops respond well to fertilizer. This soil has good tilth and can be worked within a wide range of moisture content. The rooting zone is deep and is easily penetrated by plant roots.

Included in mapping are small areas of Healing and Wideman soils, small areas of somewhat poorly drained soils in shallow depressions and old channel scars, and soils that have sandy overwash, which are in bands a few hundred feet wide and parallel the main river channel. Also included are areas of soils that have slopes of more than 3 percent and small drainage channels that bisect the long, narrow areas of soil at right angles to the main river channel.

This soil is protected by floodwater-retarding structures upstream, but flooding could occur under abnormal conditions. The possibility of flooding increases with distance from these structures and with number of tributaries that flow into the White River. The hazard of flooding increases along the course of the river from west to east.

This soil is well suited to cultivated crops. Suitable crops include soybeans, corn, small grains, and truck crops. If cultivated crops are grown, erosion is a slight hazard. Under management that includes minimum tillage, crops that leave large amounts of residue can be safely grown year after year. Conservation treatments need to be intensified as slope length and gradient increase. Small streams, which flow at right angles to the long and narrow areas of this soil, are deeply entrenched and are difficult to cross with farm machinery.

This soil is mainly used for improved pasture or hay. It is well suited to pasture. Suitable pasture plants include alfalfa, clover, lespedeza, bermudagrass, bahiagrass, and tall fescue. Concerns in management include proper stocking, rotation grazing, and weed control.

This soil is well suited to woodland. Suitable species include black walnut, red oak, cottonwood, white oak, and sycamore. There are no significant limitations to woodland use or management.

This soil is poorly suited to most urban uses. Rare flooding is a severe limitation for dwellings and small commercial buildings. Low strength is a severe limitation for local roads and streets. Rare flooding and the moderate permeability are moderate limitations of the soil for use as septic tank absorption fields. A major flood control system is needed to overcome the flooding. Low strength can be overcome by adding fill material to the roadbed. The moderate permeability is difficult to overcome, but it can be partly overcome by increasing the size of absorption fields or by modifying the field itself.

This Sturkie soil is in capability subclass IIe and in woodland suitability group 2o4.

47—Summit silty clay loam, 3 to 8 percent slopes. This is a deep, moderately well drained, gently sloping soil on foot slopes. Slopes are concave. Individual areas are about 20 to 100 acres.

Typically, the surface layer is very dark grayish brown silty clay loam about 5 inches thick. The subsurface layer is very dark gray silty clay loam to a depth of about 10 inches. The upper part of the subsoil is very dark grayish brown clay to a depth of about 28 inches; it is mottled, dark grayish brown clay to a depth of about 50 inches; and the lower part of the subsoil is mottled, olive brown silty clay to a depth of about 58 inches. The underlying material is gray, mottled silty clay to a depth of about 76 inches or more.

This soil is moderate in organic matter content and natural fertility. Reaction ranges from medium acid to neutral in the the surface layer and upper part of the subsoil and slightly acid to moderately alkaline in the lower part of the subsoil and underlying material. Permeability is slow, and the available water capacity is high. This soil has deep cracks in the surface during the dry months in summer. This soil can only be worked within a narrow moisture content range without clodding. The rooting zone is deep, but the clayey subsoil restricts penetration. Usually, a perched high water table is present late in winter and in spring.

Included in mapping are a few small areas of Eden, Samba, and Newnata soils. Also included are a few small areas of soils that have flaggy limestone fragments on the surface, small areas of soils that have a silt loam surface layer, areas of soils that are eroded, and outcrops of shale.

This soil is poorly suited to cultivated crops. Suitable crops include corn, soybeans, and small grains. If cultivated crops are grown, runoff is medium to rapid and the hazard of erosion is very severe. Under management that includes minimum tillage, contour farming, and terraces, tilled crops can be grown occasionally in a cropping system that includes close-growing cover crops most of the time. Conservation measures need to be intensified as slope length and gradient increase.

This soil is used mainly for pasture. It is moderately suited to pasture. Suitable pasture plants include fescue, white clover, bermudagrass, and lespedeza. Concerns in management include proper stocking, rotation grazing, and weed control.

This soil has low productivity as woodland, but this is the best use. Suitable trees are hackberry, honeylocust, and eastern redcedar. Seedling mortality is a moderate limitation to woodland use and management.

This soil is poorly suited to most urban uses. The high shrink-swell potential is a severe limitation for dwellings and small commercial buildings. Low strength and the high shrink-swell potential are severe limitations for local roads and streets. These limitations generally can be overcome by using special design and construction. The slow permeability is a severe limitation for use of this soil

as septic tank absorption fields. This limitation is difficult to overcome, but it can be partly overcome by increasing the size of the absorption field or by modifying the field itself.

This Summit soil is in capability subclass IVe and in woodland suitability group 5c8.

48—Summit silty clay loam, 8 to 12 percent slopes. This is a deep, moderately well drained, moderately sloping soil on foot slopes. Slopes are concave. Individual areas are about 40 to 200 acres.

Typically, the surface layer is very dark grayish brown silty clay loam about 5 inches thick. The subsurface layer is very dark gray silty clay loam to a depth of about 10 inches. The upper part of the subsoil is very dark grayish brown clay to a depth of about 28 inches; it is mottled, dark grayish brown clay to a depth of about 50 inches; and the lower part of the subsoil is mottled, olive brown silty clay to a depth of about 58 inches. The underlying material is mottled, dark gray silty clay to a depth of about 76 inches or more.

This soil is moderate in organic matter content and natural fertility. Reaction ranges from medium acid to neutral in the surface layer and upper part of the subsoil and from slightly acid to moderately alkaline in the lower part of the subsoil and underlying material. Permeability is slow, and the available water capacity is high. This soil has deep cracks in the surface during the dry months in summer. This soil can only be worked within a narrow moisture content range without clodding. The rooting zone is deep, but the clayey subsoil restricts penetration. A perched high water table is often present late in winter and in spring.

Included in mapping are a few small areas of Eden and Newnata soils. Also included are a few small areas of soils that have flaggy limestone fragments on the surface, outcrops of shale, areas of soil that are eroded, and small areas of soils that have a silt loam surface layer.

This soil is not suited to cultivated crops. The rapid runoff and a very severe hazard of erosion limit the use of this soil to pasture or range.

This soil is moderately suited to pasture. Suitable pasture plants include tall fescue, white clover, bermudagrass, and lespedeza. Concerns in management include proper stocking, rotation grazing, and weed control.

This soil has low productivity as woodland. Suitable trees are hackberry, honeylocust, and eastern redcedar. The hazard of erosion and seedling mortality are moderate limitations to woodland use and management.

This soil is poorly suited to most urban uses. The high shrink-swell potential is a severe limitation for dwellings. Low strength and the high shrink-swell potential are severe limitations for local roads and streets. Slope and the high shrink-swell potential are severe limitations for small commercial buildings. These limitations generally can be overcome by using special design and construction. The slow permeability is a severe limitation for use of this soil as septic tank absorption fields. This limitation is difficult to overcome, but it can be partly overcome by increasing the size of the field or by modifying the field itself.

This Summit soil is in capability subclass VIe and in woodland suitability group 5c8.

49—Wideman fine sandy loam, 0 to 3 percent slopes. This is a deep, excessively drained, level to nearly level soil on flood plains and natural levees. This soil is rarely flooded. Slopes are smooth and undulating. Individual areas are long and narrow and about 40 to 150 acres.

Typically, the surface layer is brown fine sandy loam about 14 inches thick. The underlying material is dark yellowish brown loamy fine sand to a depth of about 30 inches, dark yellowish brown fine sandy loam to a depth of about 34 inches, yellowish brown loamy fine sand to a depth of about 49 inches, and dark yellowish brown fine sandy loam to a depth of about 85 inches or more.

This soil is low in natural fertility and organic matter content. Reaction is strongly acid or medium acid in the surface layer and ranges from medium acid to neutral in the substratum. Permeability is moderately rapid, and the available water capacity is low. This soil can be worked within a wide range of moisture content. The rooting zone is deep and is easily penetrated by plant roots. This soil is droughty during the summer months.

Included in mapping are small areas of Healing and Sturkie soils, areas of soils that have loamy sand overwash, narrow overflow channels, and gravel bars.

This soil is in an area that is protected by floodwater-retarding structures upstream, but flooding could occur under abnormal conditions. The possibility of flooding increases with distance from these structures and with the number of tributaries that flow into the White River. The hazard of flooding increases along the course of the river from west to east.

This soil is moderately suited to cultivated crops. Suitable crops include soybeans, corn, small grains, and truck crops. The low available water capacity is a limitation. Moderate crop yields can be obtained if rainfall is adequate during the growing season. Under management that includes minimum tillage, crops that leave a large amount of residue can be grown safely year after year. Conservation treatments need to be intensified as slope length and gradient increase.

This soil is used mainly for hay or improved pasture. It is moderately suited to pasture. Suitable pasture plants include bermudagrass, lespedeza, alfalfa, tall fescue, and white clover. Concerns in management include proper stocking, rotation grazing, and weed control.

This soil is well suited to woodland. Suitable species include shortleaf pine, sweetgum, cottonwood, and

sycamore. Use of equipment and seedling mortality are moderate limitations for woodland use and management.

This soil is moderately suited to poorly suited to most urban uses. Rare flooding is a severe limitation for dwellings and small commercial buildings. Rare flooding is a moderate limitation for local roads and streets and for use of this soil as septic tank absorption fields. A major flood control system is necessary to overcome this limitation.

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

Prime farmland

In this section, prime farmland is defined and discussed, and the prime farmland soils in Stone County are listed.

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

Prime farmland soils may now be in use as cropland, pasture, woodland, or they may be in other uses. They either are used for producing food or fiber or are available for these uses. Urban or built-up land and water areas cannot be considered prime farmland. Urban and built-up areas are defined as continuous areas 10 acres or more that are used for nonfarm uses including housing, industrial, or commercial sites, sites for institutions or public buildings, small parks, cemeteries, airports, golf courses, sanitary landfills, sewage treatment plants, and water control structures.

On prime farmland, the moisture supply from precipitation or irrigation is adequate and dependable. The temperature and growing season are favorable, and the acidity or alkalinity of the soils is acceptable. There are few or no rocks. The soils are permeable to water and air. They are not excessively erodible or saturated with water for long periods and are not frequently flooded during the growing season. The slope ranges mainly from 0 to 8 percent.

Soils that have a seasonal perched water table, are subject to flooding, or are droughty may qualify as prime farmland if the limitations are overcome by drainage, flood control, or irrigation. Detailed information on the criteria for prime farmland can be obtained from the local office of the Soil Conservation Service.

In Stone county, about 45,530 acres, or about 12 percent of the county, is prime farmland. Such soils are scattered throughout the central and southern parts of Stone County on gently sloping mountaintops and plateaus, and some are on terraces that are parallel to the White River. These prime farmland soils are mainly in units 3 and 6 on the general soil map. Most of the acreage is used for pasture or hay. A small acreage is used for cultivated crops.

A recent trend in Stone County has been the conversion of some prime farmland to urban uses, especially around the city of Mountain View and along the White River. The loss of prime farmland puts pressure on marginal land, which generally is less productive because it is more erodible, droughty, and difficult to cultivate.

The following map units, or soils, make up prime farmland in Stone County.

6	Cleora fine sandy loam, occasionally flooded
14	Healing silt loam, 1 to 3 percent slopes
15	Linker fine sandy loam, 3 to 8 percent slopes
16	Linker gravelly fine sandy loam, 3 to 8 percent slopes
37	Portia fine sandy loam, 3 to 8 percent slopes
41	Samba silty clay loam, occasionally flooded
44	Spadra fine sandy loam, 1 to 3 percent slopes
46	Sturkie silt loam, 0 to 3 percent slopes

The location of each map unit is shown on the detailed soil maps at the back of this publication. The extent of each unit is given in table 8. The soil qualities that affect use and management are described in the section "Detailed soil map units." This list does not constitute a recommendation for a particular land use.

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; 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

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

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

About 44,788 acres in Stone County was used for crops and pasture in 1978, according to the Census of Agriculture. Of that acreage, about 9,110 acres was used for harvested crops and 35,678 acres was used for pasture or was idle. In addition, about 11,191 acres was in other improved and unimproved pasture. About 17,000 acres of wooded pasture was not included in the above total.

Most cleared land in the county is used for pasture and hay. The acreage of row crops is small. Areas of soils well suited to row crops are primarily on bottom lands and terraces along the White River and the Little Red River, or terraces above the flood plains along smaller streams, and on a few small, gently sloping upland areas. Crops suited to these areas are soybeans, corn, and small grains.

Some gently sloping to moderately sloping soils on uplands are moderately suited to well suited for drilled or sown crops, mainly oats, wheat, and grain sorghum.

Most soils in the county are poorly suited or not suited to intensive use for crops because of surface stoniness, slope, shallow depth to bedrock, high content of coarse fragments within the soil, or a combination of these limitations.

Contour farming, vegetated waterways, and terraces are needed on sloping soils used for tilled crops. Annual cover crops or grasses and legumes should be grown regularly in the cropping system if the hazard of erosion is severe or very severe.

If left without vegetative protection, most of the soils tend to pack and crust over after heavy rains. Growing cover crops and managing crop residue help to maintain good tilth. Crop residue should be shredded and spread evenly to provide a protective cover and add organic matter to the soil. Minimum tillage should be practiced to the extent practical for the soil conditions and the crop requirement.

In general, the soils on uplands in the county are low in nitrogen, potassium, phosphorus, calcium, and organic matter. The kinds and amounts of fertilizer applied are generally based on soil tests, crops to be grown, past

experience, capability of the soil to produce, and expected yields. On most soils, lime as indicated by soil tests helps most crops, and it is generally necessary for satisfactory production of such crops as alfalfa, white clover, red clover, vegetables, and other specialty crops.

Under good pasture management, proper grazing is essential for the production of high quality forage, stand survival, and erosion control. This helps plants maintain sufficient and generally vigorous topgrowth during the growing season. Management includes restricted grazing of tall fescue and other cool-season grasses during the hot, dry summer. Brush control is essential, and weed control is generally needed. Rotation grazing and renovation are also important management practices.

Pasture grasses respond well to nitrogen fertilizer. Grass and legume mixtures may require phosphate, potash, and lime at rates based on soil test results.

Small acreages are in commercial and home orchards and home gardens. Although the acreage and cash income from these enterprises are small, they are important. Most farm families and many urban families can and freeze homegrown fruit and vegetables for home use. Specialty crops, such as watermelons, strawberries, tomatoes, and sweet corn, are grown for cash sales at local farmers' markets.

Perennial grasses or mixtures of grasses and legumes are grown for pasture and hay. Mixtures generally consist of either a warm-season or a cool-season perennial grass and a suitable legume.

Tall fescue is the pasture grass most commonly grown in the area. It is a cool-season perennial propagated by seeding, generally in the fall. Common bermudagrass, improved bermudagrasses, and lovegrass are also grown. These are warm-season perennials that are propagated by either seeding or sprigging, generally in the spring. The bermudagrass is usually sprigged because stands started by seeding are more susceptible to winter-kill. Red clover and white clover are the most commonly grown legumes. Alfalfa is suited to the fertile, well drained Sturkie and Healing soils on bottom lands and terraces along the White River.

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 9. 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, animal manure, and green-manure crops; and harvesting that insures the smallest possible loss.

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

Crops other than those shown in table 9 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

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

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

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

Class I soils have 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 slight 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.

The capability classification of each map unit is given in the section "Detailed soil map units."

Woodland Management and Productivity

Kelly M. Koonce, forester, Soil Conservation Service, helped prepare this section.

Stone County was originally covered with a pine-hardwood forest. Clearing of the land by early settlers converted substantial areas to agronomic uses. However, changes in land use patterns during the late 1800's and early 1900's stimulated an increase in forest acreage. According to the Arkansas Forestry Commission, the trend of increasing woodland reached about 316,684 acres, or 81 percent of the county in 1981. Of this forested acreage, about 61,000 acres, or 16 percent, is in the Ozark National Forest; 14,789 acres, or 5 percent, is owned by the forest industry; and the remaining 230,898 acres, or 79 percent, is owned by private landowners.

Stands of commercial trees in the county vary in quality from good to poor. Generally the better stands are located on soils on bottom land and on north-facing slopes. Broadleaved tree species dominate the wooded areas. However, scattered stands of needleleaved species are throughout the county. Eastern redcedar is common on the shallow soils in the northern part of the county.

The economic impact of wood products in the county has increased since 1970. There are 14 small sawmills and 4 other wood-using plants in the county (*12*). A total of 371,000 cubic feet of forest products was harvested in 1977. These products include lumber, furniture stock, crossties, fenceposts, handles, and furniture. The county benefits significantly from the esthetic and recreational values of the forest (fig. 8). Other benefits of forests include habitat for wildlife and grazing for domestic animals as well as soil and water conservation.

Table 10 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the (woodland suitability) group for each soil. Soils assigned the same group require the same general management and have about the same potential productivity.

The first part of the *woodland suitability group*, 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; *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 slight or insignificant. If a soil has more than one limitation, the priority is as follows: x, w, c, s, f, and r. The third element in the symbol, a numeral, indicates the kind of trees for which the soils in the group are best suited and also indicates the severity of the hazard of limitation. The numerals 1, 2, and 3 indicate slight, moderate, and severe limitations, respectively, and suitability for needleleaved trees. The numerals 4, 5, and 6 indicate slight, moderate, and severe limitations, respectively, and suitability for broadleaved trees. The numerals 7, 8, and 9 indicate slight, moderate, and severe limitations, respectively, and suitability for both needleleaved and broadleaved trees.

In table 10, *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

Figure 8.—Beach along a small creek in an area of Estate-Portia-Moko association, steep, is among the recreation facilities in the county.

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 determined at age 30 years for eastern cottonwood, 35 years for American sycamore, and 50 years for all other species. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

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

Recreation

The soils of the survey area are rated in table 11 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 11, 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 11 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 14 and interpretations for dwellings without basements and for local roads and streets in table 13.

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.

The habitat for wildlife in Stone County is primarily forests and pastures in the Boston Mountains.

Plants of major importance to wildlife in the county include woolly croton, bush and annual lespedeza, sericea lespedeza, milk pea, panicgrasses, partridgepea, paspalums, ragweeds, tickclover, sumac, and vetch. Some overstory and understory woody plants of importance are pine, oak, hackberry, elderberry, grape, hickory, dogwood, blackberry, greenbrier, honeysuckle, persimmon, redcedar, black walnut, and wild cherry.

The hardwood forests, interspersed pastures, fencerows and numerous edges provide plentiful habitats for white-tailed deer, squirrels, raccoons, coyotes, opossums, foxes, wild turkeys, owls, hawks, bobwhite quail, nongame birds, small mammals, reptiles, and other wildlife.

In recent years, about 20,000 acres of low-grade forests has been killed by aerial spraying and planted to fescue. Increased sunlight entering these areas encourages the growth of a wide range of native herbaceous plants that create good habitat for deer, turkeys, bobwhite quail, rabbits, and other animals.

The wild turkey population has been increasing throughout the county; also the white-tailed deer population has been increasing. Bobwhite quail are abundant where suitable habitat exists, but squirrel populations throughout the county are generally low.

About 61,000 acres of Stone County is in the Ozark National Forest. The Forest Service manages the forest for multiple uses including wildlife habitat. The Sylamore Wildlife Management Area covers a part of the forest. This area is managed cooperatively by the Forest Service and the Arkansas Game and Fish Commission. These two agencies have created and maintained numerous food plots, small clearings, watering holes, and other measures that benefit a wide variety of wildlife.

Stone County has about 2,000 ponds that are used primarily for stock watering and sport fishing. They make up about 600 surface acres. Another 30 acres of ponds is devoted to commercial fish production.

About 137 miles of streams are available for fishing in the county. These include parts of the White River, nationally famous for its rainbow and brown trout fishing, the Little Red River, and Sylamore Creek. The Little Red River and Sylamore Creek have good smallmouth bass fishing. Other fishes, which are common in the county, include the largemouth bass, spotted bass, rock bass, channel catfish, bullheads, white crappie, green sunfish, bluegill, longear sunfish, and redear sunfish.

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

In table 12, the soils in Stone County are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or

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

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

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, grain sorghum, and soybeans.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, lovegrass, bermudagrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, cheatgrass, perennial lespedeza, goldenrod, and beggarweed.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, the available water capacity, and wetness. Examples of these plants are oak, cherry, sweetgum, apple, hawthorn, dogwood, hickory, and blackberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are Russian-olive, autumn-olive, and crabapple.

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

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

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

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

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include bobwhite quail, meadowlark, field sparrow, cottontail, and red fox.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, deer, and bear.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, mink, and beaver.

Engineering

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

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

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet.

Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

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

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

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

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

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

Building Site Development

Table 13 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

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

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

Sanitary Facilities

Table 14 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if

soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 14 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

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

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

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

Table 14 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock, flooding, large stones, and content of organic matter.

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

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

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

The ratings in table 14 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

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

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

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

Construction Materials

Table 15 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of

sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

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

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

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

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

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 15, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

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

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

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

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

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

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

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

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

Water Management

Table 16 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; and embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to

overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

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

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

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

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

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

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

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

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

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

Soil Properties

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

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics. These results are reported in table 20.

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

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

Engineering Index Properties

Table 17 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

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

Texture is given in the standard terms used by the U.S. Department of Agriculture (*9*). These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

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

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

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

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

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

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

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

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

Physical and Chemical Properties

Table 18 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

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

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

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

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

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

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

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

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

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

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value the more susceptible the soil is to sheet and rill erosion by water.

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

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

In table 18, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

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

Soil and Water Features

Table 19 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

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

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

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

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

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

Table 19 gives the frequency and duration of flooding and the time of year when flooding is most likely.

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

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

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

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 19 are the depth to the seasonal high water table; the kind of water table—that is, perched, and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 19. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. The numerals indicate the range in depth that water rises with the soil.

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

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

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

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

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

Engineering Index Test Data

Table 20 shows laboratory test data for a pedon sampled at a carefully selected site in the survey area. The pedon is typical of the series and is described in the section "Soil series and their morphology." The soil samples were tested by Arkansas State Highway Department.

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

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

Physical and Chemical Analyses of Selected Soils

The results of physical analysis of several typical pedons in the survey area are given in table 21 and the results of chemical analysis in table 22. The data are for soils sampled at carefully selected sites. The pedons are typical of the series and are described in the section "Soil series and their morphology." Soil samples were analyzed by the Univeristy of Arkansas, at Fayetteville.

Most determinations, except those for grain-size analysis and bulk density, were made on soil material smaller than 2 millimeters in diameter. Measurements reported as percent or quantity of unit weight were calculated on an oven-dry basis. The methods used in obtaining the data are indicated in the list that follows. Silt and clay particle size distribution was determined by hydrometer method (*4*). The codes in parentheses refer to published methods (*10*).

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

Organic matter—dry combustion (6A2b).

Extractable bases—ammonium acetate pH 7.0, uncorrected; calcium (6N2e), magnesium (602d), sodium (6P2b), potassium (6Q2b).

Extractable acidity—barium chloride-triethanolamine I (6H1a).

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

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

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*11*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 23 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

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

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Udult (*Ud*, meaning moist but not wet, plus *ult*, from Ultisol).

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

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

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the Soil Survey Manual (*9*). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (*11*). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

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

Brockwell Series

The Brockwell series consists of deep, well drained, moderately permeable soils that formed in loamy residuum of sandstone. These moderately sloping to moderately steep soils are on hilltops and hillsides of the Salem Plateau. The native vegetation is mixed upland hardwood and pine trees. Slopes are 8 to 20 percent.

Brockwell soils are geographically associated with Estate, Portia, and Ramsey soils. Estate soils are on hilltops and hillsides, have a fine control section, and are less than 60 inches deep to bedrock. Portia soils are on hilltops and foot slopes, have a fine-loamy control section, and have redder subsoil. Ramsey soils are on hilltops and hillsides, do not have an argillic horizon, and are less than 20 inches deep to bedrock.

Typical pedon of Brockwell sandy loam, 8 to 20 percent slopes, in a moist wooded area in the SW1/4SW1/4NE1/4 sec. 6, T. 16 N., R. 10 W.

A1—0 to 1 inch; dark grayish brown (10YR 4/2) sandy loam; moderate fine granular structure; friable; many fine and medium roots; common fine pores; 5 percent, by volume, sandstone stones 10 to 30 inches in diameter; strongly acid; abrupt smooth boundary.

A2—1 to 4 inches; pale brown (10YR 6/3) sandy loam; weak medium subangular blocky structure; friable; many fine and medium roots; common fine pores; 5 percent, by volume, sandstone gravel and cobbles; strongly acid; clear smooth boundary.

B1—4 to 10 inches; light yellowish brown (10YR 6/4) sandy loam; weak medium subangular blocky structure; friable; common fine and medium roots; common fine pores; 5 percent, by volume, sandstone gravel; strongly acid; clear smooth boundary.

B21t—10 to 27 inches; yellowish brown (10YR 5/6) sandy loam; moderate medium subangular blocky structure; friable; common fine and medium roots; common fine and medium pores; pockets of clean, light yellowish brown sand grains; 5 percent, by volume, sandstone gravel; very strongly acid; clear smooth boundary.

B22t—27 to 52 inches; strong brown (7.5YR 5/6) sandy clay loam; moderate medium subangular blocky structure; friable; thin discontinuous clay films on faces of peds; few fine roots; common fine pores; 10 percent, by volume, sandstone gravel and cobbles; very strongly acid; clear smooth boundary.

B23t—52 to 61 inches; strong brown (7.5YR 5/6) gravelly sandy clay loam; weak medium subangular blocky structure; friable; few thin discontinuous clay films on faces of peds; few fine roots; common fine pores; 30 percent, by volume, highly weathered sandstone gravel and cobbles; very strongly acid; abrupt smooth boundary.

R—61 inches; hard, level-bedded sandstone bedrock.

The solum is 60 to more than 80 inches thick. Reaction ranges from medium acid to very strongly acid throughout.

The A horizon is 3 to 16 inches thick. The A1 horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. Any A1 horizon that has value of 3 is less than 5 inches thick. In cultivated areas, the Ap horizon has hue of 10YR, value of 4 or 5, and chroma 2, 3, or 4. The A2 horizon has hue of 10YR, value of 5 or 6, and chroma of 3 or 4. Texture of the A horizon is fine sandy loam or sandy loam. The content of coarse fragments ranges from 0 to 10 percent, by volume.

The B1 horizon has hue of 10YR or 7.5YR, value of 4, 5, or 6, and chroma of 4 or 6. It is fine sandy loam, sandy loam, loam, and their gravelly analogs. The B2t horizon has hue of 10YR, value of 5 or 6, and chroma of 4 or 6, or it has hue of 7.5YR, value of 5, and chroma of 6. Texture is fine sandy loam, sandy loam, sandy clay loam, loam, or their gravelly analogs. The lower part of the B2t horizon is commonly mottled in shades of red and brown.

The B3 or C horizon, where present, has colors and textures similar to those of the B2t horizon. The content

of coarse fragments ranges from 0 to 35 percent, by volume, in the B or C horizon.

The R horizon is hard, level-bedded sandstone bedrock.

Ceda Series

The Ceda series consists of deep, well drained, rapidly permeable soils that formed in gravelly and loamy alluvium weathered from sandstone and shale. These level to nearly level soils are on flood plains of small streams. These soils are flooded at least once, for very brief periods, in most years. Slopes are 0 to 3 percent.

Ceda soils are geographically associated with Cleora, Enders, Mountainburg, Nella, Steprock, and Spadra soils. Cleora soils are on adjacent higher flood plains and low terraces and have a coarse-loamy control section and a mollic epipedon. Enders soils are on mountainsides and foot slopes and have an argillic horizon and a clayey control section. Steprock soils are on mountainsides and have an argillic horizon and a solum less than 40 inches thick. Mountainburg soils are on mountainsides, have an argillic horizon, and are less than 20 inches deep to bedrock. Nella soils are on mountainsides and foot slopes and have an argillic horizon and a fine-loamy control section. Spadra soils are on terraces and have a fine-loamy control section and an argillic horizon.

Typical pedon of Ceda gravelly fine sandy loam, frequently flooded, in a moist meadow in the SW1/4SE1/4SE1/4 sec. 27, T. 14 N., R. 9 W.

A1—0 to 13 inches; brown (10YR 4/3) gravelly fine sandy loam; moderate fine granular structure; friable; 30 percent, by volume, rounded sandstone gravel and cobbles; common fine and medium roots; many fine pores; slightly acid; gradual wavy boundary.

C1—13 to 24 inches; dark yellowish brown (10YR 4/4) very gravelly fine sandy loam; massive; friable; 70 percent, by volume, rounded sandstone gravel and cobbles; common medium roots; common pores; slightly acid; clear wavy boundary.

C2—24 to 48 inches; brown (7.5YR 4/4) very gravelly clay loam; massive; friable; 35 percent, by volume, rounded sandstone gravel and cobbles; common medium roots; slightly acid; clear wavy boundary.

C3—48 to 72 inches; strong brown (7.5YR 5/6) very gravelly clay loam; massive; friable; 70 percent, by volume, rounded sandstone gravel and cobbles; slightly acid.

Thickness of the loamy material ranges from 60 to 72 inches or more. Reaction is slightly acid or medium acid throughout.

The A horizon is 5 to 14 inches thick. It has hue of 10YR, value of 3, 4, or 5, and chroma of 2 or 3. Any A horizon that has value of 3 is less than 7 inches thick. The content of coarse fragments ranges from 15 to 35 percent, by volume.

The C horizon has hue of 10YR with value of 4 and chroma of 3 or 4 or with value of 5 and chroma of 4 or 6, or it has hue of 7.5YR with value of 4 and chroma of 4 or with value of 5 and chroma of 6. Texture is very gravelly loam, very gravelly fine sandy loam, or very gravelly clay loam. The content of coarse fragments ranges from 35 to 75 percent, by volume.

Clarksville Series

The Clarksville series consists of deep, somewhat excessively drained, moderately rapidly permeable, very cherty soils that formed in residuum of very cherty limestone. These are moderately sloping to very steep soils on ridges and hillsides of the Springfield Plateau. The native vegetation is mixed upland hardwoods and pines. Slopes are 8 to 50 percent.

Clarksville soils are geographically associated with the Elsah, Estate, Moko, Nixa, and Noark soils. Elsah soils are on narrow flood plains and do not have an argillic horizon. Estate soils are on lower hillsides, are less than 60 inches deep to bedrock, and have a fine control section. Moko soils are on lower hilltops and hillsides, are less than 20 inches to bedrock, and do not have an argillic horizon. Nixa soils are on ridges, are moderately well drained, and have a fragipan. Noark soils are on ridges and hillsides, are well drained, and have a clayey-skeletal control section.

Typical pedon of Clarksville very cherty silt loam, 20 to 50 percent slopes, in a wooded area in the SW1/4NE1/4SE1/4 sec. 24, T. 15 N., R. 11 W.

A1—0 to 2 inches; brown (10YR 4/3) very cherty silt loam; weak fine granular structure; friable; many fine and medium roots; few fine pores; 70 percent, by volume, chert fragments 1/2 inch to 4 inches in diameter; medium acid; clear smooth boundary.

A2—2 to 11 inches; grayish brown (10YR 5/2) very cherty silt loam; weak medium subangular blocky structure; friable; common fine and medium roots; few fine pores; 45 percent, by volume, chert fragments 1/2 inch to 4 inches in diameter; strongly acid; gradual smooth boundary.

B1—11 to 22 inches; light yellowish brown (10YR 6/4) very cherty silt loam; weak medium subangular blocky structure; friable; few fine and medium roots; common fine pores; 60 percent, by volume, chert fragments 1/2 inch to 4 inches in diameter; strongly acid; gradual smooth boundary.

B21t—22 to 40 inches; yellowish red (5YR 5/6) very cherty silty clay loam; moderate fine angular blocky structure; friable; common fine roots; common fine pores; 60 percent, by volume, chert fragments 1/2 inch to 4 inches in diameter; thin patchy clay films on faces of peds; strongly acid; gradual smooth boundary.

B22t—40 to 58 inches; red (2.5YR 4/6) very cherty silty clay loam; yellowish red (5YR 5/6) coatings on faces of peds; moderate fine angular blocky structure; firm; few fine roots; 60 percent, by volume, chert fragments 1/2 inch to 4 inches in diameter; thick continuous clay films on faces of peds; strongly acid; gradual smooth boundary.

B23t—58 to 78 inches; red (2.5YR 4/6) very cherty silty clay; yellowish red (5YR 5/6) coatings on faces of peds; moderate fine angular blocky structure; firm; 70 percent, by volume, chert fragments 1/2 inch to 4 inches in diameter; thick continuous clay films on faces of peds; strongly acid.

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

The A horizon is 7 to 18 inches thick. The A1 horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. Any A1 horizon that has value of 3 is less than 7 inches thick. The A2 horizon has hue of 10YR, value of 4, 5, or 6, and chroma of 2 or 3. The content of chert fragments ranges from 35 to 80 percent, by volume, in the A horizon.

The B1 horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 4 or 6. The B21t horizon has hue of 7.5YR or 5YR, value of 5, and chroma of 4 or 6. Texture is very cherty silt loam or very cherty silty clay loam. The B22t and B23t horizons have hue of 7.5YR, value of 5, and chroma of 4 or 6; or they have hue of 5YR or 2.5YR, value of 4 or 5, and chroma of 4 or 6. Texture is very cherty silt loam, very cherty silty clay loam, or very cherty silty clay. The content of chert fragments ranges from 50 to 90 percent, by volume, in the B horizon.

Cleora Series

The Cleora series consists of deep, well drained, moderately rapidly permeable soils that formed in loamy alluvium weathered from sandstone and shale. These level to nearly level soils are on flood plains and low terraces. These soils are flooded occasionally for brief periods late in winter or early in spring. Slopes are 0 to 3 percent.

Cleora soils are geographically associated with Ceda, Enders, Mountainburg, Nella, Spadra, and Steprock soils. Ceda soils are on lower flood plains and have a loamy-skeletal control section and a lighter colored surface layer. Enders soils are on mountainsides and foot slopes and have a clayey control section and an argillic horizon. Mountainburg soils are on mountainsides, are less than 20 inches deep to bedrock, and have an argillic horizon. Nella soils are on foot slopes and mountainsides and have a fine-loamy control section and an argillic horizon. Spadra soils are on higher terraces and have a fine-loamy control section and an argillic horizon. Steprock soils are on mountainsides and have an argillic horizon and a solum less than 40 inches thick.

Typical pedon of Cleora fine sandy loam, occasionally flooded, in a moist meadow in the SE1/4NW1/4NW1/4, sec. 26, T. 13 N., R. 13 W.

A1—0 to 13 inches; dark brown (10YR 3/3) fine sandy loam; weak fine granular structure; friable; many fine roots; common fine pores; medium acid; gradual smooth boundary.

AC—13 to 34 inches; brown (7.5YR 4/4) fine sandy loam; weak fine granular structure; friable; common fine roots; few fine pores; medium acid; gradual smooth boundary.

C—34 to 72 inches; brown (7.5YR 4/4) fine sandy loam; massive; friable; few thin strata of very dark grayish brown (10YR 3/2) loam; few fine pores; medium acid.

Thickness of the loamy sediment ranges from 60 to 72 inches or more. Reaction ranges from medium acid to neutral throughout.

The A horizon is 10 to 20 inches thick. It has hue of 10YR with value of 2 and chroma of 2 or with value of 3 and chroma of 2 or 3.

The AC horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4, or it has hue of 7.5YR, value of 4, and chroma of 4. Texture is fine sandy loam or loam.

The C horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4, or it has hue of 7.5YR, value of 4, and chroma of 4. Texture is fine sandy loam or loam. The C horizon has thin strata of finer textures.

Eden Series

The Eden series consists of shallow to moderately deep, well drained, slowly permeable soils that formed in residuum of interbedded calcareous shale and fossiliferous limestone. These moderately sloping to very steep soils are on mountainsides and foot slopes. The native vegetation is upland hardwoods and cedars. Slopes are 8 to 60 percent.

Eden soils are geographically associated with Newnata, Moko, Samba, and Summit soils. Moko soils are on mountainsides, are less than 20 inches deep to limestone bedrock, and do not have an argillic horizon. Newnata soils are on mountainsides and foot slopes and are 40 to 60 inches deep to hard limestone bedrock. Samba soils are in depressions and along drainageways, are poorly drained, and are more than 40 inches deep to bedrock. Summit soils are on foot slopes at lower elevations, are more than 40 inches deep to bedrock, and have a mollic epipedon.

Typical pedon of Eden flaggy silty clay loam, from an area of Eden-Moko association, very steep, in a wooded area in the NE1/4NE1/4NE1/4 sec. 20, T. 14 N., R. 10 W.

A1—0 to 4 inches; very dark grayish brown (10YR 3/2) flaggy silty clay loam; moderate fine granular structure; friable; 25 percent, by volume, flaggy limestone and fine fragments of shale; many fine roots; common fine pores; neutral; clear smooth boundary.

B21t—4 to 9 inches; brown (10YR 4/3) clay; moderate fine angular blocky structure; firm; thick continuous clay films on faces of peds; 10 percent, by volume, fine fragments of shale; common fine and medium roots; common fine pores; mildly alkaline; gradual smooth boundary.

B22t—9 to 20 inches; dark yellowish brown (10YR 4/4) very shaly clay; moderate fine angular blocky structure; firm; thick continuous clay films on faces of peds; 35 percent, by volume, fine fragments of shale and occasional limestone flagstones; common fine and medium roots; few fine pores; mildly alkaline; clear smooth boundary.

C1—20 to 28 inches; grayish brown (2.5Y 5/2) very shaly clay; massive; 70 percent, by volume, weathered fragments of shale; common fine roots; mildly alkaline; abrupt smooth boundary.

Cr—28 to 50 inches; very dark gray (10YR 3/1) soft, thin-bedded, highly fractured shale.

The solum is 14 to 40 inches thick. The depth to paralithic contact ranges from 20 to 40 inches. Reaction ranges from medium acid to mildly alkaline throughout.

The A horizon has hue of 10YR; value of 2, 3, or 4; and chroma of 2 or 3. Any A horizon that has value of 2 or 3 is less than 6 inches thick. The content of fragments of shale and limestone ranges from 5 to 25 percent, by volume. Texture is silty clay loam or flaggy silty clay loam.

The B horizon has hue of 10YR, value of 4 or 5, and chroma of 3, 4, or 6; or it has hue of 2.5Y, value of 4 or 5, and chroma of 4 or 6. Texture is silty clay or clay or their shaly or flaggy analogues. Olive to brown mottles are common in some places. The content of fragments of shale and limestone ranges from 10 to 35 percent, by volume.

The C horizon has hue of 2.5Y, value of 4 or 5, and chroma of 2 or 4. Texture is silty clay or clay or their very shaly or very flaggy analogs. The content of fragments of shale and limestone ranges from 35 to 75 percent, by volume.

The Cr horizon is black or gray, weathered, highly-fractured soft shale that has thin strata of fossiliferous limestone.

Elsah Series

The Elsah series consists of deep, somewhat excessively drained, moderately rapidly permeable soils that formed in cherty and loamy alluvium. These level to nearly level soils are on narrow flood plains of the Springfield Plateau. These soils are flooded at least once for very brief periods in most years. The native vegetation is bottom land hardwood trees. Slopes are 0 to 3 percent.

Elsah soils are geographically associated with Clarksville, Moko, Nixa, Noark, and Razort soils. Clarksville soils are on ridges and hillsides, have an argillic horizon, and have a solum more than 60 inches thick. Moko soils are on hilltops and hillsides, are less than 20 inches deep to bedrock, and have a mollic epipedon. Nixa soils are on ridges, are moderately well drained, and have a fragipan. Noark soils are on ridges and hillsides, have an argillic horizon, and have a clayey-skeletal control section. Razort soils are on flood plains, have an argillic horizon, and have a fine-loamy control section.

Typical pedon of Elsah cherty loam, frequently flooded, from a moist meadow in the NE1/4SW1/4NE1/4, sec. 20, T. 15 N., R. 11 W.

Ap—0 to 6 inches; dark brown (10YR 4/3) cherty loam; moderate fine granular structure; friable; 25 percent, by volume, rounded chert gravel; common fine roots; slightly acid; clear smooth boundary.

A12—6 to 13 inches; dark yellowish brown (10YR 4/4) cherty loam; weak medium subangular blocky; friable; 25 percent, by volume, rounded chert gravel; common fine roots; medium acid; clear smooth boundary.

C1—13 to 22 inches; dark brown (7.5YR 4/4) very cherty loam; massive; friable; 50 percent, by volume, rounded chert gravel; few fine roots; medium acid; clear smooth boundary.

C2—22 to 46 inches; dark yellowish brown (10YR 4/4) very cherty silt loam; massive; friable; 40 percent, by volume, rounded chert gravel; few fine roots; slightly acid; clear smooth boundary.
C3—46 to 63 inches; strong brown (7.5YR 5/6) very cherty loam; massive; friable; 60 percent, by volume, rounded chert gravel; medium acid.

Thickness of the loamy sediment ranges from 60 to 80 inches or more. Reaction ranges from medium acid to neutral throughout.

The A horizon is 6 to 18 inches thick. It has hue of 10YR, value of 3 or 4, and chroma of 2, 3, or 4. Any A horizon that has value of 3 is less than 10 inches thick. The content of fragments of chert ranges from 15 to 35 percent, by volume.

The C horizon has hue of 7.5YR, value of 4 or 5, and chroma of 4; or it has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. Texture is very cherty loam or very cherty silt loam. The content of fragments of chert ranges from 35 to 75 percent, by volume.

Enders Series

The Enders series consists of deep, well drained, very slowly permeable soils that formed in residuum and colluvium of acid shale or interbedded shale and sandstone. These gently sloping to steep soils are on upland crests, mountainsides, and foot slopes of the Boston Mountains. The native vegetation is upland hardwood trees. Slopes are 3 to 40 percent.

Enders soils are geographically associated with Ceda, Cleora, Linker, Mountainburg, Nella, Sidon, Spadra, and Steprock soils. Ceda soils are on flood plains, have a loamy-skeletal control section, and do not have an argillic horizon. Cleora soils are on flood plains and low terraces, have a coarse-loamy control section, and do not have an argillic horizon. Linker soils are on mountaintops and benches, have a fine-loamy control section, and are less than 40 inches deep to sandstone bedrock. Mountainburg soils are on mountaintops, benches, and in higher positions on mountainsides, have a loamy-skeletal control section, and are less than 20 inches deep to sandstone bedrock. Nella soils are on mountainsides and foot slopes, have a fine-loamy control section, and have a solum greater than 60 inches thick. Sidon soils are on mountaintops and benches, have a fragipan, and have a fine-loamy control section. Spadra soils are on terraces, have a fine-loamy control section, and have a solum greater than 60 inches thick. Steprock soils are in higher positions on mountainsides, have a loamy-skeletal control section, and a solum less than 40 inches thick over sandstone.

Typical pedon of Enders very stony sandy loam, 20 to 40 percent slopes, in a wooded area in the NW1/4NW1/4SE1/4 sec. 10, T. 14 N., R. 10 W.

A1—0 to 2 inches; dark grayish brown (10YR 4/2) very stony sandy loam; weak fine granular structure; friable; many fine roots; common fine pores; 35 percent, by volume, sandstone fragments 10 inches to 5 feet in diameter; strongly acid; abrupt smooth boundary.
A2—2 to 9 inches; yellowish brown (10YR 5/4) very stony sandy loam; weak medium subangular blocky structure; friable; common medium and fine roots; common medium pores; 35 percent, by volume, sandstone gravel, cobbles, and stone; very strongly acid; clear smooth boundary.
B21t—9 to 24 inches; red (2.5YR 4/6) clay; common medium distinct strong brown (7.5YR 5/6) mottles; strong fine angular blocky structure; firm; thick continuous clay films on faces of peds; common medium roots; few fine pores; 5 percent, by volume, soft sandstone gravel; very strongly acid; gradual smooth boundary.
B22t—24 to 35 inches; red (2.5YR 4/6) clay; many coarse prominent light brownish gray (10YR 6/2) mottles; strong fine angular blocky structure; firm; thick continuous clay films on faces of peds; common medium roots; 10 percent, by volume, soft, thin black fragments of shale; very strongly acid; gradual smooth boundary.
B3—35 to 48 inches; red (2.5YR 4/6) very shaly clay; common medium prominent light brownish gray (10YR 6/2) and common medium distinct yellowish red (5YR 5/6) mottles; moderate fine angular blocky structure; firm; thick continuous clay films on faces of peds; 50 percent, by volume, soft, thin black fragments of shale; extremely acid; abrupt smooth boundary.
Cr—48 to 60 inches; level-bedded, thin platy weathered yellowish red and black shale.

The solum is 32 to 59 inches thick. Depth to shale bedrock ranges from 40 to 62 inches or more. Reaction ranges from strongly acid to extremely acid throughout.

The A horizon is 4 to 10 inches thick. The A1 horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. Any A horizon that has value of 3 is less than 7 inches thick. Texture is gravelly fine sandy loam or very stony sandy loam. The A2 horizon has hue of 10YR, value of 5 or 6, and chroma of 3 or 4. In cultivated areas, the Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. Texture is gravelly fine sandy loam. The content of coarse fragments ranges from 15 to 50 percent, by volume.

The B1 horizon, where present, has hue of 7.5YR or 5YR, value of 5, and chroma of 6 or 8. The B2t horizon has hue of 5YR with value of 4 or 5 and chroma of 6 or with value of 5 and chroma of 8, or it has hue of 2.5YR, value of 4 or 5, and chroma of 6 or 8. The lower part of the B2t horizon is commonly mottled in shades of brown, red, or gray. Texture is silty clay or clay. The content of

fragments of sandstone or shale ranges from 0 to 15 percent, by volume. The B3 horizon has colors similar to those of the B2t horizon or is mottled in shades of brown, red, and gray. Texture is shaly or very shaly silty clay or clay. The content of fragments of sandstone and shale ranges from 15 to 50 percent, by volume.

The Cr horizon is yellow to black, extremely acid, weathered shale grading to hard shale bedrock.

Estate Series

The Estate series consists of deep, well drained, slowly permeable soils that formed in residuum of interbedded sandstone and limestone. These moderately sloping to very steep soils are on hilltops and hillsides of the Salem Plateau. The native vegetation is upland hardwoods and cedars. Slope ranges from 8 to 60 percent.

Estate soils are geographically associated with Brockwell, Clarksville, Moko, Nixa, Noark, Portia, and Ramsey soils. Brockwell soils are on hilltops and hillsides, have a coarse-loamy control section, and are more than 60 inches deep to bedrock. Clarksville soils are on ridges and hillsides at higher elevations, have a loamy-skeletal control section, and are more than 60 inches deep to bedrock. Moko soils are on hilltops and hillsides near limestone outcrops, are less than 20 inches deep to limestone bedrock, and do not have an argillic horizon. Nixa soils are on ridges in higher positions, have a loamy-skeletal control section, and have a fragipan. Noark soils are on hillsides and ridges at higher elevations, have a clayey-skeletal control section, and are more than 60 inches deep to bedrock. Portia soils are on foot slopes and hilltops, have a fine-loamy control section, and are more than 60 inches to bedrock. Ramsey soils are on hilltops and hillsides near outcrops of sandstone, are less than 20 inches deep to sandstone bedrock, and do not have an argillic horizon.

Typical pedon of Estate stony fine sandy loam, from an area of Estate-Portia-Moko association, rolling, in a wooded area in the NW1/4NW1/4SE1/4, sec. 21, T. 17 N., R. 11 W.

A1—0 to 3 inches; dark brown (10YR 4/3) stony fine sandy loam; moderate fine granular structure; friable; many fine roots; 20 percent, by volume, fragments of sandstone and limestone 1/2 inch to 3 feet in diameter; neutral; clear smooth boundary.

A2—3 to 6 inches; yellowish brown (10YR 5/4) stony fine sandy loam; weak medium subangular blocky structure; friable; common fine and medium pores; 15 percent, by volume, fragments of soft sandstone and limestone 1/2 inch to 15 inches in diameter; slightly acid; clear smooth boundary.

B1—6 to 10 inches; yellowish red (5YR 5/6) gravelly fine sandy loam; weak medium subangular blocky structure; friable; common medium roots; many fine and medium pores; 15 percent, by volume, soft sandstone gravel and cobbles 1/2 inch to 6 inches in diameter; strongly acid; clear smooth boundary.

B21t—10 to 28 inches; red (2.5YR 4/6) cobbly clay; moderate fine angular blocky structure; firm; thick continuous clay films on faces of peds; few fine and medium roots; few fine pores; few black stains; 20 percent, by volume, fragments of soft sandstone and limestone 1/2 inch to 10 inches in diameter; slightly acid; gradual smooth boundary.

B22t—28 to 46 inches; red (2.5YR 4/6) cobbly clay; moderate medium angular blocky structure; firm; thick continuous clay films on faces of peds; few fine roots; few fine pores; many black stains; 20 percent, by volume, fragments of soft sandstone and limestone 1/2 inch to 10 inches in diameter; slightly acid; gradual smooth boundary.

B23t—46 to 55 inches; red (2.5YR 4/6) cobbly clay loam; moderate medium angular blocky structure; firm; thick continuous clay films on faces of peds; few fine roots; few fine pores; many black stains; 20 percent, by volume, fragments of soft sandstone and limestone 1/2 inch to 10 inches in diameter; neutral; abrupt wavy boundary.

R—55 to 57 inches; hard, undulating limestone bedrock.

The solum is 40 to 60 inches thick. Depth to hard bedrock ranges from 40 to 72 inches. Reaction ranges from strongly acid to neutral in the A and B1 horizons and medium acid to neutral in the Bt horizon.

The A horizon is 5 to 11 inches thick. The A1 horizon has hue of 10YR; value of 3 or 4; and chroma of 2, 3, or 4. Any A1 horizon that has value of 3 is less than 7 inches thick. The A2 horizon has hue of 10YR; value of 4 or 5; and chroma of 2, 3 or 4. The content of coarse fragments ranges from 15 to 30 percent, by volume, in the A horizon.

The B1 horizon has hue of 7.5YR or 5YR with value of 4 and chroma of 6 or with value of 5 and chroma of 6 or 8. Texture is fine sandy loam, loam, sandy clay loam, or their gravelly analogs. The B2t horizon has hue of 5YR with value of 4 and chroma of 6 or with value of 5 and chroma of 6 or 8, or it has hue of 2.5YR, value of 4 or 5, and chroma of 6 or 8. Texture is clay, clay loam, sandy clay, or their gravelly or cobbly analogs. The content of coarse fragments ranges from 0 to 25 percent, by volume, in the B horizon.

The R layer is level-bedded to undulating, hard limestone or interbedded sandstone and limestone bedrock.

Healing Series

The Healing series consists of deep, well drained, moderately permeable soils that formed in silty alluvium. These nearly level soils are on low terraces along the White River. The native vegetation is mixed bottom land hardwood trees and bamboo cane. Slopes are 1 to 3 percent. These soils receive some protection from flooding by upstream dams, but flooding could occur under abnormal conditions.

Healing soils are geographically associated with Razort, Sturkie, and Wideman soils. Razort soils are on flood plains of smaller, intersecting streams and have a fine-loamy control section. Sturkie soils have a mollic epipedon greater than 25 inches thick but do not have an argillic horizon. Wideman soils are on natural levees and flood plains, have a sandy control section, and do not have an argillic horizon or mollic epipedon.

Typical pedon of Healing silt loam, 1 to 3 percent slopes, in a meadow in the NW1/4SW1/4SE1/4 sec. 1, T. 15 N., R. 11 W.

Ap—0 to 6 inches; dark brown (10YR 3/3) silt loam; moderate fine granular structure; friable; many fine roots; many fine pores; slightly acid; clear smooth boundary.

A12—6 to 12 inches; dark brown (10YR 3/3) silt loam; weak medium subangular blocky structure; friable; common fine roots; common fine pores; slightly acid; gradual smooth boundary.

B21t—12 to 29 inches; brown (7.5YR 4/4) silt loam; moderate medium subangular blocky structure; friable; few thin patchy clay films lining pores; few fine roots; common fine pores; medium acid; gradual smooth boundary.

B22t—29 to 58 inches; brown (7.5YR 4/4) silty clay loam; moderate medium subangular blocky structure; friable; few thin patchy clay films on faces of peds; few fine roots; common fine pores; medium acid; gradual smooth boundary.

B23t—58 to 76 inches; reddish brown (5YR 4/4) silt loam that has few fine faint pale brown mottles; moderate medium subangular blocky structure; friable; few thin patchy clay films on faces of peds; common fine pores; slightly acid.

The solum is 60 to 72 inches or more in thickness. Reaction is medium acid or slightly acid throughout.

The A horizon is 10 to 20 inches thick. It has hue of 10YR, value of 3, and chroma of 2 or 3; or hue of 7.5YR, value of 3, and chroma of 2. The content of gravel ranges from 0 to 5 percent, by volume.

The B21t horizon has hue of 10YR, value of 4, and chroma of 3 or 4; or it has hue of 7.5YR, value of 4, and chroma of 4. Texture is silt loam or silty clay loam. The content of gravel ranges from 0 to 5 percent, by volume. The B22t and B23t horizons have hue of 10YR, value of 4, and chroma of 3 or 4; or they have hue of 7.5YR or 5YR, value of 4, and chroma of 4. In places, the horizons are mottled in shades of brown. Texture of the B22t horizon is silt loam or silty clay loam. Texture of the B23t horizon is silt loam, silty clay loam, gravelly silt loam, or gravelly silty clay loam. The content of gravel ranges from 0 to 5 percent, by volume, in the B22t horizon and 0 to 25 percent, by volume, in the B23t horizon.

Linker Series

The Linker series consists of moderately deep, well drained, moderately permeable soils that formed in loamy residuum of acid sandstone bedrock. These gently sloping to moderately steep soils are on mountaintops and benches of the Boston Mountains. The native vegetation is mixed upland hardwood and pine trees. Slopes are 3 to 20 percent.

Linker soils are geographically associated with Enders, Mountainburg, and Sidon soils. Enders soils are on adjacent crests, mountainsides, and foot slopes, have a clayey control section, and are more than 40 inches deep to shale bedrock. Mountainburg soils are on mountaintops, mountainsides, and benches; have a loamy-skeletal control section; and are less than 20 inches deep to sandstone bedrock. Sidon soils are on mountaintops and benches, have a fragipan, and are more than 40 inches deep to sandstone bedrock.

Typical pedon of Linker fine sandy loam, 3 to 8 percent slopes, in a field in the NW1/4NE1/4SE1/4 sec. 2, T. 14 N., R. 11 W.

Ap—0 to 5 inches; brown (10YR 4/3) fine sandy loam; weak medium subangular blocky structure; friable; many fine roots; many fine pores; 5 percent, by volume, sandstone gravel; slightly acid; clear smooth boundary.

B1—5 to 10 inches; strong brown (7.5YR 5/6) fine sandy loam; weak medium subangular blocky structure; friable; common fine and medium roots; common fine pores; 5 percent, by volume, sandstone gravel; strongly acid; clear smooth boundary.

B21t—10 to 19 inches; yellowish red (5YR 5/8) sandy clay loam; moderate medium subangular blocky structure; friable; few fine and medium roots; common fine pores; 10 percent, by volume, sandstone gravel; few thin patchy clay films on faces of peds; strongly acid; gradual smooth boundary.

B22t—19 to 27 inches; yellowish red (5YR 5/8) sandy clay loam; common medium distinct red (2.5YR 4/6) mottles; moderate medium subangular blocky structure; friable; few medium roots; common fine pores; 10 percent, by volume, sandstone gravel; few thin patchy clay films on faces of peds; strongly acid; gradual smooth boundary.

B3—27 to 35 inches; yellowish red (5YR 5/8) loam; common medium distinct strong brown (7.5YR 5/6), brown (10YR 5/3), and red (2.5YR 4/6) mottles; moderate medium subangular blocky structure; friable; few fine pores; 10 percent, by volume, sandstone gravel; strongly acid; abrupt smooth boundary.
R—35 to 37 inches; hard, level-bedded acid sandstone bedrock.

The solum is 20 to 40 inches thick. Reaction ranges from strongly acid to extremely acid throughout except where the surface has been limed.

The Ap horizon is 4 to 7 inches thick. It 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. Some pedons have an A1 horizon 2 to 4 inches thick that has hue of 10YR; value of 3 or 4; and chroma of 2, 3, or 4. Texture is fine sandy loam or gravelly fine sandy loam. The content of sandstone gravel ranges from 0 to 25 percent, by volume.

The B1 horizon has hue of 5YR with value of 4 and chroma of 6 or with value of 5 and chroma of 6 or 8, or it has hue of 7.5YR, value of 5, and chroma of 6. Texture is fine sandy loam, sandy clay loam, or loam. The B2t horizon has hue of 5YR with value of 4 and chroma of 6 or with value of 5 and chroma of 6 or 8, or it has hue of 2.5YR, value of 4 or 5, and chroma of 6 or 8. Texture is sandy clay loam, clay loam, or loam. In some places, the lower part is mottled in shades of brown and red. The content of sandstone gravel in the B1 and B2t horizons ranges from 0 to 10 percent, by volume.

The B3 horizon has color and textures similar to those of the B2t horizon and has red, brown, and gray mottles. The content of coarse fragments of sandstone ranges from 0 to 25 percent, by volume.

The Cr horizon, where present, is red, brown, or gray weathered soft sandstone that is 1 to 6 inches thick.

The R horizon is hard, level-bedded, acid sandstone bedrock.

Moko Series

The Moko series consists of shallow, well drained, moderately permeable soils that formed in residuum of weathered dolomite or limestone. These moderately sloping to very steep soils are on hilltops, hillsides, and mountainsides. Slopes are 8 to 60 percent.

Moko soils are geographically associated with Clarksville, Eden, Estate, Newnata, Noark, Portia, Samba, and Summit soils. Clarksville soils are on ridges and hillsides at a higher elevation, are more than 20 inches deep to bedrock, and have an argillic horizon. Eden soils are on mountainsides and foot slopes, have an argillic horizon, and are 14 to 40 inches deep to weathered shale. Estate soils are more than 20 inches deep to bedrock and have an argillic horizon. Newnata soils are on mountainsides and foot slopes, have a fine control section, and are more than 20 inches deep to bedrock. Noark soils are on ridges and hillsides at a higher elevation, are more than 20 inches deep to bedrock, and have a clayey-skeletal control section. Portia soils are on lower foot slopes, are more than 20 inches deep to bedrock, and have a fine-loamy control section. Samba soils are in depressions and along drainageways, have a fine control section, and are more than 20 inches deep to bedrock. Summit soils are on foot slopes at a lower elevation, have a fine control section, and are more than 20 inches deep to bedrock.

Typical pedon of Moko very stony silt loam, from an area of Moko-Rock outcrop complex, 15 to 50 percent slopes, in a wooded area in the SE1/4SW1/4SE1/4, sec. 25, T. 16 N., R. 11 W.

A11—0 to 5 inches; black (10YR 2/1) very stony silt loam; moderate medium granular structure; friable; many fine roots; common fine pores; 50 percent, by volume, limestone cobbles and stones; neutral; clear smooth boundary.
A12—5 to 9 inches; very dark gray (10YR 3/1) very stony silt loam; weak medium subangular blocky structure; friable; common fine and medium roots; 60 percent, by volume, limestone cobbles and stones; neutral; abrupt smooth boundary.
R—9 to 12 inches; hard, level-bedded limestone bedrock that has more than 4 inches between vertical cracks.

Solum thickness and depth to bedrock range from 6 to 20 inches. Reaction is neutral or mildly alkaline throughout. The content of gravel ranges from 10 to 25 percent, by volume; and content of fragments of limestone that are greater than 3 inches in diameter ranges from 25 to 60 percent, by volume, throughout.

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

The R horizon is hard, level-bedded limestone or dolomite bedrock.

Mountainburg Series

The Mountainburg series consists of shallow, well drained, moderately rapidly permeable soils that formed in loamy residuum of acid sandstone. These gently sloping to very steep soils are on mountaintops, mountainsides, and benches of the Boston Mountains. The native vegetation is upland hardwood trees. Slopes are 3 to 60 percent.

Mountainburg soils are geographically associated with Ceda, Cleora, Enders, Linker, Nella, Sidon, and Steprock soils. Ceda soils are on flood plains, are more than 20 inches deep to bedrock, and do not have an argillic

horizon. Cleora soils are on flood plains and low terraces, are more than 20 inches deep to bedrock, and do not have an argillic horizon. Enders soils are on crests, mountainsides, and foot slopes, have a clayey control section, and are more than 20 inches deep to shale bedrock. Linker soils are on mountaintops and benches, have a fine-loamy control section, and are 20 to 40 inches deep to sandstone bedrock. Nella soils are on mountainsides and foot slopes, have a fine-loamy control section, and are deeper than 20 inches to bedrock. Sidon soils are on mountaintops and benches, have a fine-loamy control section, have a fragipan, and are more than 20 inches to sandstone bedrock. Steprock soils are on mountainsides, are 20 to 40 inches deep to weathered sandstone bedrock, and are moderately permeable.

Typical pedon of Mountainburg stony sandy loam, in an area of Linker-Mountainburg complex, 3 to 8 percent slopes, in a moist wooded area in the NE1/4SW1/4NW1/4 sec. 1, T. 14 N., R. 11 W.

A1—0 to 2 inches; very dark grayish brown (10YR 3/2) stony sandy loam; weak fine granular structure; friable; common medium and fine roots; 30 percent, by volume, sandstone stones 10 to 18 inches in diameter; strongly acid; clear smooth boundary.

A2—2 to 5 inches; yellowish brown (10YR 5/4) very gravelly sandy loam; weak medium subangular blocky structure; friable; common medium and fine roots; 50 percent, by volume, sandstone gravel and cobbles; strongly acid; clear smooth boundary.

B2t—5 to 13 inches; strong brown (7.5YR 5/6) very gravelly sandy loam; moderate medium subangular blocky structure; friable; few medium and fine roots; few thin patchy clay films on faces of peds; 35 percent, by volume, sandstone gravel and cobbles; very strongly acid; abrupt smooth boundary.

R—13 to 15 inches; hard, level-bedded acid sandstone bedrock.

Solum thickness and depth to bedrock range 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 B horizon.

The A horizon is 4 to 9 inches thick. The A1 horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. Any A horizon that has value of 3 is less than 7 inches thick. Texture of the A1 horizon is sandy loam, stony sandy loam, or very stony sandy loam. In cultivated areas, the Ap horizon has hue of 10YR with value of 4 or 5 and chroma of 3 or with value of 4 and chroma of 2. The A2 horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. The texture of the A2 horizon is sandy loam, fine sandy loam, or their very gravelly, stony, or very stony analogs. The content of coarse fragments ranges from 15 to 60 percent, by volume.

The Bt horizon has hue of 10YR or 7.5YR, value of 5, chroma of 6. Texture is very gravelly sandy clay loam, very gravelly loam, or very gravelly sandy loam. The content of coarse fragments ranges from 35 to 60 percent, by volume.

The R horizon is hard, level-bedded to undulating acid sandstone bedrock.

Nella Series

The Nella series consists of deep, well drained, moderately permeable soils formed in residuum and colluvium of acid sandstone and shale. These moderately sloping to very steep soils are on mountainsides and foot slopes of the Boston Mountains. The native vegetation is mixed upland hardwood trees. Slopes are 8 to 60 percent.

Nella soils are geographically associated with Ceda, Cleora, Enders, Mountainburg, Spadra, and Steprock soils. Ceda soils are on flood plains, have a loamy-skeletal control section, and do not have an argillic horizon. Cleora soils are on flood plains and low terraces, have a coarse-loamy control section, and do not have an argillic horizon. Enders soils are on mountainsides and foot slopes, have a clayey control section, and are less than 60 inches deep to shale bedrock. Mountainburg soils are on mountainsides, have a loamy-skeletal control section, and are less than 20 inches deep to bedrock. Spadra soils are on terraces and have a solum less than 60 inches thick. Steprock soils are on mountainsides, are 20 to 40 inches to bedrock, and have a loamy-skeletal control section.

Typical pedon of Nella stony sandy loam, from an area of Nella-Enders complex, 8 to 20 percent slopes, in a moist wooded area in the SW1/4NW1/4NW1/4 sec. 14, T. 13 N., R. 13 W.

A1—0 to 2 inches; dark grayish brown (10YR 4/2) stony sandy loam; moderate fine granular structure; friable; many fine roots; few fine pores; 25 percent, by volume, sandstone stones and cobbles; strongly acid; clear smooth boundary.

A2—2 to 8 inches; yellowish brown (10YR 5/4) gravelly sandy loam; weak medium subangular blocky structure; friable; common fine and medium roots; common fine pores; 30 percent, by volume, sandstone gravel and cobbles; strongly acid; clear smooth boundary.

B1—8 to 16 inches; strong brown (7.5YR 5/6) gravelly loam; weak medium subangular blocky structure; friable; common fine and medium roots; common fine pores; 30 percent, by volume, sandstone gravel and cobbles; strongly acid; gradual smooth boundary.

B21t—16 to 28 inches; yellowish red (5YR 5/6) gravelly sandy clay loam; weak medium subangular blocky structure; friable; few thin patchy clay films on faces of peds; common fine and medium pores; common fine pores; 25 percent, by volume, sandstone gravel; strongly acid; gradual smooth boundary.

B22t—28 to 50 inches; red (2.5YR 4/8) sandy clay loam; few fine distinct strong brown (7.5YR 5/6) mottles; moderate medium angular blocky structure; firm; thin continuous clay films on faces of peds; few fine roots; common fine pores; 10 percent, by volume, sandstone gravel; few black stains; strongly acid; gradual smooth boundary.

B23t—50 to 80 inches; red (2.5YR 4/8) clay loam; common medium distinct strong brown (7.5YR 5/6) and few fine distinct pale brown mottles; strong medium angular blocky structure; firm; thin continuous clay films on faces of peds; few fine roots; many fine and medium pores; 10 percent, by volume, sandstone gravel; few black stains; strongly acid.

The solum is 60 to more than 80 inches thick. Depth to bedrock is 6 feet or more. Reaction is very strongly acid or strongly acid throughout. The content of fragments of sandstone ranges from 10 to 35 percent, by volume, in all horizons.

The A horizon ranges from 6 to 11 inches thick. It has hue of 10YR, value of 4, and chroma of 2 or 3. 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. Texture is sandy loam or gravelly sandy loam.

The B1 horizon has hue of 7.5YR or 10YR, value of 5, and chroma of 6 or 8. It is loam, clay loam, or sandy clay loam or their gravelly analogs. The B2t horizon has hue of 5YR with value of 4 and chroma of 6 or with value of 5 and chroma of 6 or 8, or it has hue of 2.5YR, value of 4 or 5, and chroma of 6 or 8. The lower part is commonly mottled in shades of red, brown, and yellow. Texture is sandy clay loam, sandy clay, or clay loam, or their gravelly or cobbly analogs.

Newnata Series

The Newnata series consists of deep, well drained, slowly permeable soils that formed in residuum of interbedded limestone and calcareous shale. These gently sloping to steep soils are on foot slopes and mountainsides. The native vegetation was mixed upland hardwood trees. Slopes are 3 to 40 percent.

Newnata soils are geographically associated with Eden, Moko, Samba, and Summit soils. Eden soils are on mountainsides and foot slopes, and are less than 40 inches to shale bedrock. Moko soils are on hilltops and mountainsides, are less than 20 inches deep to limestone bedrock, and have a loamy-skeletal control section. Samba soils are in depressions and along drainageways, are poorly drained, and are more than 60 inches deep to bedrock. Summit soils are on foot slopes, have a mollic epipedon, and are more than 60 inches deep to bedrock.

Typical pedon of Newnata stony silt loam, from an area of Newnata-Eden-Moko association, steep, in a wooded area in the SE1/4SE1/4NE1/4 sec. 20, T. 14 N., R. 10 W.

A1—0 to 4 inches; very dark grayish brown (10YR 3/2) stony silt loam; moderate medium granular structure; friable; many fine and medium roots; many fine and medium pores; 25 percent, by volume, limestone fragments 1 inch to 20 inches in diameter and platy shale fragments 1 inch to 6 inches in diameter; slightly acid; clear wavy boundary.

B1—4 to 8 inches; dark yellowish brown (10YR 4/4) flaggy clay loam; moderate medium subangular blocky structure; firm; common fine and medium roots; common fine and medium pores; 15 percent, by volume, limestone and platy shale fragments 1 inch to 6 inches in diameter; medium acid; clear wavy boundary.

B21t—8 to 24 inches; strong brown (7.5YR 5/6) silty clay loam; moderate fine angular blocky structure; firm; few fine and medium roots; few fine pores; thick continuous clay films on faces of peds; 10 percent, by volume, platy shale and limestone fragments 1 to 6 inches in diameter; medium acid; gradual wavy boundary.

B22t—24 to 36 inches; strong brown (7.5YR 5/6) silty clay loam; few fine faint yellowish red and light yellowish brown mottles; moderate fine angular blocky structure; very firm; thick continuous clay films on faces of peds; few fine roots; few fine pores; 10 percent, by volume, platy shale and limestone fragments 1 to 6 inches in diameter; medium acid; gradual wavy boundary.

B23t—36 to 48 inches; strong brown (7.5YR 5/6) clay; common medium distinct pale brown (10YR 6/3) and yellowish brown (10YR 5/6) mottles; moderate fine angular blocky structure; very firm; thick continuous clay films on faces of peds; few fine pores; 10 percent, by volume, platy shale and limestone fragments 1 to 6 inches in diameter; few black stains; few fine black concretions; medium acid; abrupt wavy boundary.

Cr—48 to 51 inches; soft, weathered black (10YR 2/1) and gray (10YR 5/1) fractured interbedded platy shale and limestone; strong brown (7.5YR 5/6) and yellowish brown (10YR 5/4) clay in vertical fractures and 1/4- to 1/2-inch horizontal seams; medium acid; abrupt smooth boundary.

R—51 to 53 inches; gray, hard limestone bedrock.

Solum thickness and depth to hard bedrock range from 40 to 60 inches. Reaction ranges from strongly acid

to slightly acid in the A horizon and strongly acid to mildly alkaline in the B horizon.

The A horizon is 3 to 10 inches thick. It has hue of 10YR; value of 3, 4, or 5; and chroma of 2 or 3. Any A horizon that has value of 3 is less than 7 inches thick. Texture is silt loam or stony silt loam. The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 3 or 4. The A2 horizon, where present, has hue of 10YR; value of 5 or 6; and chroma of 2, 3, or 4. Texture is silt loam, gravelly silt loam, or flaggy silt loam. The content of coarse fragments ranges from 0 to 35 percent, by volume, in the A horizon.

The B1 horizon, where present, has hue of 10YR or 7.5YR, value of 5, and chroma of 4 or 6. Texture is silt loam, silty clay loam, or their gravelly or flaggy analogs. The content of coarse fragments ranges from 0 to 25 percent, by volume. The B2t horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 or 6. Texture is silty clay loam, silty clay, clay, or their gravelly, shaly, or flaggy analogs. The content of coarse fragments ranges from 0 to 20 percent, by volume. The B2t horizon has few to common mottles in shades of red or brown.

The Cr horizon, if present, is platy, soft shale that has clay or silty clay between plates. The soil material has the same colors and textures as those of the B2t horizon.

The R horizon is gray hard limestone or hard, fractured shale.

Nixa Series

The Nixa series consists of deep, moderately well drained, very slowly permeable, very cherty soils that formed in residuum of cherty limestone. These gently sloping to moderately steep soils are on ridges of the Springfield Plateau. The native vegetation was upland hardwood and pine trees. Slope ranges from 3 to 20 percent.

Nixa soils are geographically associated with Clarksville, Elsah, Estate, and Noark soils. Clarksville soils are on ridges and hillsides, are somewhat excessively drained, and do not have a fragipan. Elsah soils are on narrow flood plains, are excessively drained, and do not have a fragipan. Estate soils are on hillsides at a lower elevation, have a fine control section, do not have a fragipan, and are less than 60 inches deep to bedrock. Noark soils are on ridges and hillsides, have a clayey control section, and do not have a fragipan.

Typical pedon of Nixa very chery silt loam, 3 to 8 percent slopes, in a moist wooded area in the SE1/4NE1/4NW1/4 sec. 2, T. 15 N., R. 12 W.

A1—0 to 2 inches; dark brown (10YR 4/3) very cherty silt loam; moderate fine granular structure; friable; many fine and medium roots; few fine pores; 40 percent, by volume, chert fragments 1/4 inch to 4 inches in diameter; strongly acid; clear smooth boudary.

A2—2 to 8 inches; pale brown (10YR 6/3) very cherty silt loam; weak medium subangular blocky structure; friable; common fine and medium roots; few fine pores; 50 percent, by volume, chert fragments 1/4 inch to 4 inches in diameter; strongly acid; clear smooth boundary.

B1—8 to 15 inches; light yellowish brown (10YR 6/4) very cherty silt loam; weak medium subangular blocky structure; friable; few fine and medium roots; common fine pores; 60 percent, by volume, chert fragments 1 inch to 4 inches in diameter; strongly acid; gradual wavy boundary.

Bx1—15 to 22 inches; strong brown (7.5YR 5/6) very cherty silt loam; many medium distinct light yellowish brown (10YR 6/4) mottles; moderate fine subangular blocky structure; firm and brittle; 70 percent, by volume, chert fragments 1 inch to 6 inches in diameter; many fine pores; strongly acid; gradual wavy boundary.

Bx2—22 to 38 inches; mottled, strong brown (7.5YR 5/6), yellowish brown (10YR 5/4), and pale brown (10YR 6/3) very cherty silt loam; strong fine subangular blocky structure; firm and brittle; 70 percent, by volume, chert fragments 1 inch to 6 inches in diameter; common fine pores; thin patchy clay films on faces of peds and on chert fragments; very strongly acid; gradual wavy boundary.

B21t—38 to 48 inches; mottled, red (2.5YR 5/8), dark red (2.5YR 3/6), light brownish gray (10YR 6/2), and strong brown (7.5YR 5/8) very cherty silty clay; moderate medium angular blocky structure; firm; 60 percent, by volume, chert fragments 1 inch to 4 inches in diameter; thin continuous clay films on faces of peds; very strongly acid; gradual smooth boundary.

B22t—48 to 78 inches; dark red (2.5YR 3/6) very cherty silty clay; many medium distinct strong brown (7.5YR 5/8) and common medium prominent light brownish gray (10YR 6/2) mottles; moderate medium angular blocky structure; firm; 50 percent, by volume, chert fragments 1 inch to 4 inches in diameter; thin continuous clay films on faces of peds; very strongly acid.

Depth to the fragipan is 14 to 24 inches. Depth to consolidated bedrock is more than 60 inches. Reaction is strongly acid or very strongly acid throughout.

The A horizon is 5 to 13 inches thick. The A1 horizon has hue of 10YR, value of 3 or 4, and chroma of 2. Any A1 horizon that has value of 3 is less than 7 inches thick. The A2 horizon has hue of 10YR, value of 5 or 6, and chroma of 3 or 4. In cultivated areas the Ap 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 chert fragments ranges from 35 to 70 percent, by volume.

The B1 horizon has hue of 10YR, value of 5 or 6, and chroma of 4 or 6. Texture is very cherty silt loam, very

cherty loam, or very cherty silty clay loam. The content of chert fragments ranges from 35 to 75 percent, by volume.

The A'2 horizon, where present, has hue of 10YR, value of 5 or 6, and chroma of 2 or 3.

The Bx horizon has hue of 10YR, value of 5, and chroma of 4 or 6; or it has hue of 7.5YR, value of 5, and chroma of 4 or 6; or it is mottled in shades of brown, gray, or red. Texture is very cherty silt loam or very cherty silty clay loam. The content of chert fragments ranges from 40 to 75 percent, by volume.

The B2t horizon has hue of 2.5YR with value of 3 and chroma of 6 or with value of 4 or 5 and chroma of 4, 6, or 8; or it has hue of 5YR with value of 4 and chroma of 4 or 6 or with value of 5 and chroma of 4, 6, or 8; or it is mottled in shades of red, brown, and gray. Texture is very cherty silty clay or very cherty silty clay loam. The content of chert fragments ranges from 50 to 85 percent, by volume.

Noark Series

The Noark series consists of deep, well drained, moderately permeable soils that formed in residuum of weathered cherty limestone bedrock. These gently sloping to steep soils are on hillsides and ridges of the Springfield Plateau. The native vegetation is upland hardwood and pine trees. Slope ranges from 3 to 40 percent.

Noark soils are geographically associated with Clarksville, Elsah, Estate, Moko, and Nixa soils. Clarksville soils are on ridges and hillsides, are somewhat excessively drained, and have a loamy-skeletal control section. Elsah soils are on narrow flood plains, have a loamy-skeletal control section, and do not have an argillic horizon. Estate soils are on hillsides at a lower elevation, have a clayey control section, and are less than 60 inches deep to bedrock. Moko soils are on lower hillsides and ridges, are less than 20 inches deep to bedrock, and have a loamy-skeletal control section. Nixa soils are on ridges and have a loamy-skeletal control section and a fragipan.

Typical pedon of Noark very cherty silt loam, 8 to 20 percent slopes, in a moist upland hardwood forest in the NE1/4NW1/4SW1/4 sec. 6, T. 15 N., R. 11 W.

A1—0 to 4 inches; dark grayish brown (10YR 4/2) very cherty silt loam; weak fine subangular blocky structure; friable; many fine and medium roots; few fine pores; 50 percent, by volume, chert fragments 1/2 inch to 3 inches in diameter; medium acid; clear smooth boundary.

A2—4 to 12 inches; pale brown (10YR 6/3) very cherty silt loam; weak medium subangular blocky structure; friable; common fine and medium roots; common fine pores; 60 percent, by volume, chert fragments 1/2 inch to 3 inches in diameter; strongly acid; gradual smooth boundary.

B1—12 to 16 inches; yellowish red (5YR 5/6) very cherty silty clay loam; moderate fine subangular blocky structure; friable; common fine roots; thin patchy clay films on faces of peds; few fine pores; 35 percent, by volume, chert fragments 1/2 inch to 3 inches in diameter; strongly acid; gradual wavy boundary.

B21t—16 to 24 inches; red (2.5YR 4/6) very cherty silty clay; moderate fine angular blocky structure; firm; common fine roots; thin continuous clay films on faces of peds; 60 percent, by volume, chert fragments 1/2 inch to 5 inches in diameter; very strongly acid; gradual wavy boundary.

B22t—24 to 36 inches; dark red (2.5YR 3/6) very cherty silty clay; few medium distinct strong brown (7.5YR 5/6) and few fine prominent light brownish gray mottles; moderate medium angular blocky structure; firm; few fine roots; thin continuous clay films on faces of peds; 50 percent, by volume, chert fragments 1/2 inch to 6 inches in diameter; very strongly acid; gradual wavy boundary.

B23t—36 to 78 inches; red (2.5YR 4/6) very cherty silty clay; common medium prominent light brownish gray (10YR 6/2), common medium distinct strong brown (7.5YR 5/6), and common medium faint reddish yellow (5YR 6/8) mottles; strong medium angular blocky structure; firm; few fine roots; thick continuous clay films on faces of peds; 50 percent, by volume, chert fragments 1/2 inch to 6 inches in diameter; very strongly acid.

The solum is 60 to 80 inches or more in thickness. Reaction ranges from strongly acid to slightly acid in the A horizon and is very strongly acid or strongly acid in the B horizon.

The A horizon is 7 to 18 inches thick. The A1 horizon has hue of 10YR; value of 3 or 4; and chroma of 2, 3, or 4. Any A1 horizon that has value of 3 is less than 7 inches thick. The A2 horizon has hue of 10YR, value of 5 or 6, and chroma of 3. In cultivated areas, the Ap horizon has hue of 10YR, value of 4, and chroma of 3 or 4. The content of chert fragments ranges from 35 to 70 percent in the A horizon.

The B1 horizon has hue of 5YR, value of 4 or 5, and chroma of 6, or hue of 7.5YR or 10YR, value of 5, and chroma of 6. Texture is very cherty silt loam or very cherty silty clay loam. The B2t horizon has hue of 2.5YR with value of 4 and chroma of 6 or 8, with value of 5 and chroma of 6, or with value of 3 and chroma of 6; or it has hue of 5YR, value of 4, and chroma of 6. Texture is very cherty clay or very cherty silty clay. In some places

the B2t horizon has mottles in shades of gray and brown. The content of chert fragments ranges from 35 to 70 percent in the B21t horizon, and 50 to 80 percent in the B22t and B23t horizons.

Portia Series

The Portia series consists of deep, well drained, moderately permeable soils that formed in loamy residuum or colluvium of interbedded sandstone and limestone. These gently sloping to steep soils are on foot slopes and hilltops of the Salem Plateau. The native vegetation is mixed upland hardwood and pine trees. Slope ranges from 3 to 30 percent.

Portia soils are geographically associated with Brockwell, Estate, Moko, and Ramsey soils. Brockwell soils are on hilltops and hillsides and have a coarse-loamy control section and a yellowish brown subsoil. Estate soils are on hillsides, are less than 60 inches to bedrock, and have a fine control section. Moko soils are on hillsides, are less than 20 inches to limestone bedrock, and have a loamy-skeletal control section. Ramsey soils are on hillsides and hilltops, are less than 20 inches deep to sandstone bedrock, and do not have an argillic horizon.

Typical pedon of Portia fine sandy loam, 3 to 8 percent slopes, in a wooded area in the SW1/4SE1/4NW1/2 sec. 11, T. 15 N., R. 11 W.

Ap—0 to 7 inches; brown (10YR 4/3) fine sandy loam; weak medium subangular blocky structure; friable; common fine roots; common fine pores; 5 percent, by volume, sandstone gravel; slightly acid; clear smooth boundary.

B1—7 to 13 inches; yellowish red (5YR 4/6) fine sandy loam; weak medium subangular blocky structure; friable; common fine roots; common fine pores; 10 percent, by volume, sandstone gravel; slightly acid; clear smooth boundary.

B21t—13 to 27 inches; red (2.5YR 4/6) sandy clay loam; moderate medium subangular blocky structure; friable; few thin patchy clay films on faces of peds; common fine roots; common fine pores; 10 percent, by volume, sandstone gravel; medium acid; gradual smooth boundary.

B22t—27 to 42 inches; red (2.5YR 4/6) sandy clay loam that has pockets and seams of clean sand grains; moderate medium subangular blocky structure; firm; thin continuous clay films on faces of peds; common fine pores; 10 percent, by volume, sandstone gravel; medium acid; gradual smooth boundary.

B23t—42 to 56 inches; red (2.5YR 4/8) sandy clay that has pockets and seams of clean sand grains; moderate medium subangular blocky structure; firm; thin continuous clay films on faces of peds; common fine pores; 10 percent, by volume, sandstone gravel; strongly acid; gradual smooth boundary.

B24t—56 to 78 inches; red (2.5YR 4/8) sandy clay loam that has pockets and seams of clean sand grains; moderate medium subangular blocky structure; firm; thin patchy clay films on faces of peds; common fine pores; 10 percent, by volume, sandstone gravel; strongly acid.

The solum is 60 to 80 inches or more in thickness. Reaction ranges from strongly acid to slightly acid in the A horizon, very strongly acid to medium acid in the B1, B21t, and B22t horizons, and strongly acid or medium acid in the B23t and B24t horizons. The content of coarse fragments ranges from 0 to 10 percent, by volume, throughout.

The A horizon is 3 to 16 inches thick. The A1 horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. Any A horizon that has value of 3 is less than 6 inches thick. In some places, an A2 horizon is present that has hue of 10YR, value of 5, and chroma of 3 or 4. In cultivated areas, the Ap horizon has hue of 10YR; value of 4; and chroma of 2, 3, or 4.

The B1 horizon has hue of 5YR, value of 4 or 5, and chroma of 4 or 6, or it has hue of 7.5YR with value of 4 and chroma of 4 or with value of 5 and chroma of 4, 6, or 8. Texture is fine sandy loam or loam. The B21t horizon has hue of 5YR with value of 4 and chroma of 6 or with value of 5 and chroma of 6 or 8, or it has hue of 2.5YR, value of 4 or 5, and chroma of 6 or 8. Texture is sandy clay loam or loam. The B22t horizon has hue of 5YR with value of 4 and chroma of 6 or with value of 5 and chroma of 6 or 8, or it has hue of 2.5YR, value of 4 or 5, and chroma of 6 or 8. Texture is sandy clay loam, clay loam, or sandy clay. Mottles are in shades of brown. The B23t and B24t horizons have hue of 5YR or 2.5YR, value of 4, and chroma of 6 or 8. Mottles are in shades of brown. Texture is sandy clay loam, clay loam, or sandy clay.

Ramsey Series

The Ramsey series consists of shallow, somewhat excessively drained, rapidly permeable soils that formed in residuum of sandstone. These gently sloping to moderately steep soils are on hilltops and hillsides of the Salem Plateau. Slopes are 3 to 20 percent.

Ramsey soils are geographically associated with Brockwell, Estate, and Portia soils. Brockwell soils are on hilltops and hillsides, have an argillic horizon, and are more than 20 inches deep to bedrock. Estate soils are on hilltops and hillsides, have an argillic horizon, and are more than 20 inches deep to bedrock. Portia soils are on hilltops and hillsides, have an argillic horizon, and are more than 20 inches deep to bedrock.

Typical pedon of Ramsey stony fine sandy loam, in an area of Ramsey-Rock outcrop complex, 3 to 20 percent slopes, in a wooded area in the NE1/4SW1/4NW1/4 sec. 8, T. 16 N., R. 10 W.

A1—0 to 2 inches; very dark grayish brown (10YR 3/2) stony fine sandy loam; weak fine granular structure; friable; 15 percent, by volume, sandstone stones up to 3 feet in diameter; strongly acid; clear smooth boundary.
A2—2 to 5 inches; brown (10YR 4/3) stony fine sandy loam; weak medium subangular blocky structure; friable; 15 percent, by volume, sandstone stones and cobbles 6 to 18 inches in diameter; very strongly acid; clear smooth boundary.
B—5 to 12 inches; yellowish brown (10YR 5/4) fine sandy loam; weak medium subangular blocky structure; friable; 5 percent, by volume, sandstone gravel and cobbles 6 to 18 inches in diameter; very strongly acid; abrupt smooth boundary.
R—12 to 15 inches; hard, level-bedded sandstone bedrock.

Solum thickness and depth to bedrock range from 7 to 20 inches. Reaction is strongly acid or very strongly acid throughout.

The A horizon is 3 to 6 inches thick. 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 with value of 4 and chroma of 2 or 3 or with value of 5 and chroma of 3 or 4. Texture of the A2 horizon is stony sandy loam or stony fine sandy loam. The content of coarse fragments ranges from 15 to 30 percent, by volume, in the A horizon.

The B horizon has hue of 10YR with value of 4 and chroma of 4 or with value of 5 and chroma of 4 or 6, or it has hue of 7.5YR, value of 5, and chroma of 6. Texture is sandy loam, fine sandy loam, gravelly sandy loam, or gravelly fine sandy loam. The content of coarse fragments ranges from 5 to 35 percent, by volume.

The R horizon is hard, acid sandstone bedrock.

Razort Series

The Razort series consists of deep, well drained, moderately permeable soils that formed in loamy alluvium. These level to nearly level soils are on flood plains. The native vegetation is bottom land hardwood trees and bamboo cane. These soils are flooded at least once for a very brief period in most years. Slopes are 0 to 3 percent.

Razort soils are geographically associated with Elsah, Healing, Sturkie, and Wideman soils. Elsah soils are on flood plains, are cherty throughout, have a loamy-skeletal control section, and do not have an argillic horizon. Healing soils are on terraces of larger streams and have a fine-silty control section. Sturkie soils are on terraces of larger streams, have a fine-silty control section, and do not have an argillic horizon. Wideman soils are on natural levees and flood plains of large streams, have a sandy control section, and do not have an argillic horizon.

Typical pedon of Razort silt loam, frequently flooded, in a pasture in the NW1/4SE1/4SW1/4 sec. 4, T. 14 N., R. 10 W.

Ap—0 to 8 inches; dark brown (10YR 3/3) silt loam; moderate granular structure; friable; common fine roots; common fine pores; 5 percent, by volume, fine chert gravel; slightly acid; abrupt smooth boundary.
B21t—8 to 24 inches; dark brown (10YR 3/3) silt loam; moderate medium subangular blocky structure; friable; few fine roots; common fine pores; few thin patchy clay films on faces of peds; 5 percent, by volume, fine chert gravel; slightly acid; gradual smooth boundary.
B22t—24 to 39 inches; dark brown (10YR 3/3) loam; moderate medium subangular blocky structure; friable; common fine pores; few thin patchy clay films on faces of peds; 5 percent, by volume, fine chert gravel; slightly acid; clear smooth boundary.
B23t—39 to 49 inches; brown (10YR 4/3) gravelly clay loam; moderate medium subangular blocky structure; friable; few fine pores; 15 percent, by volume, fine chert and sandstone gravel; common thin patchy clay films on faces of peds; slightly acid; clear smooth boundary.
C—49 to 60 inches; brown (10YR 4/3) very gravelly silt loam; massive; 70 percent, by volume, chert gravel; neutral.

The solum is 40 to 60 inches thick. Reaction is slightly acid or neutral in the A horizon and medium acid or slightly acid in the B horizon. The content of gravel ranges from 0 to 25 percent, by volume, in the solum.

The A horizon ranges from 6 to 10 inches thick. It has hue of 10YR, value of 3, and chroma of 3 or 4. Texture is silt loam or fine sandy loam.

The B1 horizon, where present, has hue of 10YR, value of 3 or 4, and chroma of 3 or 4. Texture is loam, silt loam, or their gravelly analogs. The B2t horizon has hue of 10YR, value of 3 or 4, and chroma of 3 or 4, or it has hue of 7.5YR, value of 4, and chroma of 4. Texture is silt loam, loam, or clay loam, or their gravelly analogs.

The underlying C horizon is stratified loamy, sandy, and gravelly material.

Samba Series

The Samba series consists of deep, poorly drained, very slowly permeable soils that formed in silty and clayey alluvium. These level soils are in depressions and along drainageways. Slopes are 0 to 1 percent. These soils are occasionally flooded for brief periods in winter and early in spring. A perched high water table is present late in winter and spring.

Samba soils are geographically associated with Eden, Moko, Newnata, and Summit soils. Eden soils are on

foot slopes and mountainsides, are well drained, and are less than 40 inches deep to shale bedrock. Moko soils are on mountainsides, are less than 20 inches deep to limestone bedrock, and have a loamy-skeletal control section. Newnata soils are on foot slopes and mountainsides, are well drained, and are less than 60 inches deep to bedrock. Summit soils are on foot slopes, are moderately well drained, and are slowly permeable.

Typical pedon of Samba silty clay loam, occasionally flooded, in a pasture in the SE1/4NW1/4NE1/4 sec. 27, T. 14 N., R. 11 W.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) silty clay loam; moderate medium granular structure; friable; 5 percent, by volume, sandstone gravel; medium acid; abrupt smooth boundary.

A12—7 to 19 inches; very dark gray (10YR 3/1) silty clay loam; moderate medium subangular blocky structure; firm; 5 percent, by volume, sandstone gravel and few fragments of shale; slightly acid; clear smooth boundary.

B21tg—19 to 46 inches; grayish brown (10YR 5/2) clay; common medium distinct yellowish brown (10YR 5/8) mottles; moderate coarse subangular blocky structure; firm; thick continuous clay films on faces of peds; 5 percent, by volume, sandstone gravel; common black masses; slightly acid; clear smooth boundary.

B22tg—46 to 55 inches; gray (10YR 5/1) clay; many medium prominent yellowish brown (10YR 5/8) mottles; moderate coarse subangular blocky structure; firm; thick continuous clay films on faces of peds; a few sandstone pebbles; common black masses; slightly acid; gradual smooth boundary.

Cg—55 to 65 inches; gray (10YR 5/1) silty clay; many medium prominent yellowish brown (10YR 5/8) mottles; massive; common black masses; slightly acid.

The solum is 50 to 72 inches or more in thickness. Depth to bedrock is more than 72 inches. Reaction is slightly acid or medium acid in the A horizon and ranges from medium acid to neutral in the B and C horizons. The content of gravel ranges from 2 to 5 percent, by volume, throughout.

The A horizon is 8 to 20 inches thick. The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2.

The Btg horizon has hue of 10YR, value of 4 or 5, and chroma of 1 or 2, or it has hue of 2.5Y, value of 5 or 6, and chroma of 2. It is mottled in shades of brown, yellowish brown, or yellowish red. Texture is silty clay loam, silty clay, or clay.

The Cg horizon, where present, has colors and textures similar to those of the Btg horizon.

Sidon Series

The Sidon series consists of deep, moderately well drained, slowly permeable soils that formed in loamy residuum of interbedded sandstone and shale. These gently sloping soils are on mountaintops and benches of the Boston Mountains. The native vegetation is mixed upland hardwood trees. Slopes are 3 to 8 percent. Root development and penetration are restricted by a fragipan at a depth of 20 to 36 inches. A perched high water table is often formed above the fragipan during the winter and early in spring.

Sidon soils are geographically associated with Enders, Linker, and Mountainburg soils. Enders soils are on crests, mountainsides, and foot slopes; have a clayey control section; and do not have a fragipan. Linker soils are on mountaintops and benches, are 20 to 40 inches deep to sandstone bedrock, and do not have a fragipan. Mountainburg soils are on mountaintops, mountainsides, and benches; are less than 20 inches deep to sandstone bedrock; have a loamy-skeletal control section; and do not have a fragipan.

Typical pedon of Sidon fine sandy loam, 3 to 8 percent slopes, in a field in the NE1/4SE1/4SE1/4 sec. 7, T. 14 N., R. 10 W.

Ap—0 to 6 inches; dark yellowish brown (10YR 4/4) fine sandy loam; weak medium subangular blocky structure; friable; common fine roots; few fine pores; slightly acid; abrupt smooth boundary.

B21t—6 to 17 inches; strong brown (7.5YR 5/6) silty clay loam; moderate medium subangular blocky structure; friable; few thin patchy clay films on faces of peds; few fine roots; common fine pores; very strongly acid; clear smooth boundary.

B22t—17 to 23 inches; yellowish brown (10YR 5/8) silty clay loam; few fine distinct yellowish red mottles; moderate medium subangular blocky structure; friable; few thin patchy clay films on faces of peds; few fine roots; common fine pores; very strongly acid; clear smooth boundary.

Bx1—23 to 34 inches; strong brown (7.5YR 5/8) loam; many medium distinct light yellowish brown (10YR 6/4) and many medium prominent light brownish gray (10YR 6/2) mottles; strong medium subangular blocky structure; firm and brittle; many thin patchy clay films on faces of peds; 5 percent, by volume, soft sandstone gravel; many fine pores; very strongly acid; gradual smooth boundary.

Bx2—34 to 48 inches; mottled, light brownish gray (10YR 6/2), strong brown (7.5YR 5/8), and yellowish brown (10YR 5/6) loam; strong medium subangular blocky structure; firm and brittle; many thin patchy clay films on faces of peds; 5 percent, by volume, soft sandstone gravel; many fine pores; very strongly acid; clear smooth boundary.

B3—48 to 57 inches; mottled, light brownish gray (10YR 6/2), strong brown (7.5YR 5/8), and red (2.5YR 4/6) clay loam; moderate medium subangular blocky structure; firm; thin continuous clay films on faces of peds; 5 percent, by volume, soft sandstone gravel; many fine pores; very strongly acid; abrupt smooth boundary.
R—57 inches; hard, level-bedded, acid sandstone bedrock.

The solum and depth to bedrock ranges from 40 to 60 inches or more. Depth to the fragipan ranges from 20 to 36 inches. Reaction is strongly acid or very strongly acid throughout except where the surface layer has been limed.

The Ap horizon ranges from 4 to 7 inches in thickness. It has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. Texture is fine sandy loam or gravelly fine sandy loam. The content of sandstone gravel ranges from 0 to 25 percent, by volume.

The B2t horizon has hue of 10YR or 7.5YR, value of 5, and chroma of 6 or 8. Texture is silty clay loam, loam, clay loam, or their gravelly analogs. The content of sandstone gravel ranges from 0 to 25 percent, by volume. The Bx horizon has hue of 10YR or 7.5YR, value of 5, and chroma of 6 or 8, and mottles in shades of gray, brown, and red. Texture is silty clay loam, loam, clay loam, or their gravelly analogs. The content of sandstone gravel ranges from 0 to 35 percent, by volume. The B3 horizon has colors similar to those of the Bx horizon. Texture is loam, clay loam, or their gravelly or very gravelly analogs. The content of sandstone gravel ranges from 0 to 45 percent, by volume.

The Cr horizon, where present, is highly weathered soft sandstone that has sandy soil material mottled in shades of red, brown, and gray that fills the cracks and crevices between the rock fragments. The Cr horizon ranges from 1 to 4 inches thick.

The R horizon is hard, level-bedded acid sandstone bedrock.

Spadra Series

The Spadra series consists of deep, well drained, moderately permeable soils that formed in loamy alluvium. These nearly level soils are on stream terraces in the Boston Mountains. Slopes are 1 to 3 percent. These soils could be flooded under abnormal conditions.

Spadra soils are geographically associated with Ceda, Cleora, Enders, and Nella soils. Ceda soils are on flood plains, have a loamy-skeletal control section, and do not have an argillic horizon. Cleora soils are on lower terraces and flood plains, have a coarse-loamy control section, and do not have an argillic horizon. Nella soils are on mountainsides and foot slopes, and have a solum more than 60 inches thick. Enders soils are on mountainsides and foot slopes, have a clayey control section, and are less than 60 inches deep to shale bedrock.

Typical pedon of Spadra fine sandy loam, 1 to 3 percent slopes, in a moist meadow in the SE1/4NE1/4NW1/4 sec. 34, T. 14 N., R. 11 W.

Ap—0 to 8 inches; dark yellowish brown (10YR 4/4) fine sandy loam; weak fine granular structure; friable; common fine roots; few fine pores; 10 percent, by volume, sandstone gravel; medium acid; abrupt smooth boundary.
B21t—8 to 16 inches; yellowish red (5YR 5/6) loam; weak medium subangular blocky structure; friable; few thin discontinuous clay films on faces of peds; few fine roots; few fine pores; 5 percent, by volume, sandstone gravel; strongly acid; clear smooth boundary.
B22t—16 to 29 inches; yellowish red (5YR 5/6) sandy clay loam; moderate medium subangular blocky structure; friable; few thin discontinuous clay films on faces of peds; few fine roots; few fine pores; 5 percent, by volume, sandstone gravel; strongly acid; gradual smooth boundary.
B3—29 to 46 inches; yellowish red (5YR 4/6) loam; common medium faint strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; firm; common fine pores; 5 percent, by volume, sandstone gravel; strongly acid; clear smooth boundary.
C—46 to 72 inches; brown (7.5YR 4/4) gravelly sandy loam; massive; 20 percent, by volume; sandstone gravel and cobbles; very strongly acid.

The solum is 40 to 60 inches thick. Bedrock is more than 72 inches deep. Reaction ranges from medium acid to very strongly acid throughout.

The A horizon is 5 to 10 inches thick. The A horizon has hue of 10YR with value of 3 or 4 and chroma of 4 or with value of 4 and chroma of 2 or 3; or it has hue of 7.5YR, value of 4, and chroma of 4. The content of sandstone gravel ranges from 0 to 10 percent, by volume.

The B2t horizon has a hue of 5YR with value of 4 or 5 and chroma of 4 or 6 or with value of 3 and chroma of 4; or it has hue of 7.5YR, value of 4, and chroma of 4. In places, this horizon has mottles in shades of yellow or brown. Texture is loam or sandy clay loam. The content of sandstone gravel ranges from 0 to 5 percent, by volume.

The B3 and C horizons have hue of 7.5YR or 5YR, value of 4, and chroma of 4 or 6; or they have hue of 10YR, value of 4 or 5, and chroma of 3 or 4. Texture is loam, sandy loam, fine sandy loam, or their gravelly analogs. The content of sandstone gravel ranges from 0 to 20 percent, by volume.

Steprock Series

The Steprock series consists of moderately deep, well drained, moderately permeable soils that formed in loamy residuum and colluvium of interbedded sandstone, siltstone, and shale. These moderately sloping to very steep soils are on mountainsides of the Boston Mountains. The native vegetation is upland hardwood trees. Slopes are 8 to 60 percent.

Steprock soils are geographically asssociated with Ceda, Cleora, Enders, Nella, and Mountainburg soils. Ceda soils are on narrow flood plains, have sediment more than 60 inches thick, and do not have an argillic horizon. Cleora soils are on flood plains and low terraces, have a coarse-loamy control section, and do not have an argillic horizon. Enders soils have a clayey control section and are more than 40 inches deep to shale bedrock. Nella soils are on mountainsides and foot slopes, have a fine-loamy control section, and are more than 60 inches deep to hard bedrock. Mountainburg soils are on mountaintops, benches, and mountainsides; are less than 20 inches deep to hard sandstone bedrock; and are moderately rapidly permeable.

Typical pedon of Steprock very stony sandy loam, from an area of Steprock-Nella-Mountainburg complex, 40 to 60 percent slopes, in a wooded area in the SE1/4NW1/4SE1/4 sec. 14, T. 13 N., R. 12 W.

A1—0 to 3 inches; brown (10YR 4/3) very stony sandy loam; weak medium granular structure; friable; 50 percent, by volume, sandstone gravel and cobbles; common fine roots; strongly acid; clear smooth boundary.

A2—3 to 11 inches; light yellowish brown (10YR 6/4) very gravelly sandy loam; weak medium subangular blocky structure; friable; 35 percent, by volume, sandstone gravel and flaggy cobbles; common medium roots; strongly acid; gradual smooth boundary.

B1—11 to 17 inches; strong brown (7.5YR 5/6) very gravelly sandy loam; weak medium subangular blocky structure; friable; common medium roots; 40 percent, by volume, sandstone gravel and flaggy cobbles; very strongly acid; gradual smooth boundary.

B21t—17 to 28 inches; yellowish red (5YR 5/6) very gravelly loam; few fine faint strong brown mottles; moderate medium subangular blocky structure; friable; few thin patchy clay films on faces of peds; 50 percent, by volume, sandstone gravel and flaggy cobbles; common medium roots; very strongly acid; gradual smooth boundary.

B3—28 to 35 inches; yellowish red (5YR 5/6) very gravelly sandy loam; few fine faint strong brown mottles; weak medium subangular blocky structure; friable; 70 percent, by volume, sandstone gravel and cobbles; common medium roots; very strongly acid; clear smooth boundary.

Cr—35 to 60 inches; thin-bedded, soft sandstone that has yellowish red (5YR 5/6) and strong brown (7.5YR 5/6) sandy loam between beds.

Solum thickness and depth to the Cr horizon range from 20 to 40 inches. Reaction is strongly acid or very strongly acid throughout. The content of coarse fragments ranges from 35 to 50 percent, by volume, in the A horizon and 35 to 75 percent in the B horizon.

The A horizon is 3 to 12 inches thick. The A1 horizon has hue of 10YR; value of 3, 4, or 5; and chroma of 2 or 3. If the A horizon is less than 7 inches thick, value is 3. The A2 horizon has hue of 10YR, value of 5 or 6, and chroma of 3 or 4.

The B1 horizon, where present, has hue of 7.5YR or 5YR, value of 5, and chroma of 6 or 8. Texture is very gravelly sandy loam or very gravelly loam. The B2t horizon has hue of 5YR with value of 4 and chroma of 6 or with value of 5 and chroma of 6 or 8; or it has hue of 7.5YR, value of 5, and chroma of 6 or 8 that has none to few mottles in shades of brown. Texture is very gravelly loam, very gravelly clay loam, or very gravelly sandy clay loam. The B3 horizon has colors similar to those of the B2t horizon. Texture is very gravelly sandy loam or very gravelly loam.

The Cr horizon is partly weathered sandstone or siltstone that has horizontal cleavage planes less than 3 inches apart.

Depth to unweathered bedrock is 4 feet or more.

Sturkie Series

The Sturkie series consists of deep, well drained, moderately permeable soils that developed in silty alluvium. These level to nearly level soils are on low terraces along the White River. The native vegetation is bottom land hardwood trees and bamboo cane. Slopes are 0 to 3 percent. These soils receive some protection from flooding by upstream dams, but flooding could occur under abnormal conditions.

Sturkie soils are geographically associated with Healing, Razort, and Wideman soils. Healing soils are on low terraces, have a mollic epipedon less than 25 inches thick, and have an argillic horizon. Razort soils are on flood plains of smaller, intersecting streams; have a fine-loamy control section; and an argillic horizon. Wideman soils are on natural levees and flood plains, have a sandy control section, and do not have an argillic horizon or mollic epipedon.

Typical pedon of Sturkie silt loam, 0 to 3 percent slopes, in a meadow in the SW1/4SW1/4SE1/4 sec. 1, T. 15 N., R. 11 W.

Ap—0 to 6 inches; dark brown (10YR 3/3) silt loam; weak medium granular structure; friable; many fine roots; many fine pores; neutral; abrupt smooth boundary.
A12—6 to 28 inches; very dark grayish brown (10YR 3/2) silt loam; moderate fine subangular blocky structure; friable; common fine roots; common fine pores; neutral; gradual smooth boundary.
B21—28 to 56 inches; dark brown (10YR 3/3) silt loam; moderate fine subangular blocky structure; friable; common fine pores; neutral; gradual smooth boundary.
B22—56 to 85 inches; dark brown (10YR 3/3) silt loam; common streaks and irregular pockets of brown (7.5YR 4/4) silt loam; moderate fine subangular blocky structure; friable; common fine pores; neutral.

The solum is 50 to 80 inches thick. Reaction is slightly acid or neutral in the A horizon and ranges from slightly acid to moderately alkaline in the B and C horizons. Mollic colors extend to a depth of 25 to 50 inches or more.

The A horizon is 10 to 35 inches thick. It has hue of 10YR with value of 2 and chroma of 2 or with value of 3 and chroma of 2 or 3; or it has hue of 7.5YR, value of 3, and chroma of 2. The content of gravel ranges from 0 to 5 percent, by volume.

The B horizon has hue of 10YR, value of 3 or 4, and chroma of 3 or 4; or it has hue of 7.5YR, value of 4, and chroma of 4. Texture is silt loam or silty clay loam. The content of gravel ranges from 0 to 5 percent, by volume.

The C horizon, where present, has colors similar to those of the B horizon. In some places, this horizon has mottles in shades of yellow or brown. Texture is silt loam, loam, or sandy loam. The content of gravel ranges from 0 to 10 percent, by volume.

Summit Series

The Summit series consists of deep, moderately well drained, slowly permeable soils that formed in clayey residuum of calcareous shale. These gently sloping to moderately sloping soils are on foot slopes. Slopes are 3 to 12 percent.

Summit soils are geographically associated with Eden, Moko, Newnata, and Samba soils. Eden soils are on mountainsides and foot slopes, do not have a mollic epipedon, and are less than 40 inches deep to weathered shale bedrock. Moko soils are on upper mountainsides, have a loamy-skeletal control section, and are less than 20 inches deep to limestone bedrock. Newnata soils are on mountainsides and foot slopes, are less than 60 inches deep to limestone bedrock, and do not have a mollic epipedon. Samba soils are in depressions and on flood plains, are poorly drained, and are very slowly permeable.

Typical pedon of Summit silty clay loam, 3 to 8 percent slopes, in a field in the NW1/4NE1/4NE1/4 sec. 20, T. 14 N., R. 10 W.

Ap—0 to 5 inches; very dark grayish brown (10YR 3/2) silty clay loam; strong medium granular structure; firm; many fine roots; common fine pores; slightly acid; clear smooth boundary.
A12—5 to 10 inches; very dark gray (10YR 3/1) silty clay loam; moderate medium granular structure; firm; common fine roots; common fine pores; slightly acid; clear smooth boundary.
B21t—10 to 28 inches; very dark grayish brown (10YR 3/2) clay; few fine faint dark brown mottles; strong coarse angular blocky structure; firm; continuous thick clay films; common fine and medium roots; many fine pores; common slickensides that do not intersect; medium acid; gradual smooth boundary.
B22t—28 to 50 inches; dark grayish brown (2.5Y 4/2) clay; many coarse distinct olive brown (2.5Y 4/4) mottles; strong coarse angular blocky structure; firm; continuous thick clay films; common slickensides that do not intersect; few fine roots; few fine pores; 2 percent thin, black platy shale fragments; few fine gold and black concretions; few soft, white calcium carbonate masses; neutral; gradual smooth boundary.
B3—50 to 58 inches; olive brown (2.5Y 4/4) silty clay; many coarse distinct dark gray (10YR 4/1) mottles; moderate medium angular blocky structure; firm; common slickensides that do not intersect; common soft, white calcium carbonate mosses; 10 percent, by volume, thin, black platy shale fragments; mildly alkaline; gradual smooth boundary.
C—58 to 76 inches; dark gray (10YR 4/1) silty clay; common medium prominent yellowish brown (10YR 5/8) and common medium distinct olive brown (2.5Y 4/4) mottles; massive; firm; 10 percent, by volume, soft, thin, black platy shale fragments; mildly alkaline.

The solum is 50 to more than 60 inches thick. Depth to shale bedrock is more than 60 inches. Reaction ranges from medium acid to neutral in the A horizon and upper B horizon and from slightly acid to moderately alkaline in the lower B and C horizons. The content of coarse fragments, mainly shale, ranges from 0 to 10 percent, by volume, throughout.

The A horizon is 8 to 16 inches thick. It has hue of 10YR, value of 2 or 3, and chroma of 1 or 2.

The B1 horizon, where present, has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. Texture is silty clay loam or silty clay. The B2t and B3 horizons have hue of 10YR, value of 3 or 4, and chroma of 1, 2, 3, or 4; or they have hue of 2.5Y with value of 3 and chroma of

4 or with value of 4 and chroma of 2 or 4. They are mottled in shades of red, brown, or gray. Texture is silty clay or clay.

The C horizon is massive silty clay or clay. It is mottled in shades of red, gray, and brown.

The Summit soils in this survey are considered taxadjuncts to the Summit series. They have the morphology within the concept of the series, however, Stone County is considerably east of the area where these soils are usually located. There is no difference in use, management, or behavior.

Wideman Series

The Wideman series consists of deep, excessively drained, moderately rapidly permeable soils that formed in sandy alluvium. These level to nearly level soils are on natural levees and flood plains along the White River. The native vegetation is bottom land hardwood trees. Slopes are 0 to 3 percent. These soils receive some protection from flooding by upstream dams, but flooding could occur under abnormal conditions.

Wideman soils are geographically associated with Healing, Razort, and Sturkie soils. Healing soils are on low terraces, have a mollic epipedon, an argillic horizon, and a fine-silty control section. Razort soils are on flood plains of smaller, intersecting streams, have a fine-loamy control section, and an argillic horizon. Sturkie soils are on low terraces, have a mollic epipedon, and a fine-silty control section.

Typical pedon of Wideman fine sandy loam, 0 to 3 percent slopes, in a meadow in the NE1/4SE1/4SW1/4 sec. 32, T. 15 N., R. 8 W.

Ap—0 to 5 inches; brown (10YR 4/3) fine sandy loam; weak fine granular structure; very friable; many fine roots; medium acid; abrupt smooth boundary.

A12—5 to 14 inches; brown (10YR 4/3) fine sandy loam; weak medium subangular blocky structure; very friable; few fine roots; few streaks of yellowish brown (10YR 5/4) fine sandy loam; medium acid; clear smooth boundary.

C1—14 to 30 inches; dark yellowish brown (10YR 4/4) loamy fine sand; single grained; very friable; slightly roots; slightly acid; clear smooth boundary.

C2—30 to 34 inches; dark yellowish brown (10YR 5/4) loamy fine sandy; single grained; very friable; slightly acid; abrupt smooth boundary.

C3—34 to 49 inches; yellowish brown (10YR 5/4) loamy fine sand; single grained; very friable; slightly acid; clear smooth boundary.

C4—49 to 85 inches; dark yellowish brown (10YR 4/4) fine sandy loam; massive; very friable; pockets and streaks of light yellowish brown (10YR 6/4) sand; slightly acid.

The sandy sediment is 60 to 80 inches or more in thickness. Reaction is strongly acid or medium acid in the surface layer and ranges from medium acid to neutral in the B and C horizons.

The A1 horizon has hue of 10YR; value of 3, 4 or 5; and chroma of 2, 3, or 4. Any A horizon that has value of 3 is less than 7 inches thick. The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4.

The C horizon has hue of 10YR; value of 4, 5, 6, or 7; and chroma of 2, 3, or 4; or it has hue of 7.5YR; value of 4, 5, or 6; and chroma of 4, 5, or 6. Texture is dominantly loamy sand, loamy fine sand, or fine sand that has thin strata of loamy very fine sand or finer textures. In places in the lower part of the C horizon, the content of coarse fragments, dominantly lenses of gravel, range from 0 to 20 percent, by volume.

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 horizon differentiation are described.

Factors of Soil Formation

Soil is the collection of three-dimensional natural bodies on the earth's surface. Soil supports plants and has properties resulting from the integrated effect of climate and living matter acting on parent material, as conditioned by relief, over time.

The interaction of five main factors results in differences between 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 kinds of plants and organisms living in the soils, the relief of the land and its effect on runoff, and the length of time it took the soil to form.

The influence of any factor can vary from place to place, but the interaction of all factors determines the kind of soil that forms. In the following paragraphs the factors of soil formation are discussed as they relate to the soils in Stone County.

Parent Material

The soils of Stone County formed in material of weathered, consolidated bedrock of the Ordovician through Pennsylvanian Periods of the Paleozoic Era (*3, 7*).

Stone County lies within the Salem, Springfield, and Boston Mountain Plateaus of the Ozark Plateau Province. The Salem Plateau is the oldest, lowest in elevation, and northernmost of the three surfaces. It roughly parallels the White River to its junction with Sylamore Creek. The Springfield Plateau is intermediate in age and elevation. It lies south of the Salem Plateau. The Boston Mountain Plateau is the youngest and highest in elevation of the surfaces. It covers the southern part of Stone County.

The St. Peter Sandstone and Everton Formation of Middle Ordovician age is exposed over most of the Salem Plateau. A few small areas of Powell, Cotter, and Jefferson City Dolomites of Lower Ordovician age are exposed along the White River in the extreme northern part of the county (*5*).

The Everton Formation consists of brownish gray sandy crystalline dolomite in the lower part. This grades into fine- to medium-grained sandstone. The upper Everton consists of sandy oolitic limestone that grades laterally into sandy dolomite. St. Peter Sandstone overlies the Everton Formation. It consists of massive upper and lower fine- to medium-grained sandstone units that have fine-grained sandstone interbedded with greenish gray shale and dolomite between them. Plattin Limestone, Fernvale Limestone, Cason Shale, and St. Clair Limestone of the Upper Ordovician and Silurian Periods form discontinuous wedges between outcrops of the St. Peter Sandstone and the Boone Formation (*6*). In outcrops above the St. Peter Sandstone and below the Boone Formation, one or more of these formations are exposed. Brockwell, Estate, Moko, Portia, and Ramsey soils formed in residuum from these formations.

The Boone Formation of the Mississippian Periods caps the uplands and ridges through the central part of Stone County. This formation forms the Springfield Plateau, which is highly eroded and dissected. The Boone Formation consists of three distinct lithologic units. The basal unit is a fine- to coarse-grained sandstone that ranges from a few inches to a few feet thick. The middle unit, the St. Joe Limestone Member, consists of very finely crystalline limestone. The upper unit, which is the thickest, is interbedded light gray medium-crystalline fossiliferous limestone and medium gray to brownish gray chert. The amount of chert varies 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 areas.

Ruddell Shale outcrops above the Boone Formation. This is capped by Batesville Sandstone. This coarse-grained, cream-colored to brown sandstone forms a bench paralleling the north escarpment of the Boston Mountains. The city of Mountain View is located on this bench. Linker, Mountainburg, and Sidon soils formed in these areas.

Fayetteville Shale and Pitkin Limestone are exposed on the north escarpment of the Boston Mountains. Fayetteville Shale consists of dark gray shale and dark gray microcrystalline petroliferous limestone. Pitkin Limestone consists of medium gray limestone that has thin beds of dark gray limy shale. This unit contains small quantities of dark gray chert. Eden, Moko, Newnata, and Summit soils formed in these areas.

The Hale Formation is exposed in most of the Boston Mountains Plateau in the southern part of Stone County. This formation is made up of the Cane Hill Member, Bloyd Shale, and the Prairie Grove Member. These members consist mainly of fine- to coarse-grained sandstones and shales. Enders, Nella, and Steprock soils formed in these areas.

Sediment deposited by the White River, Little Red River, Sylamore Creek, and numerous smaller streams is the parent material of soils on terraces and flood plains. This alluvium is a mixture of material derived from many different kinds of soil, rock, and unconsolidated material. It was transported by water from uplands in Stone County and from counties to the west and north. Sturkie, Razort, Healing, Ceda, Cleora, Wideman, and Spadra soils formed in this material.

Climate

The climate in Stone County is characterized by relatively cool winters, warm to hot summers, and fairly abundant rainfall. The present climate probably is similar to the climate under which the soils formed. The average daily maximum temperature is 91° F in July, and 46° in January. Annual rainfall is about 48 inches and is generally well distributed throughout the year. For additional information about the climate, refer to the section "General nature of the survey area."

The warm, moist climate in the survey area promotes rapid soil formation and encourages rapid chemical reactions. The large amount of water that moves through the soil is instrumental in moving dissolved or suspended materials downward in the soil profile. Plant remains decompose rapidly, and the organic acid that forms hastens the removal of carbonates and the formation of clay. Because the soil is frozen only to a shallow depth and for a relatively short period, soil formation continues almost the year round. The climate throughout the survey area is relatively uniform, but its effect is modified locally by elevation and slope aspect. Climate alone does not account for differences in the soils in the survey area.

Living Organisms

Plants and animals, including insects, bacteria, and fungi, are important in the formation of soils. Among the changes they cause are gains in organic matter and nitrogen in the soil, gains or losses in plant nutrients, and changes in structure and porosity.

Before Stone County was settled, the native vegetation had more influence on soil formation than did animal activity. Forests consisting of stands of hardwood trees or mixed hardwoods and shortleaf pine covered most of the survey area.

Scattered across the northern part of the county on the uplands are shallow soils that overlie limestone, dolomite, or sandstone. These soils supported savannas. The vegetation on these savannas was eastern redcedar or mixed eastern redcedar and hardwoods. Grasses grew tall in openings between the trees. Ramsey and Moko soils are dominant in these areas. These soils have a surface layer that has been darkened to a depth of several inches by the accumulation of organic matter.

The native vegetation on most of the gently sloping to very steep, dissected uplands was upland oaks and hickory in mixed stands with shortleaf pine. The soils in these areas have a significant accumulation of organic matter and are dark colored only in the uppermost few inches. Brockwell, Enders, Estate, Linker, Nella, Nixa, and Noark soils formed on these uplands. They differ mainly in parent material, relief, age, and degree of weathering.

In the alluvial areas, the native vegetation was mainly hardwood trees, such as cottonwood, sycamore, elm, black walnut, ash, oak, and hickory. The understory vegetation was mainly cane, vines, and briers. Sturkie, Healing, Cleora, and Wideman soils formed in these areas.

Variations in native vegetation in the county are related partly to variations in the available water capacity and in the surface and internal drainage of the soils. Slope aspect and soil fertility cause minor variations.

Only the major differences in the original vegetation are reflected to any extent in the characteristics of the soils.

Man is important to the future rate and direction of soil formation. He clears the forest, cultivates the land, and introduces new kinds of plants. He applies fertilizer, organic residue, lime, and chemicals for insect, disease, and weed control. He builds dams for flood control, he cuts and fills and grades and compacts the soil surface, and he covers the surface with structures and pavements. Some of the results of these actions will not become known for many centuries. Nevertheless, the way that other living organisms affect soil formation in the county has been drastically changed by man.

Relief

The relief in Stone County is the result of the uplift of Paleozoic rocks and the subsequent erosion and entrenchment of streams and drainage channels into the land surface. The highest point in Stone County, Strand Knob, which is about 1 mile south of Alco, is about 1,840 feet above sea level. The lowest point, which is about 250 feet above sea level, is where the White River leaves the northeastern part of the county.

Some of the greatest differences in the soils of Stone County are caused by differences in relief through its effect on drainage, runoff, erosion, and percolation of water through the soil. Relief ranges from nearly vertical bluffs to broad, gently sloping areas.

Some soils on the steeper slopes, narrow ridges, and mountaintops are shallow because they have lost so much material through geologic erosion. Moko and

Ramsey soils are examples. In other areas of strong relief, soils formed in cherty limestone. Those soils, for example, Noark soils, contain large quantities of chert residue from weathered limestone. The chert mantle retards geologic erosion. In contrast, soils that are on gently sloping to moderately steep uplands, for example, Brockwell, Sidon, and Linker soils, have lost little soil material.

Portia and Summit soils formed on foot slopes in deep accumulations of material that washed or sloughed down from adjacent higher slopes. Spadra soils, which are on gently sloping stream terraces, formed in deep loamy material that washed from uplands and was deposited on stream flood plains before the streams were further entrenched.

The soils on the flood plains along streams in the survey area are level to nearly level and are subject to flooding unless they are protected by upstream floodwater-retarding structures. Sturkie, Razort, and Wideman soils formed in these areas in deep silty, loamy, or sandy alluvium.

Time

The length of time required for soils to form depends largely on other factors of soil formation. Generally, less time is required if the climate is warm and humid and the vegetation luxuriant. If other factors are equal, less time is required if the parent material is loamy than if it is clayey.

In terms of geologic time, most of the soils in Stone County are old, regardless of whether they are on mountaintops, hillsides, or stream terraces. The young soils formed either in alluvium along streams or in residuum where geologic erosion has nearly kept pace with weathering of the bedrock.

The soils on uplands formed in material that weathered from rocks of Ordovician to Pennsylvanian age. Most of these soils are old. Most of the cations have been leached out, and the reaction is strongly acid or very strongly acid. There has been considerable weathering and translocation of clay, and the horizons are clearly expressed. Iron, as well as clay, has been translocated from the A horizon to the B horizon and then oxidized, giving the B horizon stronger red, brown, and yellow colors than the A horizon. Nella, Enders, and Noark soils clearly show the effect of time acting with other soil-forming factors on parent material.

Wideman soils are young soils. They formed in recent alluvium on flood plains of the White River in Stone County. No definite horizons have formed below the A horizon. Instead, these soils still have the depostional bedding planes and have no soil structure. Base saturation is high, and the reaction is medium acid to neutral, which indicates that leaching has been slight. The content of organic matter decreases irregularly as depth increases. Except for the slight changes caused by worms and roots, there is little evidence of soil-forming activity.

Sturkie soils are intermediate in age. They formed in silty alluvium on terraces of large streams. Horizonation is weakly expressed, and there is little evidence of clay translocation. The B horizon is underlain by stratified beds of silt loam, silty clay loam, and gravel.

Soil Horizon Differentiation

The effects of the soil-forming factors are reflected in the soil profile, which is a succession of layers, or horizons, from the surface down to the parent material. The parent material has been little altered by soil-forming processes. The horizons differ in one or more properties, such as color, texture, structure, consistence, porosity, or reaction (*8*).

Most soil profiles contain three major horizons—the A, B, and C horizons. Young soils do not have a B horizon.

The horizon of maximum accumulation of organic matter is called the A1 horizon, or the surface layer. The horizon of maximum leaching of dissolved or suspended materials is called the A2 horizon, or the subsurface layer.

The B horizon lies immediately below the A horizon and is sometimes called the subsoil. It is the horizon of maximum accumulation of dissolved or suspended materials such as iron and clay. Commonly, the B horizon has blocky structure and is firmer than the horizons immediately above or below it.

The C horizon lies below the B horizon. It typically has been little affected by the soil-forming processes, though it is in some places materially modified by weathering. In some young soils, the C horizon has been only slightly modified by living organisms and by weathering, and it immediately underlies the A horizon.

In the survey area, several processes have been active in the formation of soil horizons. Among these processes are the accumulation of organic matter, the leaching of carbonates and bases, the formation and translocation of silicate clay minerals, and the oxidation or reduction and transfer of iron. In most of the soils, more than one of these processes were involved.

The physical weathering of rocks, through heating and cooling and wetting and drying, slowly breaks them into small pieces that form the parent material for the residual soils. This is most evident in Moko and Ramsey soils.

The accumulation of organic matter in the upper part of the profile (A1 horizon) is readily evident in the Nixa soils. These soils have a light-colored subsurface layer from which organic matter, clay, and iron oxides have been removed.

In Stone County, leaching of bases and translocation of silicate clay are among the most important processes of horizon differentiation in the soils.

Leaching of carbonates and bases has occurred to some degree in nearly all the soils in the survey area. Generally, bases are leached downward in soils before silicate clay minerals begin to move. Most of the soils in the survey are strongly leached. Healing and Sturkie soils are moderately leached, and Moko soils are only slightly leached.

The translocation of silicate clay minerals has contributed to horizon development in most of the soils in the county. In the few areas where the soils are or have been cultivated, most of the eluviated A2 horizon has been destroyed. Where it remains, however, the A2 horizon has blocky to platy structure, has less clay than the lower horizons, and is lighter colored than the rest of the soil. Clay films generally have accumulated in pores and on surfaces of peds in the B horizon. The soils were probably leached of carbonates and soluble salts to a great extent before the translocation of silicate clay occurred. Estate and Noark soils are examples of the effects of these processes.

Oxidation of iron is evident in moderately well drained and well drained soils, for example, Brockwell, Linker, and Portia soils on uplands and Spadra soils on terraces. Red or brown B horizon indicates the oxidation of iron.

References

(1) American Association of State Highway [and Transportation] Officials. 1970. Standard specifications for highway materials and methods of sampling and testing. Ed. 10, 2 vol., illus.

(2) American Society for Testing and Materials. 1974. Method for classification of soils for engineering purposes. ASTM Stand. D 2487-69. *In* 1974 Annual Book of ASTM Standards, Part 19, 464 pp., illus.

(3) Branner, George C. and others. 1929. Geologic map of Arkansas. U.S. Geological Survey.

(4) Day, Paul R. and others. 1956. Report of the committee on physical analysis, 1954-1955. Soil Science Society of America Proceedings 20: 167-169.

(5) Croneis, Carey. 1930. Geology of the Arkansas Paleozic Area. Arkansas Geological Survey Bulletin 3, 457 pp., illus.

(6) Glick, Ernest E. and Sherwood E. Frezon. 1965. Geologic map of Snowball Quadrangle, Newton and Searcy Counties, Arkansas. U.S. Geological Survey Map GQ425.

(7) Haley, Boyd R. and others. 1976. Geology map of Arkansas. U.S. Geological Survey.

(8) United States Department of Agriculture. 1938. Soils and men. U.S. Department of Agriculture Yearbook, 1232 pp., illus.

(9) United States Department of Agriculture. 1951. Soil survey manual. U.S. Dep. Agric. Handb. 18, 503 pp., illus. [Supplements replacing pp. 173-188 issued May 1962.]

(10) United States Department of Agriculture. 1972. Soil survey laboratory methods and procedures for collecting soil samples. Soil Survey Investigation Report 1, 63 pp., illus.

(11) United States Department of Agriculture. 1975. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. Soil Conservation Service, U.S. Department of Agriculture Handbook 436, 754 pp., illus.

(12) United States Department of Agriculture. 1980. Arkansas Forest Industries, 1977. Forest Service, Southern Forest Experiment Station Resource Bulletin SO-75, 18 pp.

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.

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
Medium	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.

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

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

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.

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.

Climax vegetation. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15 to 38 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

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.

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

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

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

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.
Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.
Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.
Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.
Soft.—When dry, breaks into powder or individual grains under very slight pressure.
Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

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

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

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

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

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

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:
Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.
Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.
Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.
Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.
Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.
Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.
Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

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

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

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

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.
Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

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

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.

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

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

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist, 6 to 15 inches (15 to 37.5 centimeters) long.

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

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

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

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.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual*. The major horizons of mineral soil are as follows:
O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.
A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.
E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.
B horizon.—The mineral horizon below an O, A, or E horizon. The B horizon is in part a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.
C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Arabic numeral 2 precedes the letter C.
R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

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

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

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

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

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

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Karst (topography). The relief of an area underlain by limestone that dissolves in differing degrees, thus forming numerous depressions or small basins.

Large stones (in tables). Rock fragments 3 inches (7.5 centimeters) or more across. Large stones adversely affect the specified use of the soil.

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

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

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

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

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

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

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.)

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

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

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

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

Percolation. The downward movement of water through the soil.

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

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

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

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

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

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

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

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

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

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

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

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

	pH
Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

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

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

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

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

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

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

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

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

Sandstone. Sedimentary rock containing dominantly sand-size particles.

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

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

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

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

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

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

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

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

Sinkhole. A depression in the landscape where limestone has been dissolved.

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

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.

Small stones (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

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

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

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

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

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

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

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the A2 or E horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

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

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet.

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

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

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

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

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

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily

rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

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

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.

Tables

TABLE 1.--NUMBER AND SIZE OF FARMS IN STONE COUNTY

All farms	1978	1974	1969
Number of farms	609	580	627
Average size of farms	212	217	213
Total acreage in farmland	129,324	126,011	133,238
Percentage of county in farmland	33.2	32.4	34.2

TABLE 2.--NUMBER OF LIVESTOCK AND POULTRY ON FARMS

Livestock and poultry	1978	1974	1969
Cattle and calves	20,513	22,555	16,586
Hogs and pigs	2,779	2,140	3,848
Horses and ponies	419	288	438
Chickens (broilers)	2,987,654	2,505,721	1,484,637

TABLE 3.--NUMBER OF LIVESTOCK AND POULTRY SOLD FROM FARMS

Livestock and poultry	1978	1974	1969
Cattle and calves	11,936	8,803	8,657
Hogs and pigs	5,894	7,914	13,209
Horses and ponies	22	23	46
Chickens (broilers)	15,607,431	11,989,473	7,756,958

TABLE 4.--ACREAGE OF PRINCIPAL CROPS

Crop	1978	1974	1969
Corn	---	146	359
Sorghum	---	201	92
Soybeans	270	60	298
Hay crops	8,796	7,117	5,225

TABLE 5.--TEMPERATURE AND PRECIPITATION

[Recorded 1962-78 at Mountain View, Arkansas]

Month	Temperature						Precipitation				
				2 years in 10 will have--				2 years in 10 will have--			
	Average daily maximum	Average daily minimum	Average daily	Maximum temperature higher than--	Minimum temperature lower than--	Average number of growing degree days[1]	Average	Less than--	More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January	46.2	24.5	35.4	72	-1	22	2.97	1.51	4.24	5	1.9
February	50.9	27.7	39.3	73	6	16	3.20	1.67	4.52	6	1.9
March	60.9	37.3	49.1	86	15	172	5.14	2.44	7.47	7	.8
April	72.3	48.1	60.2	87	28	310	4.59	2.28	6.58	7	.0
May	78.9	54.5	66.7	92	34	518	4.86	2.77	6.71	7	.0
June	86.3	62.8	74.6	98	45	738	3.79	1.54	5.68	6	.0
July	91.1	67.1	79.1	104	51	902	4.03	2.44	5.45	6	.0
August	89.2	64.8	77.0	102	50	837	3.64	1.45	5.47	5	.0
September	81.9	58.9	70.4	96	38	612	4.99	1.59	7.76	6	.0
October	73.8	46.7	60.3	91	27	335	2.86	.81	4.52	4	.0
November	60.6	38.1	49.4	79	13	113	4.37	2.00	6.39	5	.8
December	49.9	29.2	39.5	74	4	19	3.57	1.59	5.25	6	1.0
Yearly:											
Average	70.2	46.6	58.4	---	---	---	---	---	---	---	---
Extreme	---	---	---	104	-3	---	---	---	---	---	---
Total	---	---	---	---	---	4,594	48.01	39.25	55.95	70	6.4

[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 6.--FREEZE DATES IN SPRING AND FALL

[Recorded 1962-78 at Mountain View, Arkansas]

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	March 29	April 10	April 22
2 years in 10 later than--	March 23	April 6	April 16
5 years in 10 later than--	March 12	March 28	April 6
First freezing temperature in fall:			
1 year in 10 earlier than--	November 7	October 22	October 5
2 years in 10 earlier than--	November 11	October 27	October 10
5 years in 10 earlier than--	November 20	November 8	October 20

TABLE 7.--GROWING SEASON

[Recorded 1962-78 at Mountain View, Arkansas]

Probability	Length of growing season if daily minimum temperature is--		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	233	200	176
8 years in 10	240	208	183
5 years in 10	253	225	196
2 years in 10	268	243	211
1 year in 10	279	255	221

TABLE 8.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
1	Brockwell sandy loam, 8 to 20 percent slopes	1,070	0.3
2	Ceda gravelly fine sandy loam, frequently flooded	4,345	1.1
3	Clarksville very cherty silt loam, 8 to 20 percent slopes	1,080	0.3
4	Clarksville very cherty silt loam, 20 to 50 percent slopes	36,105	9.2
5	Clarksville-Nixa complex, 8 to 20 percent slopes	5,980	1.5
6	Cleora fine sandy loam, occasionally flooded	650	0.2
7	Eden-Moko association, very steep	8,505	2.2
8	Elsah cherty loam, frequently flooded	1,380	0.4
9	Enders gravelly fine sandy loam, 3 to 8 percent slopes	4,040	1.0
10	Enders very stony sandy loam, 8 to 20 percent slopes	6,005	1.5
11	Enders very stony sandy loam, 20 to 40 percent slopes	7,975	2.0
12	Estate-Portia-Moko association, rolling	10,575	2.7
13	Estate-Portia-Moko association, steep	5,565	1.4
14	Healing silt loam, 1 to 3 percent slopes	1,055	0.3
15	Linker fine sandy loam, 3 to 8 percent slopes	9,852	2.5
16	Linker gravelly fine sandy loam, 3 to 8 percent slopes	21,400	5.5
17	Linker gravelly fine sandy loam, 8 to 12 percent slopes	7,195	1.8
18	Linker-Mountainburg complex, 3 to 8 percent slopes	12,175	3.1
19	Linker-Mountainburg complex, 8 to 20 percent slopes	19,530	5.0
20	Moko-Estate complex, 40 to 60 percent slopes	11,200	2.9
21	Moko-Rock outcrop complex, 15 to 50 percent slopes	5,890	1.5
22	Mountainburg very stony sandy loam, 8 to 20 percent slopes	1,220	0.3
23	Mountainburg very stony sandy loam, 20 to 40 percent slopes	1,255	0.3
24	Nella-Enders complex, 8 to 20 percent slopes	14,755	3.8
25	Nella-Enders complex, 20 to 40 percent slopes	11,330	2.9
26	Nella-Steprock complex, 8 to 20 percent slopes	13,100	3.3
27	Nella-Steprock-Mountainburg complex, 20 to 40 percent slopes	30,900	7.9
28	Newnata silt loam, 3 to 8 percent slopes	1,775	0.5
29	Newnata-Eden-Moko association, rolling	5,560	1.4
30	Newnata-Eden-Moko association, steep	11,235	2.9
31	Nixa very cherty silt loam, 3 to 8 percent slopes	2,105	0.5
32	Nixa-Noark complex, 3 to 8 percent slopes	2,770	0.7
33	Noark very cherty silt loam, 3 to 8 percent slopes	3,010	0.8
34	Noark very cherty silt loam, 8 to 20 percent slopes	22,670	5.8
35	Noark very cherty silt loam, 20 to 40 percent slopes	25,545	6.5
36	Noark-Nixa complex, 8 to 20 percent slopes	11,380	2.9
37	Portia fine sandy loam, 3 to 8 percent slopes	770	0.2
38	Ramsey-Rock outcrop complex, 3 to 20 percent slopes	1,460	0.4
39	Razort fine sandy loam, frequently flooded	1,695	0.4
40	Razort silt loam, frequently flooded	1,520	0.4
41	Samba silty clay loam, occasionally flooded	1,540	0.4
42	Sidon fine sandy loam, 3 to 8 percent slopes	5,570	1.4
43	Sidon gravelly fine sandy loam, 3 to 8 percent slopes	1,705	0.4
44	Spadra fine sandy loam, 1 to 3 percent slopes	1,495	0.4
45	Steprock-Nella-Mountainburg complex, 40 to 60 percent slopes	24,370	6.2
46	Sturkie silt loam, 0 to 3 percent slopes	1,450	0.4
47	Summit silty clay loam, 3 to 8 percent slopes	2,715	0.7
48	Summit silty clay loam, 8 to 12 percent slopes	3,570	0.9
49	Wideman fine sandy loam, 0 to 3 percent slopes	1,270	0.3
	Approximate land area[1]	389,312	99.4
	Large water areas[2]	2,368	0.6
	Total area	391,680	100.0

[1] 1974 Census of Agriculture.

[2] Enclosed areas of water of more than 40 acres and streams and sloughs more than one-eighth of a statute mile in width.

TABLE 9.--YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Map symbol and soil name	Soybeans	Corn	Oats	Tall fescue	Improved bermudagrass
	Bu	Bu	Bu	AUM*	AUM*
1--Brockwell	---	---	---	4.0	5.0
2--Ceda	---	---	---	4.5	5.0
3--Clarksville	---	---	---	4.5	4.0
4--Clarksville	---	---	---	---	---
5--Clarksville-Nixa	---	---	---	4.5	4.0
6--Cleora	25	55	---	8.0	8.5
7:**					
Eden	---	---	---	---	---
Moko	---	---	---	---	---
8--Elsah	---	---	---	7.5	6.5
9--Enders	---	50	45	4.5	4.5
10, 11--Enders	---	---	---	---	---
12:**					
Estate	---	---	---	5.0	5.0
Portia	---	---	---	5.5	5.5
Moko	---	---	---	---	---
13:**					
Estate	---	---	---	---	---
Portia	---	---	---	4.5	5.0
Moko	---	---	---	---	---
14--Healing	35	85	70	9.0	9.0
15--Linker	20	50	45	5.0	5.5
16--Linker	20	50	45	5.0	5.5
17--Linker	15	35	35	4.5	5.0
18--Linker-Mountainburg	---	---	---	4.0	4.5
19--Linker-Mountainburg	---	---	---	3.5	4.0

See footnotes at end of table.

TABLE 9.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Map symbol and soil name	Soybeans	Corn	Oats	Tall fescue	Improved bermudagrass
	Bu	Bu	Bu	AUM*	AUM*
20---------- Moko-Estate	---	---	---	---	---
21---------- Moko-Rock outcrop	---	---	---	---	---
22, 23---------- Mountainburg	---	---	---	---	---
24---------- Nella-Enders	---	---	---	4.0	5.0
25---------- Nella-Enders	---	---	---	---	---
26---------- Nella-Steprock	---	---	---	3.5	5.0
27---------- Nella-Steprock-Mountainburg	---	---	---	---	---
28---------- Newnata	---	50	50	5.5	5.0
29:**					
Newnata----------	---	---	---	5.0	4.5
Eden----------	---	---	---	4.0	3.5
Moko----------	---	---	---	---	---
30:**					
Newnata----------	---	---	---	---	---
Eden----------	---	---	---	---	---
Moko----------	---	---	---	---	---
31---------- Nixa	---	---	45	5.5	5.0
32---------- Nixa-Noark	---	---	50	6.0	5.5
33---------- Noark	---	---	60	6.5	6.0
34---------- Noark	---	---	---	5.5	5.0
35---------- Noark	---	---	---	5.0	4.5
36---------- Noark-Nixa	---	---	---	5.5	5.0
37---------- Portia	---	75	60	6.5	7.0
38---------- Ramsey-Rock outcrop	---	---	---	---	---
39, 40---------- Razort	---	---	---	9.0	9.0
41---------- Samba	25	70	60	7.5	7.5

See footnotes at end of table.

TABLE 9.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Map symbol and soil name	Soybeans	Corn	Oats	Tall fescue	Improved bermudagrass
	Bu	Bu	Bu	AUM*	AUM*
42, 43---------- Sidon	25	60	50	5.5	6.0
44---------- Spadra	30	75	60	9.0	9.0
45---------- Steprock-Nella-Mountainburg	---	---	---	---	---
46---------- Sturkie	35	90	70	9.0	9.0
47---------- Summit	---	---	50	6.0	5.5
48---------- Summit	---	---	---	5.0	4.5
49---------- Wideman	25	60	45	4.5	5.5

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

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

TABLE 10.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available]

Map symbol and soil name	Woodland suitability group	Management concerns			Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Common trees	Site index	
1---------- Brockwell	3o7	Slight	Slight	Slight	Shortleaf pine-------	70	Shortleaf pine, loblolly pine.
					Southern red oak-----	65	
					Black oak----------	---	
					White oak----------	---	
2---------- Ceda	3f8	Slight	Slight	Moderate	Shortleaf pine-------	70	Loblolly pine, shortleaf pine, American sycamore, sweetgum.
					Southern red oak-----	---	
					White oak----------	---	
					Sweetgum-----------	80	
					American sycamore----	80	
3---------- Clarksville	4f8	Slight	Slight	Moderate	White oak----------	55	White oak, shortleaf pine.
					Shortleaf pine-------	---	
4---------- Clarksville	4f9	Moderate	Severe	Severe	White oak----------	55	White oak, shortleaf pine.
					Shortleaf pine-------	---	
5:*							
Clarksville-------	4f8	Slight	Slight	Moderate	White oak----------	55	White oak, shortleaf pine.
					Shortleaf pine-------	---	
Nixa----------	4f8	Slight	Slight	Moderate	Shortleaf pine-------	60	Shortleaf pine, loblolly pine, eastern redcedar, black locust, southern red oak.
					Southern red oak-----	60	
					White oak----------	60	
					Eastern redcedar-----	40	
					Black locust---------	---	
6---------- Cleora	2o4	Slight	Slight	Slight	Eastern cottonwood---	100	Sweetgum, eastern cottonwood, black walnut, American sycamore.
					Northern red oak-----	80	
					Sweetgum-----------	90	
7:*							
Eden----------	4c3	Severe	Severe	Severe	Eastern redcedar-----	40	Eastern redcedar.
					Black locust---------	---	
					Chinquapin oak-------		
Moko----------	5x3	Severe	Severe	Severe	Eastern redcedar-----	30	Eastern redcedar.
8---------- Elsah	2f5	Slight	Slight	Moderate	Eastern cottonwood---	95	Black walnut, green ash, sweetgum.
					American sycamore----	---	
					Sweetgum-----------	---	
9---------- Enders	4o1	Slight	Slight	Slight	Southern red oak-----	60	Loblolly pine, shortleaf pine, eastern redcedar.
					White oak----------	55	
					Eastern redcedar-----	40	
					Shortleaf pine-------	60	
10---------- Enders	4x3	Slight	Severe	Slight	Southern red oak-----	60	Loblolly pine, shortleaf pine, eastern redcedar.
					White oak----------	55	
					Eastern redcedar-----	40	
					Shortleaf pine-------	60	
11---------- Enders	5r3	Moderate	Severe	Moderate	Southern red oak-----	50	Loblolly pine, shortleaf pine, eastern redcedar.
					White oak----------	50	
					Eastern redcedar-----	35	
					Shortleaf pine-------	50	
12:*							
Estate----------	4x8	Moderate	Moderate	Slight	Southern red oak-----	65	Shortleaf pine, loblolly pine, eastern redcedar.
					Eastern redcedar-----	40	
					Shortleaf pine-------	60	
					Black locust---------	---	
					White oak----------	---	

See footnote at end of table.

TABLE 10.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Map symbol and soil name	Woodland suitability group	Management concerns			Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Common trees	Site index	
12:*							
Portia	3o7	Slight	Slight	Slight	Shortleaf pine	---	Loblolly pine, shortleaf pine.
					Sweetgum	80	
					Loblolly pine	75	
Moko	5x3	Severe	Severe	Severe	Eastern redcedar	30	Eastern redcedar.
13:*							
Estate	4x9	Severe	Severe	Slight	Southern red oak	65	Shortleaf pine, loblolly pine, eastern redcedar.
					Eastern redcedar	40	
					Shortleaf pine	60	
					Black locust	---	
					White oak	---	
Portia	3r8	Moderate	Moderate	Slight	Shortleaf pine	---	Loblolly pine, shortleaf pine.
					Sweetgum	80	
					Loblolly pine	75	
Moko	5x3	Severe	Severe	Severe	Eastern redcedar	30	Eastern redcedar.
14--- Healing	2o7	Slight	Slight	Slight	Shortleaf pine	80	Shortleaf pine, southern red oak, white oak, American sycamore, eastern cottonwood, black walnut.
					Southern red oak	80	
					White oak	70	
					American sycamore	80	
					Eastern cottonwood	90	
15, 16, 17--- 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	---	
18:*							
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	---	
Mountainburg	5x2	Slight	Moderate	Moderate	Shortleaf pine	50	Shortleaf pine, eastern redcedar, loblolly pine.
					Eastern redcedar	30	
					Loblolly pine	---	
19:*							
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	---	
Mountainburg	5x2	Moderate	Moderate	Moderate	Shortleaf pine	50	Shortleaf pine, eastern redcedar, loblolly pine.
					Eastern redcedar	30	
					Loblolly pine	---	
20:*							
Moko	5x3	Severe	Severe	Severe	Eastern redcedar	30	Eastern redcedar.
Estate	4x9	Severe	Severe	Severe	Southern red oak	65	Shortleaf pine, loblolly pine, eastern redcedar.
					Eastern redcedar	40	
					Shortleaf pine	60	
					Black locust	---	
					White oak	---	
21:*							
Moko	5x3	Severe	Severe	Severe	Eastern redcedar	30	Eastern redcedar.
Rock outcrop.							

See footnote at end of table.

TABLE 10.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Map symbol and soil name	Woodland suitability group	Management concerns			Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Common trees	Site index	
22---------- Mountainburg	5x3	Moderate	Severe	Moderate	Shortleaf pine------- Eastern redcedar----- Loblolly pine--------	50 30 ---	Shortleaf pine, eastern redcedar, loblolly pine.
23---------- Mountainburg	5x3	Severe	Severe	Moderate	Shortleaf pine------- Eastern redcedar----- Loblolly pine--------	50 30 ---	Shortleaf pine, eastern redcedar, loblolly pine.
24:*							
Nella----------	4x8	Slight	Moderate	Slight	Shortleaf pine------- Southern red oak----- Eastern redcedar----- Black oak----------	60 60 40 ---	Shortleaf pine, loblolly pine.
Enders----------	4x3	Slight	Severe	Slight	Southern red oak----- White oak---------- Eastern redcedar----- Shortleaf pine-------	60 55 40 60	Loblolly pine, shortleaf pine, eastern redcedar.
25:*							
Nella----------	4x8	Moderate	Moderate	Slight	Shortleaf pine------- Southern red oak----- Eastern redcedar----- Black oak----------	60 60 40 ---	Shortleaf pine, loblolly pine.
Enders----------	5r3	Severe	Severe	Moderate	Southern red oak----- White oak---------- Eastern redcedar----- Shortleaf pine-------	50 50 35 50	Loblolly pine, shortleaf pine, eastern redcedar.
26:*							
Nella----------	4x8	Slight	Moderate	Slight	Shortleaf pine------- Southern red oak----- Eastern redcedar----- Black oak----------	60 60 40 ---	Shortleaf pine, loblolly pine.
Steprock----------	4x8	Slight	Moderate	Moderate	Shortleaf pine------- Southern red oak----- White oak---------- Eastern redcedar----- Loblolly pine--------	55 45 45 35 ---	Shortleaf pine, loblolly pine, eastern redcedar.
27:*							
Nella----------	4x8	Moderate	Moderate	Slight	Shortleaf pine------- Southern red oak----- Eastern redcedar----- Black oak----------	60 60 40 ---	Shortleaf pine, loblolly pine.
Steprock----------	4x9	Moderate	Severe	Moderate	Shortleaf pine------- Southern red oak----- White oak---------- Eastern redcedar----- Loblolly pine--------	55 45 45 35 ---	Shortleaf pine, loblolly pine, eastern redcedar.
Mountainburg------	5x3	Severe	Severe	Moderate	Shortleaf pine------- Eastern redcedar----- Loblolly pine--------	50 30 ---	Shortleaf pine, eastern redcedar, loblolly pine.
28---------- Newnata	4o7	Slight	Slight	Slight	Northern red oak----- Eastern redcedar----- Hackberry---------- Shortleaf pine------- Black locust--------- White oak---------- Green ash---------- Blackgum---------- Shagbark hickory-----	65 40 --- 60 --- --- --- --- ---	Northern red oak, white oak, eastern redcedar.

See footnote at end of table.

TABLE 10.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Map symbol and soil name	Woodland suitability group	Management concerns			Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Common trees	Site index	
29:*							
Newnata	4x8	Moderate	Moderate	Slight	Northern red oak	65	Northern red oak, white oak, eastern redcedar.
					Eastern redcedar	40	
					Hackberry	---	
					Shortleaf pine	60	
					Black locust	---	
					White oak	---	
					Green ash	---	
					Blackgum	---	
					Shagbark hickory	---	
Eden	4c2	Slight	Moderate	Moderate	Eastern redcedar	44	Eastern redcedar.
					Black locust	---	
Moko	5x3	Severe	Severe	Severe	Eastern redcedar	30	Eastern redcedar.
30:*							
Newnata	4x9	Severe	Severe	Slight	Northern red oak	65	Northern red oak, white oak, eastern redcedar.
					Eastern redcedar	40	
					Hackberry	---	
					Shortleaf pine	60	
					Black locust	---	
					White oak	---	
					Green ash	---	
					Blackgum	---	
					Shagbark hickory	---	
Eden	4c3	Moderate	Severe	Moderate	Eastern redcedar	44	Eastern redcedar.
Moko	5x3	Severe	Severe	Severe	Eastern redcedar	30	Eastern redcedar.
31--Nixa	4f8	Slight	Slight	Moderate	Shortleaf pine	60	Shortleaf pine, loblolly pine, eastern redcedar, black locust, southern red oak.
					Southern red oak	60	
					White oak	60	
					Eastern redcedar	40	
					Black locust	---	
32:*							
Nixa	4f8	Slight	Slight	Moderate	Shortleaf pine	60	Shortleaf pine, loblolly pine, eastern redcedar, black locust, southern red oak.
					Southern red oak	60	
					White oak	60	
					Eastern redcedar	40	
					Black locust	---	
Noark	4f8	Slight	Slight	Moderate	Shortleaf pine	60	Shortleaf pine, eastern redcedar, southern red oak.
					Eastern redcedar	40	
					Southern red oak	60	
					White oak	---	
33, 34--Noark	4f8	Slight	Slight	Moderate	Shortleaf pine	60	Shortleaf pine, eastern redcedar, southern red oak.
					Eastern redcedar	40	
					Southern red oak	60	
					White oak	---	
35--Noark	4r9	Moderate	Severe	Moderate	Shortleaf pine	60	Shortleaf pine, eastern redcedar, southern red oak.
					Eastern redcedar	40	
					Southern red oak	60	
					White oak	---	
36:*							
Noark	4f8	Slight	Slight	Moderate	Shortleaf pine	60	Shortleaf pine, eastern redcedar, southern red oak.
					Eastern redcedar	40	
					Southern red oak	60	
					White oak	---	
Nixa	4f8	Slight	Slight	Moderate	Shortleaf pine	60	Shortleaf pine, loblolly pine, eastern redcedar, black locust, southern red oak.
					Southern red oak	60	
					White oak	60	
					Eastern redcedar	40	
					Black locust	---	

See footnote at end of table.

TABLE 10.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Map symbol and soil name	Woodland suitability group	Management concerns			Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Common trees	Site index	
37---------- Portia	3o7	Slight	Slight	Slight	Shortleaf pine------- Sweetgum---------- Loblolly pine--------	--- 80 75	Loblolly pine, shortleaf pine.
38:* Ramsey---------- Rock outcrop.	5x9	Severe	Severe	Moderate	White oak---------- Shortleaf pine------- Loblolly pine--------	61 59 73	Shortleaf pine, loblolly pine.
39, 40---------- Razort	2o7	Slight	Slight	Slight	Shortleaf pine------- Southern red oak----- Eastern cottonwood--- American sycamore---- Sweetgum---------- White oak----------	80 80 90 85 80 75	Shortleaf pine, loblolly pine, southern red oak, white oak, black walnut, American sycamore, eastern cottonwood, sweetgum.
41---------- Samba	4w8	Slight	Moderate	Moderate	Water oak---------- Sweetgum---------- Eastern cottonwood---	70 70 ---	Sweetgum.
42, 43---------- Sidon	3o7	Slight	Slight	Slight	Northern red oak----- White oak---------- Shortleaf pine-------	--- --- ---	Loblolly pine, shortleaf pine.
44---------- Spadra	2o7	Slight	Slight	Slight	Shortleaf pine------- Southern red oak----- Eastern redcedar-----	80 80 60	Loblolly pine, shortleaf pine, black walnut, black locust, southern red oak, eastern redcedar.
45:* Steprock---------- Nella---------- Mountainburg------ 46---------- Sturkie	4x9 4x9 5x3 2o4	Severe Severe Severe Slight	Severe Severe Severe Slight	Moderate Moderate Moderate Slight	Shortleaf pine------- Southern red oak----- White oak---------- Eastern redcedar----- Loblolly pine-------- Shortleaf pine------- Southern red oak----- Eastern redcedar----- Black oak---------- Shortleaf pine------- Eastern redcedar----- Loblolly pine-------- Southern red oak----- White oak---------- American sycamore---- Eastern cottonwood---	55 45 45 35 --- 60 60 40 --- 50 30 --- 80 70 80 100	Shortleaf pine, loblolly pine, eastern redcedar. Shortleaf pine, loblolly pine. Shortleaf pine, eastern redcedar, loblolly pine. Northern red oak, white oak, American sycamore, eastern cottonwood, black walnut.
47---------- Summit	5c8	Slight	Slight	Moderate	Hackberry---------- Honeylocust---------- Eastern redcedar-----	--- --- ---	Honeylocust, eastern redcedar.
48---------- Summit	5c8	Moderate	Slight	Moderate	Hackberry---------- Honeylocust---------- Eastern redcedar-----	--- --- ---	Honeylocust, eastern redcedar.
49---------- Wideman	3s8	Slight	Moderate	Moderate	Sweetgum---------- Eastern cottonwood--- American sycamore----	80 90 80	Eastern cottonwood, American sycamore, loblolly pine, shortleaf pine, sweetgum.

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

TABLE 11.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails
1--- Brockwell	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
2--- Ceda	Severe: flooding.	Moderate: small stones.	Severe: flooding, small stones.	Moderate: flooding.
3--- Clarksville	Severe: small stones.	Severe: small stones.	Severe: slope, small stones.	Severe: small stones.
4--- Clarksville	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.
5:*				
Clarksville---	Severe: small stones.	Severe: small stones.	Severe: slope, small stones.	Severe: small stones.
Nixa---	Severe: small stones, percs slowly.	Severe: small stones, percs slowly.	Severe: slope, small stones, percs slowly.	Severe: small stones.
6--- Cleora	Severe: flooding.	Slight---	Moderate: flooding.	Slight.
7:*				
Eden---	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.
Moko---	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: large stones, slope, small stones.	Severe: large stones, slope.
8--- Elsah	Severe: flooding.	Moderate: small stones.	Severe: flooding, small stones.	Moderate: flooding.
9--- Enders	Severe: percs slowly.	Severe: percs slowly.	Severe: small stones, percs slowly.	Slight.
10--- Enders	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, large stones, percs slowly.	Moderate: large stones.
11--- Enders	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: slope, large stones, percs slowly.	Severe: slope.
12:*				
Estate---	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope, small stones.	Moderate: large stones.
Portia---	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight.

See footnote at end of table.

TABLE 11.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails
12:*				
Moko	Severe: depth to rock.	Severe: depth to rock.	Severe: large stones, slope, small stones.	Severe: large stones.
13:*				
Estate	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.
Portia	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Moko	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: large stones, slope, small stones.	Severe: large stones, slope.
14--- Healing	Severe: flooding.	Slight	Moderate: slope.	Severe: erodes easily.
15--- Linker	Slight	Slight	Moderate: slope.	Slight.
16--- Linker	Slight	Slight	Moderate: small stones, slope.	Slight.
17--- Linker	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
18:*				
Linker	Slight	Slight	Moderate: small stones, slope.	Slight.
Mountainburg	Severe: small stones, depth to rock.	Severe: small stones, depth to rock.	Severe: small stones, depth to rock.	Moderate: large stones, small stones.
19:*				
Linker	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Mountainburg	Severe: small stones, depth to rock.	Severe: small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Moderate: large stones.
20:*				
Moko	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: large stones, slope, small stones.	Severe: large stones, slope.
Estate	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.
21:*				
Moko	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: large stones, slope, small stones.	Severe: large stones, slope.
Rock outcrop.				

See footnote at end of table.

TABLE 11.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails
22--Mountainburg	Severe: small stones, depth to rock.	Severe: small stones, depth to rock.	Severe: large stones, slope, small stones.	Severe: large stones, small stones.
23--Mountainburg	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: large stones, slope, small stones.	Severe: large stones, slope, small stones.
24:*				
Nella	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: large stones.
Enders	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, large stones, percs slowly.	Moderate: large stones.
25:*				
Nella	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Enders	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: slope, large stones, percs slowly.	Severe: slope.
26:*				
Nella	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: large stones.
Steprock	Moderate: slope, large stones.	Moderate: slope, large stones.	Severe: large stones, slope, small stones.	Moderate: large stones.
27:*				
Nella	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Steprock	Severe: slope.	Severe: slope.	Severe: large stones, slope, small stones.	Severe: slope.
Mountainburg	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: large stones, slope, small stones.	Severe: large stones, slope, small stones.
28--Newnata	Moderate: percs slowly.	Moderate: percs slowly.	Severe: erodes easily.	Severe: erodes easily.
29:*				
Newnata	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.
Eden	Moderate: slope, percs slowly, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Moderate: small stones.
Moko	Severe: depth to rock.	Severe: depth to rock.	Severe: large stones, slope, small stones.	Severe: large stones.

See footnote at end of table.

TABLE 11.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails
30:*				
Newnata	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.
Eden	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.
Moko	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: large stones, slope, small stones.	Severe: large stones, slope.
31 Nixa	Severe: small stones, percs slowly.	Severe: small stones, percs slowly.	Severe: small stones, percs slowly.	Severe: small stones.
32:*				
Nixa	Severe: small stones, percs slowly.	Severe: small stones, percs slowly.	Severe: small stones, percs slowly.	Severe: small stones.
Noark	Severe: small stones.	Severe: small stones.	Severe: small stones.	Severe: small stones.
33 Noark	Severe: small stones.	Severe: small stones.	Severe: small stones.	Severe: small stones.
34 Noark	Severe: small stones.	Severe: small stones.	Severe: slope, small stones.	Severe: small stones.
35 Noark	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.
36:*				
Noark	Severe: small stones.	Severe: small stones.	Severe: slope, small stones.	Severe: small stones.
Nixa	Severe: small stones, percs slowly.	Severe: small stones, percs slowly.	Severe: slope, small stones, percs slowly.	Severe: small stones.
37 Portia	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight.
38:*				
Ramsey	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, small stones.	Moderate: large stones.
Rock outcrop.				
39, 40 Razort	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.
41 Samba	Severe: wetness, flooding, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, erodes easily.
42, 43 Sidon	Moderate: percs slowly, wetness.	Moderate: percs slowly, wetness.	Moderate: slope, percs slowly, wetness.	Severe: erodes easily.

See footnote at end of table.

TABLE 11.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails
44--- Spadra	Severe: flooding.	Slight---	Moderate: slope.	Slight.
45:* Steprock---	Severe: slope.	Severe: slope.	Severe: large stones, slope, small stones.	Severe: slope.
Nella---	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Mountainburg---	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: large stones, slope, small stones.	Severe: large stones, slope, small stones.
46--- Sturkie	Severe: flooding.	Slight---	Slight---	Slight.
47--- Summit	Moderate: wetness.	Moderate: wetness.	Moderate: slope, wetness.	Severe: erodes easily.
48--- Summit	Moderate: slope, wetness.	Moderate: slope, wetness.	Severe: slope.	Severe: erodes easily.
49--- Wideman	Severe: flooding.	Slight---	Slight---	Slight.

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

TABLE 12.--WILDLIFE HABITAT

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Map symbol and soil name	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
1---- Brockwell	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
2---- Ceda	Poor	Fair	Fair	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.
3---- Clarksville	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
4---- Clarksville	Very poor.	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
5:*										
Clarksville-------	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Nixa----------	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
6---- Cleora	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
7:*										
Eden----------	Very poor.	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Moko----------	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
8---- Elsah	Fair	Fair	Fair	Good	Fair	Poor	Poor	Fair	Good	Poor.
9---- Enders	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
10---- Enders	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
11---- Enders	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
12:*										
Estate----------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Portia----------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Moko----------	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
13:*										
Estate----------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Portia----------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Moko----------	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
14---- Healing	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.

See footnote at end of table.

TABLE 12.--WILDLIFE HABITAT--Continued

Map symbol and soil name	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
15, 16--Linker	Fair	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
17--Linker	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
18:*										
Linker	Fair	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
Mountainburg	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Poor	Very poor.
19:*										
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.
20:*										
Moko	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Estate	Very poor.	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
21:*										
Moko	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Rock outcrop.										
22, 23--Mountainburg	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Poor	Very poor.
24:*										
Nella	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Enders	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
25:*										
Nella	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Enders	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
26:*										
Nella	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Steprock	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
27:*										
Nella	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Steprock	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Mountainburg	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Poor	Very poor.

See footnote at end of table.

TABLE 12.--WILDLIFE HABITAT--Continued

Map symbol and soil name	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
28---- Newnata	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
29:*										
Newnata----	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Eden----	Fair	Good	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Moko----	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
30:*										
Newnata----	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Eden----	Very poor.	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Moko----	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
31---- Nixa	Poor	Fair	Fair	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.
32:*										
Nixa----	Poor	Fair	Fair	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.
Noark----	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
33, 34---- Noark	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
35---- Noark	Very poor.	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
36:*										
Noark----	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
Nixa----	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
37---- Portia	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
38:*										
Ramsey----	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Rock outcrop.										
39, 40---- Razort	Poor	Fair	Fair	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
41---- Samba	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
42, 43---- Sidon	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
44---- Spadra	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.

See footnote at end of table.

TABLE 12.--WILDLIFE HABITAT--Continued

Map symbol and soil name	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
45:*										
Steprock	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Nella	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Mountainburg	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Poor	Very poor.
46--- Sturkie	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
47, 48--- Summit	Fair	Good	Fair	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
49--- Wideman	Fair	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.

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

TABLE 13.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation]

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
1---------- Brockwell	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
2---------- Ceda	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
3---------- Clarksville	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
4---------- Clarksville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
5:* Clarksville------	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
Nixa----------	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
6---------- Cleora	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
7:* Eden----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, low strength.
Moko----------	Severe: depth to rock, large stones, slope.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.
8---------- Elsah	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
9---------- Enders	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
10---------- Enders	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.
11---------- Enders	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.
12:* Estate----------	Moderate: depth to rock, too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: depth to rock, slope, shrink-swell.	Severe: slope.	Severe: low strength.
Portia----------	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, low strength.

See footnote at end of table.

TABLE 13.--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:*					
Moko	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, large stones.
13:*					
Estate	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.
Portia	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Moko	Severe: depth to rock, large stones, slope.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.
14 Healing	Slight	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength.
15, 16 Linker	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: slope, depth to rock.	Moderate: depth to rock.
17 Linker	Severe: depth to rock.	Moderate: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock, slope.
18:*					
Linker	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: slope.	Moderate: depth to rock.
Mountainburg	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
19:*					
Linker	Severe: depth to rock.	Moderate: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock, slope.
Mountainburg	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.
20:*					
Moko	Severe: depth to rock, large stones, slope.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.
Estate	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.
21:*					
Moko	Severe: depth to rock, large stones, slope.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.
Rock outcrop.					

See footnote at end of table.

TABLE 13.--BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
22--Mountainburg	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, large stones.
23--Mountainburg	Severe: depth to rock, large stones, slope.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.
24:*					
Nella	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
Enders	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.
25:*					
Nella	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Enders	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.
26:*					
Nella	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
Steprock	Moderate: depth to rock, slope.	Moderate: slope.	Moderate: depth to rock, slope.	Severe: slope.	Moderate: slope.
27:*					
Nella	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Steprock	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Mountainburg	Severe: depth to rock, large stones, slope.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.
28--Newnata	Moderate: depth to rock, too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
29:*					
Newnata	Moderate: depth to rock, too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: slope, shrink-swell.	Severe: low strength, shrink-swell.
Eden	Moderate: too clayey.	Moderate: shrink-swell, slope.	Moderate: slope, depth to rock, shrink-swell.	Severe: slope.	Severe: low strength.
Moko	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, large stones.

See footnote at end of table.

TABLE 13.--BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
30:*					
Newnata	Severe: slope.	Severe: slope, shrink-swell.	Severe: slope, shrink-swell.	Severe: slope, shrink-swell.	Severe: low strength, slope, shrink-swell.
Eden	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, low strength.
Moko	Severe: depth to rock, large stones, slope.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.
31--Nixa	Slight	Slight	Slight	Moderate: slope.	Slight.
32:*					
Nixa	Slight	Slight	Slight	Moderate: slope.	Slight.
Noark	Moderate: too clayey.	Slight	Slight	Moderate: slope.	Slight.
33--Noark	Moderate: too clayey.	Slight	Slight	Moderate: slope.	Slight.
34--Noark	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
35--Noark	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
36:*					
Noark	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
Nixa	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
37--Portia	Slight	Slight	Slight	Moderate: slope.	Moderate: low strength.
38:*					
Ramsey	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.
Rock outcrop.					
39, 40--Razort	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
41--Samba	Severe: wetness.	Severe: wetness, shrink-swell, flooding.	Severe: wetness, shrink-swell, flooding.	Severe: wetness, shrink-swell, flooding.	Severe: low strength, wetness, flooding.
42, 43--Sidon	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: slope, wetness.	Moderate: low strength, wetness.
44--Spadra	Slight	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.

See footnote at end of table.

TABLE 13.--BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
45:*					
Steprock	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Nella	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Mountainburg	Severe: depth to rock, large stones, slope.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.
46 Sturkie	Slight	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength.
47 Summit	Severe: wetness.	Severe: shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
48 Summit	Severe: wetness.	Severe: shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.
49 Wideman	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.

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

TABLE 14.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation]

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1--Brockwell	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: small stones, slope.
2--Ceda	Severe: flooding, poor filter.	Severe: seepage, flooding.	Severe: flooding, seepage.	Severe: flooding, seepage.	Poor: small stones, seepage.
3--Clarksville	Moderate: slope.	Severe: seepage, slope.	Severe: seepage, too clayey.	Severe: seepage.	Poor: too clayey, small stones.
4--Clarksville	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope, too clayey.	Severe: seepage, slope.	Poor: too clayey, small stones, slope.
5:*					
Clarksville	Moderate: slope.	Severe: seepage, slope.	Severe: seepage, too clayey.	Severe: seepage.	Poor: too clayey, small stones.
Nixa	Severe: percs slowly.	Severe: slope.	Moderate: too clayey, slope.	Moderate: slope.	Poor: small stones.
6--Cleora	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding, seepage.	Severe: flooding, seepage.	Good.
7:*					
Eden	Severe: slope, percs slowly, depth to rock.	Severe: slope.	Severe: slope, too clayey, depth to rock.	Severe: slope, depth to rock.	Poor: slope, too clayey.
Moko	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope.	Poor: area reclaim, slope, thin layer.
8--Elsah	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding, seepage.	Severe: flooding, seepage.	Poor: seepage, small stones.
9--Enders	Severe: percs slowly.	Moderate: depth to rock, slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock.	Poor: too clayey, hard to pack.
10--Enders	Severe: percs slowly.	Severe: slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock, slope.	Poor: too clayey, hard to pack.
11--Enders	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
12:*					
Estate	Severe: percs slowly.	Severe: slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock, slope.	Poor: too clayey, hard to pack.

See footnote at end of table.

TABLE 14.--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:*					
Portia	Moderate: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Moko	Severe: depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock.	Poor: area reclaim, thin layer.
13:*					
Estate	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
Portia	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Moko	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope.	Poor: area reclaim, slope, thin layer.
14 Healing	Moderate: flooding, percs slowly.	Severe: flooding.	Moderate: flooding.	Moderate: flooding.	Good.
15, 16 Linker	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, thin layer.
17 Linker	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, thin layer.
18:*					
Linker	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, thin layer.
Mountainburg	Severe: depth to rock.	Severe: seepage, depth to rock.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Poor: area reclaim, small stones, thin layer.
19:*					
Linker	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, thin layer.
Mountainburg	Severe: depth to rock.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Poor: area reclaim, small stones, thin layer.
20:*					
Moko	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope.	Poor: area reclaim, slope, thin layer.
Estate	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.

See footnote at end of table.

TABLE 14.--SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
21:*					
Moko	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope.	Poor: area reclaim, slope, thin layer.
Rock outcrop.					
22---------- Mountainburg	Severe: depth to rock, large stones.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Poor: area reclaim, small stones, thin layer.
23---------- Mountainburg	Severe: depth to rock, slope, large stones.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: area reclaim, small stones, slope.
24:*					
Nella	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: slope, small stones.
Enders	Severe: percs slowly.	Severe: slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock, slope.	Poor: too clayey, hard to pack.
25:*					
Nella	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Enders	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
26:*					
Nella	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: slope, small stones.
Steprock	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, thin layer, small stones.
27:*					
Nella	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Steprock	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope, small stones.
Mountainburg	Severe: depth to rock, slope, large stones.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: area reclaim, small stones, slope.
28---------- Newnata	Severe: percs slowly.	Moderate: depth to rock, slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock.	Poor: too clayey, hard to pack.

See footnote at end of table.

TABLE 14.--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
29:*					
Newnata	Severe: percs slowly.	Severe: slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock, slope.	Poor: too clayey, hard to pack.
Eden	Severe: percs slowly, depth to rock.	Severe: slope.	Severe: too clayey, depth to rock.	Severe: depth to rock.	Poor: too clayey.
Moko	Severe: depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock.	Poor: area reclaim, thin layer.
30:*					
Newnata	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
Eden	Severe: slope, percs slowly, depth to rock.	Severe: slope.	Severe: slope, too clayey, depth to rock.	Severe: slope, depth to rock.	Poor: slope, too clayey.
Moko	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope.	Poor: area reclaim, slope, thin layer.
31--- Nixa	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Poor: small stones.
32:*					
Nixa	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Poor: small stones.
Noark	Moderate: percs slowly.	Moderate: seepage, slope.	Severe: too clayey.	Slight	Poor: too clayey, small stones.
33--- Noark	Moderate: percs slowly.	Moderate: seepage, slope.	Severe: too clayey.	Slight	Poor: too clayey, small stones.
34--- Noark	Moderate: percs slowly, slope.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, small stones.
35--- Noark	Severe: slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, small stones, slope.
36:*					
Noark	Moderate: percs slowly, slope.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, small stones.
Nixa	Severe: percs slowly.	Severe: slope.	Moderate: too clayey, slope.	Moderate: slope.	Poor: small stones.
37--- Portia	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.

See footnote at end of table.

TABLE 14.--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
38:*					
Ramsey	Severe: depth to rock.	Severe: seepage, depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock, seepage.	Poor: area reclaim, small stones.
Rock outcrop.					
39, 40--- Razort	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding, seepage.	Severe: flooding.	Good.
41--- Samba	Severe: wetness, percs slowly, flooding.	Severe: wetness, flooding.	Severe: wetness, too clayey, flooding.	Severe: wetness, flooding.	Poor: too clayey, hard to pack, wetness.
42, 43--- Sidon	Severe: percs slowly, wetness.	Severe: wetness.	Severe: depth to rock.	Moderate: wetness, depth to rock.	Fair: area reclaim, too clayey.
44--- Spadra	Moderate: flooding, percs slowly.	Severe: flooding.	Moderate: flooding.	Moderate: flooding.	Good.
45:*					
Steprock	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope, small stones.
Nella	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Mountainburg	Severe: depth to rock, slope, large stones.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: area reclaim, small stones, slope.
46--- Sturkie	Moderate: flooding, percs slowly.	Severe: flooding.	Moderate: flooding, too clayey.	Moderate: flooding.	Good.
47--- Summit	Severe: wetness, percs slowly.	Severe: wetness.	Severe: too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
48--- Summit	Severe: wetness, percs slowly.	Severe: slope, wetness.	Severe: too clayey.	Moderate: wetness, slope.	Poor: too clayey, hard to pack.
49--- Wideman	Moderate: flooding.	Severe: flooding, seepage.	Severe: seepage.	Severe: seepage.	Poor: seepage.

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

TABLE 15.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," "probable," and "improbable." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation]

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
1---------- Brockwell	Good----------	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
2---------- Ceda	Good----------	Improbable: small stones.	Probable----------	Poor: small stones, area reclaim.
3---------- Clarksville	Good----------	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
4---------- Clarksville	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
5:* Clarksville----------	Good----------	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
Nixa----------	Good----------	Improbable: small stones.	Probable----------	Poor: small stones, area reclaim.
6---------- Cleora	Good----------	Improbable: excess fines.	Improbable: excess fines.	Good.
7:* Eden----------	Poor: slope, thin layer, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, too clayey, small stones.
Moko----------	Poor: area reclaim, large stones, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, large stones, slope.
8---------- Elsah	Good----------	Improbable: small stones.	Improbable: excess fines.	Poor: small stones, area reclaim.
9, 10---------- Enders	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, small stones, too clayey.
11---------- Enders	Poor: low strength, slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, thin layer, too clayey.
12:* Estate----------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, too clayey.
Portia----------	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.

See footnote at end of table.

TABLE 15.--CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
12:*				
Moko	Poor: area reclaim, large stones, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, large stones, thin layer.
13:*				
Estate	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope, too clayey.
Portia	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Moko	Poor: area reclaim, large stones, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, large stones, slope.
14---- Healing	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
15, 16, 17---- Linker	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
18,* 19:*				
Linker	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Mountainburg	Poor: area reclaim, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, thin layer.
20:*				
Moko	Poor: area reclaim, large stones, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, large stones, slope.
Estate	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
21:*				
Moko	Poor: area reclaim, large stones, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, large stones, slope.
Rock outcrop.				
22---- Mountainburg	Poor: area reclaim, large stones, thin layer.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, large stones, thin layer.
23---- Mountainburg	Poor: area reclaim, large stones, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, large stones, slope.
24:*				
Nella	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.

See footnote at end of table.

TABLE 15.--CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
24:*				
Enders	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
25:*				
Nella	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Enders	Poor: low strength, slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, too clayey.
26:*				
Nella	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
Steprock	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
27:*				
Nella	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Steprock	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Mountainburg	Poor: area reclaim, large stones, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, large stones, slope.
28 Newnata	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
29:*				
Newnata	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, too clayey.
Eden	Poor: thin layer, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones.
Moko	Poor: area reclaim, large stones, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, large stones, thin layer.
30:*				
Newnata	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, too clayey.
Eden	Poor: slope, thin layer, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, too clayey, small stones.

See footnote at end of table.

TABLE 15.--CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
30:*				
Moko	Poor: area reclaim, large stones, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, large stones, slope.
31				
Nixa	Good	Improbable: small stones.	Probable	Poor: small stones, area reclaim.
32:*				
Nixa	Good	Improbable: small stones.	Probable	Poor: small stones, area reclaim.
Noark	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, too clayey.
33, 34				
Noark	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, too clayey.
35				
Noark	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
36:*				
Noark	Good	Improbable: excess fines	Improbable: excess fines.	Poor: small stones, area reclaim, too clayey.
Nixa	Good	Improbable: small stones.	Probable	Poor: small stones, area reclaim.
37				
Portia	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Good.
38:*				
Ramsey	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, thin layer.
Rock outcrop.				
39, 40				
Razort	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
41				
Samba	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
42, 43				
Sidon	Fair: thin layer, wetness, area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
44				
Spadra	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.

See footnote at end of table.

TABLE 15.--CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
45:*				
Steprock	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Nella	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Mountainburg	Poor: area reclaim, large stones, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, large stones, slope.
46 Sturkie	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
47 Summit	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
48 Summit	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, slope.
49 Wideman	Good	Improbable: thin layer.	Improbable: too sandy.	Good.

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

TABLE 16.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation]

Map symbol and soil name	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
1---------- Brockwell	Moderate: seepage.	Severe: piping.	Deep to water	Slope----------	Slope----------	Slope.
2---------- Ceda	Severe: seepage.	Severe: seepage.	Deep to water	Flooding, droughty.	Favorable-----	Droughty.
3---------- Clarksville	Severe: seepage.	Moderate: seepage.	Deep to water	Droughty, slope.	Slope----------	Droughty, slope.
4---------- Clarksville	Severe: seepage, slope.	Moderate: seepage.	Deep to water	Droughty, slope.	Slope----------	Droughty, slope.
5:* Clarksville------	Severe: seepage.	Moderate: seepage.	Deep to water	Droughty, slope.	Slope----------	Slope, droughty.
Nixa----------	Slight---------	Moderate: seepage, piping.	Deep to water	Droughty, percs slowly.	Slope, rooting depth	Slope, rooting depth, droughty.
6---------- Cleora	Severe: seepage.	Severe: seepage, piping.	Deep to water	Flooding------	Favorable-----	Favorable.
7:* Eden----------	Moderate: depth to rock.	Moderate: hard to pack, thin layer, large stones.	Deep to water	Slope, depth to rock percs slowly.	Slope, percs slowly, depth to rock	Slope, depth to rock, percs slowly.
Moko----------	Severe: depth to rock, slope.	Severe: large stones.	Deep to water	Large stones, droughty, depth to rock	Slope, large stones, depth to rock	Large stones, slope, droughty.
8---------- Elsah	Severe: seepage.	Severe: seepage.	Deep to water	Flooding------	Favorable-----	Favorable.
9---------- Enders	Moderate: depth to rock.	Severe: hard to pack.	Deep to water	Percs slowly, slope.	Percs slowly.	Percs slowly.
10---------- Enders	Moderate: depth to rock.	Severe: hard to pack.	Deep to water	Percs slowly, slope, large stones.	Slope, large stones, percs slowly.	Slope, large stones, percs slowly.
11---------- Enders	Severe: slope.	Severe: hard to pack.	Deep to water	Percs slowly, slope, large stones.	Slope, large stones, percs slowly.	Slope, large stones, percs slowly.
12:* Estate----------	Moderate: depth to rock.	Moderate: thin layer, hard to pack, large stones.	Deep to water	Percs slowly, slope.	Slope, large stones, percs slowly.	Large stones, slope, percs slowly.
Portia----------	Moderate: seepage.	Moderate: piping.	Deep to water	Slope----------	Slope----------	Slope.
Moko----------	Severe: depth to rock.	Severe: large stones.	Deep to water	Large stones, droughty, depth to rock	Slope, large stones, depth to rock	Large stones, slope, droughty.

See footnote at end of table.

TABLE 16.--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
13:*						
Estate	Severe: slope.	Moderate: thin layer, hard to pack, large stones.	Deep to water	Percs slowly, slope.	Slope, large stones, percs slowly.	Large stones, slope, percs slowly.
Portia	Severe: slope.	Moderate: piping.	Deep to water	Slope	Slope	Slope.
Moko	Severe: depth to rock, slope.	Severe: large stones.	Deep to water	Large stones, droughty, depth to rock	Slope, large stones, depth to rock	Large stones, slope, droughty.
14--Healing	Moderate: seepage.	Severe: piping.	Deep to water	Erodes easily	Erodes easily	Erodes easily.
15, 16--Linker	Moderate: seepage, depth to rock.	Severe: piping.	Deep to water	Depth to rock, slope.	Depth to rock	Depth to rock.
17--Linker	Moderate: seepage, depth to rock.	Severe: piping.	Deep to water	Depth to rock, slope.	Slope, depth to rock	Slope, depth to rock
18:*						
Linker	Moderate: seepage, depth to rock.	Severe: piping.	Deep to water	Depth to rock, slope.	Depth to rock	Depth to rock.
Mountainburg	Severe: depth to rock, seepage.	Severe: large stones, thin layer.	Deep to water	Slope, large stones, depth to rock	Large stones, depth to rock	Large stones, droughty, depth to rock
19:*						
Linker	Moderate: seepage, depth to rock.	Severe: piping.	Deep to water	Depth to rock, slope.	Slope, depth to rock	Slope, depth to rock
Mountainburg	Severe: depth to rock, seepage.	Severe: large stones, thin layer.	Deep to water	Slope, large stones, depth to rock	Slope, large stones, depth to rock	Large stones, slope, droughty.
20:*						
Moko	Severe: depth to rock, slope.	Severe: large stones.	Deep to water	Large stones, droughty, depth to rock	Slope, large stones, depth to rock	Large stones, slope, droughty.
Estate	Severe: slope.	Moderate: thin layer, hard to pack, large stones.	Deep to water	Percs slowly, slope.	Slope, large stones, percs slowly.	Large stones, slope, percs slowly.
21:*						
Moko	Severe: depth to rock, slope.	Severe: large stones.	Deep to water	Large stones, droughty, depth to rock	Slope, large stones, depth to rock	Large stones, slope, droughty.
Rock outcrop.						
22--Mountainburg	Severe: depth to rock, seepage.	Severe: large stones, thin layer.	Deep to water	Slope, large stones, depth to rock	Slope, large stones, depth to rock	Large stones, slope, droughty.
23--Mountainburg	Severe: depth to rock, slope, seepage.	Severe: large stones, thin layer.	Deep to water	Slope, large stones, depth to rock	Slope, large stones, depth to rock	Large stones, slope, droughty.

See footnote at end of table.

TABLE 16.--WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
24:*						
Nella	Moderate: seepage.	Severe: piping.	Deep to water	Slope	Slope, large stones.	Large stones, slope.
Enders	Moderate: depth to rock.	Severe: hard to pack.	Deep to water	Percs slowly, slope, large stones.	Slope, large stones, percs slowly.	Slope, large stones, percs slowly.
25:*						
Nella	Severe: slope.	Severe: piping.	Deep to water	Slope	Slope, large stones.	Large stones, slope.
Enders	Severe: slope.	Severe: hard to pack.	Deep to water	Percs slowly, slope, large stones.	Slope, large stones, percs slowly.	Slope, large stones, percs slowly.
26:*						
Nella	Moderate: seepage.	Severe: piping.	Deep to water	Slope	Slope, large stones.	Large stones, slope.
Steprock	Moderate: seepage, depth to rock.	Severe: piping.	Deep to water	Droughty, depth to rock slope.	Slope, large stones, depth to rock	Large stones, slope, droughty.
27:*						
Nella	Severe: slope.	Severe: piping.	Deep to water	Slope	Slope, large stones.	Large stones, slope.
Steprock	Severe: slope.	Severe: piping.	Deep to water	Droughty, depth to rock slope.	Slope, large stones, depth to rock	Large stones, slope, droughty.
Mountainburg	Severe: depth to rock, slope, seepage.	Severe: large stones, thin layer.	Deep to water	Slope, large stones, depth to rock	Slope, large stones, depth to rock	Large stones, slope, droughty.
28 Newnata	Moderate: depth to rock.	Moderate: thin layer, hard to pack.	Deep to water	Percs slowly, slope, erodes easily	Erodes easily, percs slowly.	Erodes easily, percs slowly.
29:*						
Newnata	Moderate: depth to rock.	Moderate: thin layer, hard to pack, large stones.	Deep to water	Percs slowly, slope, erodes easily	Slope, large stones, erodes easily	Slope, large stones, erodes easily
Eden	Moderate: depth to rock.	Moderate: hard to pack, thin layer, large stones.	Deep to water	Slope, erodes easily percs slowly.	Slope, percs slowly.	Slope, percs slowly.
Moko	Severe: depth to rock.	Severe: large stones.	Deep to water	Large stones, droughty, depth to rock	Slope, large stones, depth to rock	Large stones, slope, droughty.
30:*						
Newnata	Severe: slope.	Moderate: thin layer, hard to pack, large stones.	Deep to water	Percs slowly, slope, erodes easily	Slope, large stones, erodes easily	Slope, large stones, erodes easily

See footnote at end of table.

TABLE 16.--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
30:*						
Eden	Severe: slope.	Moderate: hard to pack, thin layer, large stones.	Deep to water	Slope, erodes easily percs slowly.	Slope, percs slowly.	Slope, percs slowly.
Moko	Severe: depth to rock, slope.	Severe: large stones.	Deep to water	Large stones, droughty, depth to rock	Slope, large stones, depth to rock	Large stones, slope, droughty.
31 Nixa	Slight	Moderate: seepage, piping.	Deep to water	Droughty, percs slowly.	Rooting depth	Droughty, rooting depth.
32:*						
Nixa	Slight	Moderate: seepage, piping.	Deep to water	Droughty, percs slowly.	Rooting depth	Droughty, rooting depth.
Noark	Moderate: seepage.	Slight	Deep to water	Droughty, slope.	Favorable	Droughty.
33 Noark	Moderate: seepage.	Slight	Deep to water	Droughty, slope.	Favorable	Droughty.
34 Noark	Moderate: seepage.	Slight	Deep to water	Droughty, slope.	Slope	Slope, droughty.
35 Noark	Severe: slope.	Slight	Deep to water	Droughty, slope.	Slope	Slope, droughty.
36:*						
Noark	Moderate: seepage.	Slight	Deep to water	Droughty, slope.	Slope	Slope, droughty.
Nixa	Slight	Moderate: seepage, piping.	Deep to water	Droughty, percs slowly.	Slope, rooting depth	Slope, rooting depth, droughty.
37 Portia	Moderate: seepage.	Moderate: piping.	Deep to water	Slope	Favorable	Favorable.
38:*						
Ramsey	Severe: depth to rock.	Severe: piping.	Deep to water	Large stones, droughty, depth to rock	Slope, large stones, depth to rock	Large stones, slope, droughty.
Rock outcrop.						
39, 40 Razort	Moderate: seepage.	Severe: piping.	Deep to water	Erodes easily, flooding.	Erodes easily	Erodes easily.
41 Samba	Slight	Severe: hard to pack, wetness.	Percs slowly, flooding.	Wetness, percs slowly, erodes easily	Erodes easily, wetness, percs slowly.	Wetness, erodes easily percs slowly.
42, 43 Sidon	Moderate: depth to rock.	Severe: thin layer.	Percs slowly, slope.	Slope, percs slowly, rooting depth	Wetness, rooting depth erodes easily	Percs slowly, erodes easily rooting depth.
44 Spadra	Moderate: seepage.	Severe: piping.	Deep to water	Erodes easily	Erodes easily	Erodes easily.
45:*						
Steprock	Severe: slope.	Severe: piping.	Deep to water	Droughty, depth to rock slope.	Slope, large stones, depth to rock	Large stones, slope, droughty.

See footnote at end of table.

TABLE 16.--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
45:*						
Nella	Severe: slope.	Severe: piping.	Deep to water	Slope	Slope, large stones.	Large stones, slope.
Mountainburg	Severe: depth to rock, slope, seepage.	Severe: large stones, thin layer.	Deep to water	Slope, large stones, depth to rock	Slope, large stones, depth to rock	Large stones, slope, droughty.
46--- Sturkie	Moderate: seepage.	Severe: piping.	Deep to water	Erodes easily	Erodes easily	Erodes easily.
47--- Summit	Slight	Severe: hard to pack.	Percs slowly, slope.	Percs slowly, erodes easily	Erodes easily, wetness.	Erodes easily, percs slowly.
48--- Summit	Slight--- slope.	Severe: hard to pack.	Percs slowly, slope.	Wetness, percs slowly, erodes easily	Slope, erodes easily wetness.	Slope, erodes easily percs slowly.
49--- Wideman	Severe: seepage.	Severe: piping, seepage.	Deep to water	Droughty	Favorable	Droughty.

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

TABLE 17.--ENGINEERING INDEX PROPERTIES

[The symbol < means less than; > means more than. Absence of an entry indicates that 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---------- Brockwell	0-4	Sandy loam-------	SM SM-SC	A-4, A-2	0	95-100	75-100	60-95	30-60	<20	NP-5
	4-10	Fine sandy loam, sandy loam, loam.	SM, ML, CL-ML, SM-SC	A-4, A-2	0	95-100	75-100	60-95	30-60	<20	NP-5
	10-52	Fine sandy loam, loam, sandy clay loam.	SM, ML, CL-ML, SM-SC	A-4, A-2	0	95-100	60-100	50-95	30-60	<20	NP-5
	52-61	Fine sandy loam, loam, sandy clay loam.	SM, SM-SC	A-4, A-2	0	85-100	55-90	40-75	25-45	<25	NP-7
2---------- Ceda	0-13	Gravelly fine sandy loam.	SM, GM, SM-SC, GM-GC	A-1, A-2, A-4	0-10	55-75	50-75	30-50	13-45	<26	NP-7
	13-72	Very gravelly loam, very gravelly fine sandy loam, very gravelly clay loam.	GM, GP-GM, GM-GC	A-1, A-2, A-4, A-6	0-15	15-50	15-50	10-50	5-45	<40	NP-18
3, 4---------- Clarksville	0-22	Very cherty silt loam.	GC, SC, SM-SC, GP-GC	A-2, A-1	5-10	30-70	10-60	5-50	5-35	20-40	5-15
	22-40	Very cherty silty clay loam, very cherty silty clay.	GC, SC, SP-SC, GP-GC	A-2, A-6	5-10	30-70	10-60	10-50	5-45	30-40	15-25
	40-78	Very cherty silty clay, very cherty clay.	GC, SC, GP-GC, SP-SC	A-2, A-7	5-10	30-70	10-60	10-50	10-45	55-75	35-55
5:*											
Clarksville-----	0-22	Very cherty silt loam.	GC, SC, SM-SC, GP-GC	A-2, A-1	5-10	30-70	10-60	5-50	5-35	20-40	5-15
	22-40	Very cherty silty clay loam, very cherty silty clay.	GC, SC, SP-SC, GP-GC	A-2, A-6	5-10	30-70	10-60	10-50	5-45	30-40	15-25
	40-78	Very cherty silty clay, very cherty clay.	GC, SC, GP-GC, SP-SC	A-2-7, A-7	5-10	30-70	10-60	10-50	10-45	55-75	35-55
Nixa----------	0-8	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
	8-15	Very cherty silt loam, very cherty silty clay loam.	GC, GM, SC, SM	A-1, A-2, A-4	0-10	40-70	30-60	25-55	20-50	<30	NP-8
	15-38	Very cherty silt loam, very cherty silty clay loam.	GC, GM, SC, SM	A-1, A-2, A-4	0-10	40-70	30-60	25-55	20-50	<30	NP-8
	38-78	Very cherty silty clay, very cherty silty clay loam.	GM, GC, GP-GM, GM-GC	A-1, A-2	10-30	15-45	5-40	5-35	5-30	<30	NP-8
6---------- Cleora	0-13	Fine sandy loam	SM, SC, ML, CL	A-4	0	100	98-100	94-100	36-85	<31	NP-10
	13-72	Loam, fine sandy loam.	SM, SC, ML, CL	A-4	0	100	98-100	94-100	36-85	<31	NP-10

See footnote at end of table.

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
7:*											
Eden	0-4	Flaggy silty clay loam.	ML, CL, MH, CH	A-7, A-6	5-25	75-95	70-95	70-95	65-95	35-65	12-35
	4-28	Flaggy silty clay, flaggy clay, shaly silty clay.	MH, CH, CL	A-7	5-25	75-100	70-100	65-100	65-95	45-75	20-45
	28-50	Weathered bedrock	---	---	---	---	---	---	---	---	---
Moko	0-9	Very stony silty clay 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
	9-12	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
8	0-13	Cherty loam	CL	A-4, A-6	0-15	95-100	90-100	90-100	85-100	22-32	8-15
Elsah	13-63	Very cherty loam, very cherty silt loam.	SM, ML, CL, SC	A-2, A-4	15-40	80-90	70-85	60-80	30-70	<30	NP-8
9	0-6	Gravelly fine sandy 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
Enders	6-35	Silty clay, clay	CH	A-7	0	95-100	85-100	85-100	70-95	65-80	35-45
	35-48	Silty clay, shaly silty clay, shaly clay.	CH	A-7	0-5	95-100	90-100	85-100	70-95	65-80	35-45
	48-60	Weathered bedrock, unweathered bedrock.	---	---	---	---	---	---	---	---	---
10, 11	0-9	Very stony sandy 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
Enders	9-35	Silty clay, clay	CH	A-7	0	95-100	85-100	85-100	70-95	50-65	30-40
	35-48	Silty clay, shaly silty clay, shaly clay.	CH	A-7	0-5	95-100	85-100	85-100	70-95	50-65	30-40
	48-60	Weathered bedrock, unweathered bedrock.	---	---	---	---	---	---	---	---	---
12,* 13:*											
Estate	0-6	Stony fine sandy loam.	SM	A-2, A-4	10-30	75-100	60-100	55-80	20-50	<20	NP-3
	6-10	Sandy loam, clay loam, sandy clay loam.	ML, CL-ML, SM, SM-SC	A-2, A-4	0-20	80-100	70-100	40-80	30-60	<25	NP-5
	10-55	Clay, sandy clay, clay loam.	CH, CL	A-6, A-7	0-15	80-100	80-100	70-90	55-80	35-55	15-30
	55-57	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Portia	0-13	Fine sandy loam	SM, ML	A-4	0	100	85-100	70-85	35-60	---	NP
	13-27	Loam, sandy clay loam.	CL, ML, CL-ML	A-4, A-6	0	100	85-100	75-95	65-80	18-30	3-12
	27-42	Clay loam, loam, sandy clay loam.	CL	A-4, A-6	0	100	85-100	80-95	65-85	25-40	8-20
	42-78	Sandy clay, clay loam, sandy clay loam.	CL, CH, SC	A-4, A-6, A-7	0	100	85-100	80-95	36-75	25-55	8-30
Moko	0-9	Very stony 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
	9-12	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
14---------- Healing	0-12	Silt loam--------	ML, CL-ML	A-4	0	90-100	90-100	90-100	80-95	<30	NP-7
	12-58	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	90-100	90-100	90-100	85-95	20-35	5-15
	58-76	Silt loam, clay loam, gravelly silt loam.	GC, ML, CL, SC	A-4, A-6, A-2	0	60-100	50-100	35-85	25-80	27-40	4-17
15---------- Linker	0-5	Fine sandy loam	SM, ML	A-4	0	85-100	80-100	70-100	40-70	<30	NP-7
	5-27	Fine sandy loam, sandy clay loam, loam.	CL, SC, SM, ML	A-4, A-6	0	90-100	80-100	70-100	40-80	<40	NP-18
	27-35	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
	35-37	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
16, 17---------- Linker	0-5	Gravelly fine sandy loam.	ML, GM, SM	A-2, A-4	0-5	60-100	60-100	55-100	25-70	<30	NP-7
	5-27	Fine sandy loam, sandy clay loam, loam.	CL, SC, SM, ML	A-4, A-6	0-5	90-100	80-100	70-100	40-80	<40	NP-18
	27-35	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
	35-37	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
18,* 19:* Linker----------	0-5	Gravelly fine sandy loam.	ML, GM, SM	A-2, A-4	0-5	60-100	60-100	55-100	25-70	<30	NP-7
	5-27	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
	27-35	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
	35-37	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Mountainburg----	0-5	Stony sandy loam	GM	A-1, A-2	15-30	40-50	30-50	20-40	15-25	<20	NP
	5-13	Very gravelly sandy clay loam, very gravelly loam, very gravelly fine sandy loam.	GM, GC, GM-GC	A-1, A-2	15-25	40-60	30-50	25-50	20-30	<30	NP-10
	13-15	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
20:* Moko----------	0-9	Very stony 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
	9-12	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
20:*											
Estate	0-6	Stony fine sandy loam.	SM	A-2, A-4	10-30	75-100	60-100	55-80	20-50	<20	NP-3
	6-10	Sandy loam, clay loam, sandy clay loam.	ML, CL-ML, SM, SM-SC	A-2, A-4	0-20	80-100	70-100	40-80	30-60	<25	NP-5
	10-55	Clay, sandy clay, clay loam.	CH, CL	A-6, A-7	0-15	80-100	80-100	70-90	55-80	35-55	15-30
	55-57	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
21:*											
Moko	0-9	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
	9-12	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
22, 23 Mountainburg	0-5	Very stony sandy loam.	GM	A-1, A-2	30-65	40-50	30-50	20-40	15-25	<20	NP
	5-13	Very gravelly sandy clay loam, very gravelly loam, very gravelly fine sandy loam.	GM, GC, GM-GC	A-1, A-2	5-25	40-60	30-50	25-50	20-30	<30	NP-10
	13-15	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
24,* 25:*											
Nella	0-16	Stony sandy loam	ML, CL, SM, SC	A-4	10-30	90-100	85-90	65-75	36-55	<30	NP-8
	16-80	Gravelly clay loam, gravelly sandy clay loam.	CL, SC, CL-ML, SM-SC	A-4, A-6, A-2	0-10	75-95	60-90	45-70	30-60	25-40	6-20
Enders	0-9	Very stony sandy 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
	9-35	Silty clay, clay	CH	A-7	0	95-100	85-100	85-100	70-95	50-65	30-40
	35-48	Silty clay, shaly silty clay, shaly clay.	CH	A-7	0-5	95-100	85-100	85-100	70-95	50-65	30-40
	48-60	Weathered bedrock, unweathered bedrock.	---	---	---	---	---	---	---	---	---
26:*											
Nella	0-16	Stony sandy loam	ML, CL, SM, SC	A-4	10-30	90-100	85-90	65-75	36-55	<30	NP-8
	16-80	Gravelly clay loam, gravelly sandy clay loam.	CL, SC, CL-ML, SM-SC	A-4, A-6, A-2	0-10	75-95	60-90	45-70	30-60	25-40	6-20
Steprock	0-3	Very stony sandy loam.	SM, SM-SC, ML, CL-ML	A-2, A-4	25-45	70-90	60-85	55-85	30-65	<20	NP-5
	3-35	Very gravelly sandy clay loam, very gravelly loam, very gravelly sandy loam.	SM, GM, ML, CL-ML	A-2, A-4	5-25	45-80	40-70	40-65	30-65	18-25	NP-7
	35-60	Weathered bedrock	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
27:*											
Nella	0-16	Stony sandy loam	ML, CL, SM, SC	A-4	10-30	90-100	85-90	65-75	36-55	<30	NP-8
	16-80	Gravelly clay loam, gravelly sandy clay loam.	CL, SC, CL-ML, SM-SC	A-4, A-6, A-2	0-10	75-95	60-90	45-70	30-60	25-40	6-20
Steprock	0-3	Very stony sandy loam.	SM, SM-SC, ML, CL-ML	A-2, A-4	25-45	70-90	60-85	55-85	30-65	<20	NP-5
	3-35	Very gravelly sandy clay loam, very gravelly loam, very gravelly sandy loam.	SM, GM, ML, CL-ML	A-2, A-4	5-25	45-80	40-70	40-65	30-65	18-25	NP-7
	35-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Mountainburg	0-5	Very stony sandy loam.	GM	A-1, A-2	30-65	40-50	30-50	20-40	15-25	<20	NP
	5-13	Very gravelly sandy clay loam, very gravelly loam, very gravelly fine sandy loam.	GM, GC, GM-GC	A-1, A-2	5-25	40-60	30-50	25-50	20-30	<30	NP-10
	13-15	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
28 Newnata	0-5	Silt loam	CL, CL-ML	A-2, A-4, A-6	0-5	95-100	85-100	75-90	70-85	18-30	5-15
	5-8	Clay loam, silty clay loam, silty clay.	CL	A-4, A-6, A-7	0-10	90-100	80-95	70-90	60-80	30-45	10-25
	8-48	Silty clay loam, silty clay, clay.	CL, CH	A-6, A-7	0-10	95-100	85-95	75-95	70-90	40-60	20-35
	48-51	Weathered bedrock	---	---	---	---	---	---	---	---	---
	51-53	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
29,* 30:*											
Newnata	0-4	Stony silt loam	CL, CL-ML, SC, SM-SC	A-2, A-4, A-6	10-35	80-95	70-80	65-75	30-60	18-30	5-15
	4-8	Clay loam, silty clay loam, flaggy clay loam.	CL	A-4, A-6, A-7	0-15	90-100	75-95	70-90	60-80	30-45	5-15
	8-48	Silty clay loam, silty clay, clay.	CL, CH	A-6, A-7	0-10	95-100	85-95	75-95	70-90	40-60	20-35
	48-51	Weathered bedrock	---	---	---	---	---	---	---	---	---
	51-53	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Eden	0-4	Flaggy silty clay loam.	ML, CL, MH, CH	A-7, A-6	25-40	75-95	70-95	70-95	65-95	35-65	12-35
	4-28	Flaggy silty clay, flaggy clay, shaly silty clay.	MH, CH, CL	A-7	10-45	75-100	70-100	65-100	65-95	45-75	20-45
	28-50	Weathered bedrock	---	---	---	---	---	---	---	---	---
Moko	0-9	Very stony silty clay 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
	9-12	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
31---------- Nixa	0-8	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
	8-15	Very cherty silt loam, very cherty silty clay loam.	GC, GM, SC, SM	A-1, A-2, A-4	0-10	40-70	30-60	25-55	20-50	<30	NP-8
	15-38	Very cherty silt loam, very cherty silty clay loam.	GC, GM, SC, SM	A-1, A-2, A-4	0-10	40-70	30-60	25-55	20-50	<30	NP-8
	38-78	Very cherty silty clay, very cherty silty clay loam.	GM, GC, GP-GM, GM-GC	A-1, A-2	10-30	15-45	5-40	5-35	5-30	<30	NP-8
32:*											
Nixa----------	0-8	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
	8-15	Very cherty silt loam, very cherty silty clay loam.	GC, GM, SC, SM	A-1, A-2, A-4	0-10	40-70	30-60	25-55	20-50	<30	NP-8
	15-38	Very cherty silt loam, very cherty silty clay loam.	GC, GM, SC, SM	A-1, A-2, A-4	0-10	40-70	30-60	25-55	20-50	<30	NP-8
	38-78	Very cherty silty clay, very cherty silty clay loam.	GM, GC, GP-GM, GM-GC	A-1, A-2	10-30	15-45	5-40	5-35	5-30	<30	NP-8
Noark----------	0-12	Very cherty silt loam.	GM	A-2, A-1, A-4	0	20-50	20-50	20-50	15-45	<20	NP-3
	12-16	Very cherty silt loam, very cherty silty clay loam.	GC, GM-GC	A-2, A-4, A-6, A-1	0	20-50	20-50	20-50	15-45	20-35	5-15
	16-24	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
	24-78	Very cherty clay	GC, GM-GC, GP-GC	A-2	5-10	10-40	10-40	10-40	5-35	41-60	20-35
33, 34, 35------- Noark	0-12	Very cherty silt loam.	GM	A-2, A-1, A-4	0	20-50	20-50	20-50	15-45	<20	NP-3
	12-16	Very cherty silt loam, very cherty silty clay loam.	GC, GM-GC	A-2, A-4, A-6, A-1	0	20-50	20-50	20-50	15-45	20-35	5-15
	16-24	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
	24-78	Very cherty clay	GC, GM-GC, GP-GC	A-2	5-10	10-40	10-40	10-40	5-35	41-60	20-35
36:*											
Noark----------	0-12	Very cherty silt loam.	GM	A-2, A-1, A-4	0	20-50	20-50	20-50	15-45	<20	NP-3
	12-16	Very cherty silt loam, very cherty silty clay loam.	GC, GM-GC	A-2, A-4, A-6, A-1	0	20-50	20-50	20-50	15-45	20-35	5-15
	16-24	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
	24-78	Very cherty clay	GC, GM-GC, GP-GC	A-2	5-10	10-40	10-40	10-40	5-35	41-60	20-35

See footnote at end of table.

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
36:*											
Nixa	0-8	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
	8-15	Very cherty silt loam, very cherty silty clay loam.	GC, GM, SC, SM	A-1, A-2, A-4	0-10	40-70	30-60	25-55	20-50	<30	NP-8
	15-38	Very cherty silt loam, very cherty silty clay loam.	GC, GM, SC, SM	A-1, A-2, A-4	0-10	40-70	30-60	25-55	20-50	<30	NP-8
	38-78	Very cherty silty clay, very cherty silty clay loam.	GM, GC, GP-GM, GM-GC	A-1, A-2	10-30	15-45	5-40	5-35	5-30	<30	NP-8
37	0-13	Fine sandy loam	SM, ML	A-4	0	100	85-100	70-85	35-60	---	NP
Portia	13-27	Loam, sandy clay loam.	CL, ML, CL-ML	A-4, A-6	0	100	85-100	75-95	65-80	18-30	3-12
	27-42	Clay loam, loam, sandy clay loam.	CL	A-4, A-6	0	100	85-100	80-95	65-85	25-40	8-20
	42-78	Sandy clay, clay loam, clay.	CL, CH, SC	A-4, A-6, A-7	0	100	85-100	80-95	36-75	25-55	8-30
38:*											
Ramsey	0-5	Stony fine sandy loam.	SM, SC, ML, CL	A-4, A-2	15-30	75-90	65-85	50-75	34-65	18-25	2-8
	5-12	Sandy loam, gravelly sandy loam, gravelly fine sandy loam.	SM, SC	A-4, A-2	5-25	75-90	65-80	50-75	34-65	18-25	2-8
	12-15	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
39	0-8	Fine sandy loam	ML, CL-ML	A-4	0	80-100	80-100	65-90	65-90	<25	NP-7
Razort	8-49	Silt loam, loam, clay loam.	CL, CL-ML	A-4, A-6	0	85-100	85-100	75-85	70-80	25-40	7-15
	49-60	Gravelly silt loam, gravelly loam.	GM, SM, ML, CL-ML	A-2, A-4, A-1	0	35-75	30-70	25-65	20-60	<20	NP-7
40	0-8	Silt loam	ML, CL-ML	A-4	0	80-100	80-100	65-90	65-90	<25	NP-7
Razort	8-49	Silt loam, loam, clay loam.	CL, CL-ML	A-4, A-6	0	85-100	85-100	75-85	70-80	25-40	7-15
	49-60	Gravelly silt loam, gravelly loam.	GM, SM, ML, CL-ML	A-2, A-4, A-1	0	35-75	30-70	25-65	20-60	<20	NP-7
41	0-19	Silty clay loam	CL, CH	A-6, A-7	0	100	95-100	95-100	85-95	35-55	17-35
Samba	19-55	Silty clay, clay	CH, MH	A-7	0	100	90-100	90-100	85-100	55-70	25-40
	55-65	Silty clay, clay, silty clay loam.	CH, MH	A-7	0	65-100	60-100	60-100	55-100	55-70	25-40
42	0-6	Fine sandy loam	ML, CL-ML, CL	A-4	0	90-100	70-100	65-90	65-85	18-25	2-10
Sidon	6-23	Silty clay loam, clay loam, loam.	CL-ML, CL	A-4, A-6	0	90-100	75-100	65-90	60-75	20-37	5-18
	23-48	Clay loam, loam, gravelly clay loam.	CL, SC	A-4, A-6	0	95-100	50-100	40-94	35-70	20-35	8-15
	48-57	Clay loam, loam, gravelly clay loam.	CL, SC	A-2, A-4, A-6	0-5	80-100	45-100	35-85	25-60	20-30	8-15
	57-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
43---------- Sidon	0-6	Gravelly fine sandy loam.	ML, CL-ML, CL	A-4	0	90-100	70-100	65-90	65-85	15-25	2-10
	6-23	Silty clay loam, clay loam, loam.	CL-ML, CL	A-4, A-6	0	90-100	75-100	65-90	60-75	20-37	5-18
	23-48	Clay loam, loam, gravelly clay loam.	CL, SC	A-4, A-6	0	95-100	50-100	40-94	35-70	20-35	8-15
	48-57	Clay loam, loam, gravelly clay loam.	CL, SC	A-2, A-4, A-6	0-5	80-100	45-100	35-85	25-60	20-30	8-15
	57-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
44---------- Spadra	0-8	Fine sandy loam	ML, SM	A-2, A-4	0	85-100	80-100	65-80	30-75	<20	NP-3
	8-29	Loam, sandy clay loam.	CL, CL-ML	A-4, A-6	0	90-100	90-100	80-95	55-75	25-40	5-15
	29-72	Fine sandy loam, sandy loam, gravelly fine sandy loam.	ML, CL, SM, SC	A-4, A-2, A-1	0	70-100	70-100	40-85	20-65	<30	NP-10
45:*											
Steprock--------	0-3	Very stony sandy loam.	SM, SM-SC, ML, CL-ML	A-2, A-4	25-45	70-90	60-85	55-85	30-65	<20	NP-5
	3-35	Very gravelly sandy clay loam, very gravelly loam, very gravelly sandy loam.	SM, GM, ML, CL-ML	A-2, A-4	5-25	45-80	40-70	40-65	30-65	18-25	NP-7
	35-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Nella----------	0-16	Stony sandy loam	ML, CL, SM, SC	A-4	10-30	90-100	85-90	65-75	36-55	<30	NP-8
	16-80	Gravelly clay loam, gravelly sandy clay loam.	CL, SC, CL-ML, SM-SC	A-4, A-6, A-2	0-10	75-95	60-90	45-70	30-60	25-40	6-20
Mountainburg----	0-5	Very stony sandy loam.	GM	A-1, A-2	30-65	40-50	30-50	20-40	15-25	<20	NP
	5-13	Very gravelly sandy clay loam, very gravelly loam, very gravelly sandy loam.	GM, GC, GM-GC	A-1, A-2	35-25	40-60	30-50	25-50	20-30	<30	NP-10
	13-15	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
46---------- Sturkie	0-28	Silt loam--------	ML, CL-ML	A-4	0	100	90-100	80-100	70-90	<25	NP-7
	28-85	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	90-100	85-100	75-95	20-35	5-15
47, 48---------- Summit	0-10	Silty clay loam	CL, CH	A-6, A-7	0	90-100	90-100	85-100	80-99	35-60	11-30
	10-58	Clay, silty clay	CH, CL	A-7	0	85-100	85-100	80-100	80-98	41-70	18-40
	58-76	Clay, silty clay.	CH, CL	A-7	0	98-100	98-100	96-100	80-98	41-70	18-40
49---------- Wideman	0-14	Fine sandy loam	SM, ML	A-2, A-4	0	100	100	65-90	30-60	<20	NP-3
	14-30	Sandy loam, loamy fine sand, fine sand.	SP-SM, SM	A-2, A-3	0	100	100	60-100	15-35	---	NP
	30-34	Fine sandy loam, fine sand.	SM, ML, CL-ML, SM-SC	A-2, A-4	0	100	100	65-100	30-75	<25	NP-5
	34-49	Loamy sand, loamy fine sand, fine sand.	SM, SP-SM	A-2	0	100	70-100	50-75	10-35	---	NP
	49-85	Fine sandy loam, sandy loam, loamy fine sand.	SM, ML	A-2, A-4	0	100	95-100	65-90	25-55	<20	NP-3

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

TABLE 18.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

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

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	G/cm³	In/hr	In/in	pH				Pct
1----------	0-4	3-10	1.30-1.60	0.6-2.0	0.10-0.20	4.5-6.0	Low----------	0.28	5	.5-1
Brockwell	4-10	3-10	1.30-1.60	0.6-2.0	0.10-0.20	4.5-6.0	Low----------	0.28		
	10-52	10-20	1.30-1.60	0.6-2.0	0.12-0.20	4.5-6.0	Low----------	0.28		
	52-61	15-30	1.30-1.60	0.6-2.0	0.12-0.18	4.5-6.0	Low----------	0.24		
2----------	0-13	10-18	1.30-1.60	6.0-20	0.05-0.12	5.6-6.5	Low----------	0.17	5	.5-1
Ceda	13-72	15-32	1.40-1.70	6.0-20	0.02-0.16	5.6-6.5	Low----------	0.28		
3, 4----------	0-22	14-20	1.30-1.60	2.0-6.0	0.07-0.12	4.5-6.0	Low----------	0.28	2	1-2
Clarksville	22-40	25-35	1.40-1.65	2.0-6.0	0.06-0.10	4.5-5.5	Low----------	0.28		
	40-78	40-75	1.40-1.80	2.0-6.0	0.05-0.08	4.5-5.5	Low----------	0.28		
5:*										
Clarksville-----	0-22	14-20	1.30-1.60	2.0-6.0	0.07-0.12	4.5-6.0	Low----------	0.28	2	1-2
	22-40	25-35	1.40-1.65	2.0-6.0	0.06-0.10	4.5-5.5	Low----------	0.28		
	40-78	40-75	1.40-1.80	2.0-6.0	0.05-0.08	4.5-5.5	Low----------	0.28		
Nixa----------	0-8	5-25	1.30-1.60	0.6-2.0	0.08-0.10	4.5-5.5	Low----------	0.32	2	1-3
	8-15	20-35	1.30-1.60	0.2-0.6	0.08-0.10	4.5-5.5	Low----------	0.43		
	15-38	20-35	1.40-1.80	<0.06	0.05-0.08	4.5-5.5	Low----------	0.43		
	38-78	30-50	1.30-1.45	<0.06	0.03-0.06	4.5-5.5	Low----------	0.37		
6----------	0-13	10-18	---	2.0-6.0	0.11-0.20	5.6-7.3	Low----------	0.28	5	2-4
Cleora	13-72	10-18	---	2.0-6.0	0.11-0.20	5.6-7.3	Low----------	0.28		
7:*										
Eden----------	0-4	27-60	1.45-1.65	0.06-0.6	0.11-0.17	5.6-7.8	Moderate-----	0.17	4	.5-4
	4-28	40-60	1.45-1.65	0.06-0.2	0.08-0.13	5.6-7.8	Moderate-----	0.28		
	28-50	---	---	---	---	---	----------	0.17		
Moko----------	0-9	18-35	1.25-1.60	0.6-2.0	0.09-0.14	6.6-7.8	Low----------	0.24	1	2-6
	9-12	---	---	---	---	---	----------	----		
8----------	0-13	20-27	1.20-1.40	0.6-2.0	0.17-0.24	5.6-7.3	Low----------	0.28	3	1-4
Elsah	13-63	5-20	1.40-1.60	2.0-6.0	0.10-0.15	5.6-7.3	Low----------	0.17		
9----------	0-6	10-25	1.25-1.60	0.6-2.0	0.07-0.15	3.6-5.5	Low----------	0.32	3	1-3
Enders	6-35	35-60	1.15-1.45	<0.06	0.12-0.18	3.6-5.5	High----------	0.37		
	35-48	35-60	1.20-1.45	<0.06	0.08-0.10	3.6-5.5	Moderate-----	0.37		
	48-60	---	---	---	---	---	----------	----		
10, 11----------	0-9	10-25	1.25-1.60	0.6-2.0	0.15-0.22	3.6-5.5	Low----------	0.32	3	1-3
Enders	9-35	35-60	1.15-1.45	<0.06	0.09-0.13	3.6-5.5	High----------	0.37		
	35-48	35-60	1.25-1.45	<0.06	0.11-0.13	3.6-5.5	Moderate-----	0.37		
	48-60	---	---	---	---	---	----------	----		
12,* 13:*										
Estate----------	0-6	5-20	1.40-1.60	0.6-6.0	0.07-0.15	5.1-7.3	Low----------	0.15	3	2-5
	6-10	20-35	1.30-1.50	0.6-2.0	0.10-0.18	5.1-7.3	Low----------	0.32		
	10-55	35-55	1.20-1.40	0.06-0.2	0.12-0.18	5.6-7.3	Moderate-----	0.28		
	55-57	---	---	---	---	---	----------	----		
Portia----------	0-13	7-20	1.30-1.60	0.6-2.0	0.11-0.15	5.1-6.5	Low----------	0.24	3	1-3
	13-27	18-35	1.30-1.60	0.6-2.0	0.15-0.24	4.5-6.0	Low----------	0.32		
	27-42	20-40	1.30-1.60	0.2-2.0	0.10-0.17	4.5-6.0	Low----------	0.32		
	42-78	20-40	1.20-1.60	0.2-2.0	0.12-0.20	5.1-6.0	Moderate-----	0.28		
Moko----------	0-9	18-35	1.25-1.60	0.6-2.0	0.09-0.14	6.6-7.8	Low----------	0.24	1	2-6
	9-12	---	---	---	---	---	----------	----		

See footnote at end of table.

TABLE 18.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	G/cm³	In/hr	In/in	pH				Pct
14----------	0-12	10-25	1.25-1.50	0.6-2.0	0.16-0.24	5.6-6.5	Low----------	0.37	5	2-4
Healing	12-58	20-35	1.25-1.45	0.6-2.0	0.16-0.24	5.6-6.5	Low----------	0.37		
	58-76	20-35	1.25-1.60	0.6-2.0	0.13-0.19	5.6-6.5	Low----------	0.37		
15----------	0-5	5-20	1.30-1.60	0.6-2.0	0.11-0.20	3.6-5.5	Low----------	0.28	3	.5-2
Linker	5-27	18-35	1.30-1.60	0.6-2.0	0.11-0.20	3.6-5.5	Low----------	0.32		
	27-35	18-35	1.30-1.60	0.6-2.0	0.08-0.20	3.6-5.5	Low----------	0.28		
	35-37	---	---	---	---	---	----------	----		
16, 17----------	0-5	5-20	1.30-1.60	0.6-2.0	0.11-0.17	3.6-5.5	Low----------	0.24	3	.5-2
Linker	5-27	18-35	1.30-1.60	0.6-2.0	0.11-0.20	3.6-5.5	Low----------	0.32		
	27-35	18-35	1.30-1.60	0.6-2.0	0.08-0.20	3.6-5.5	Low----------	0.28		
	35-37	---	---	---	---	---	----------	----		
18,* 19:*										
Linker----------	0-5	5-20	1.30-1.60	0.6-2.0	0.11-0.17	3.6-5.5	Low----------	0.24	3	.5-2
	5-27	18-35	1.30-1.60	0.6-2.0	0.11-0.20	3.6-5.5	Low----------	0.32		
	27-35	18-35	1.30-1.60	0.6-2.0	0.08-0.20	3.6-5.5	Low----------	0.28		
	35-37	---	---	---	---	---	----------	----		
Mountainburg----	0-5	4-12	1.30-1.60	2.0-6.0	0.05-0.10	5.1-6.0	Low----------	0.17	1	1-3
	5-13	10-25	1.30-1.60	2.0-6.0	0.05-0.10	4.5-5.5	Low----------	0.24		
	13-15	---	---	---	---	---	----------	----		
20:*										
Moko----------	0-9	18-35	1.25-1.60	0.6-2.0	0.09-0.14	6.6-7.8	Low----------	0.24	1	2-6
	9-12	---	---	---	---	---	----------	----		
Estate----------	0-6	5-20	1.40-1.60	0.6-6.0	0.07-0.15	5.1-7.3	Low----------	0.15	3	2-5
	6-10	20-35	1.30-1.50	0.6-2.0	0.10-0.18	5.1-7.3	Low----------	0.32		
	10-55	35-55	1.20-1.40	0.06-0.2	0.12-0.18	5.6-7.3	Moderate-----	0.28		
	55-57	---	---	---	---	---	----------	----		
21:*										
Moko----------	0-9	18-35	1.25-1.60	0.6-2.0	0.09-0.14	6.6-7.8	Low----------	0.24	1	2-6
	9-12	---	---	---	---	---	----------	----		
Rock outcrop.										
22, 23----------	0-5	3-10	1.30-1.60	2.0-6.0	0.05-0.10	5.1-6.0	Low----------	0.15	1	1-3
Mountainburg	5-13	10-25	1.30-1.60	2.0-6.0	0.05-0.10	4.5-5.5	Low----------	0.24		
	13-15	---	---	---	---	---	----------	----		
24,* 25:*										
Nella----------	0-16	20-35	1.30-1.50	0.6-2.0	0.08-0.15	4.5-5.5	Low----------	0.15	5	.5-3
	16-80	22-35	1.35-1.60	0.6-2.0	0.07-0.14	4.5-5.5	Low----------	0.20		
Enders----------	0-9	10-25	1.25-1.60	0.6-2.0	0.15-0.22	3.6-5.5	Low----------	0.32	3	1-3
	9-35	35-60	1.15-1.45	<0.06	0.09-0.13	3.6-5.5	High----------	0.24		
	35-48	35-60	1.25-1.45	<0.06	0.11-0.13	3.6-5.5	Moderate-----	0.24		
	48-60	---	---	---	---	---	----------	----		
26:*										
Nella----------	0-16	20-35	1.30-1.50	0.6-2.0	0.08-0.15	4.5-5.5	Low----------	0.15	5	.5-3
	16-80	22-35	1.35-1.60	0.6-2.0	0.07-0.14	4.5-5.5	Low----------	0.20		
Steprock--------	0-3	8-18	1.30-1.60	2.0-6.0	0.04-0.08	4.5-5.5	Low----------	0.17	3	.5-2
	3-35	10-35	1.30-1.60	0.6-2.0	0.06-0.10	4.5-5.5	Low----------	0.17		
	35-60	---	---	---	---	---	----------	----		
27:*										
Nella----------	0-16	20-35	1.30-1.50	0.6-2.0	0.08-0.15	4.5-5.5	Low----------	0.15	5	.5-3
	16-80	22-35	1.35-1.60	0.6-2.0	0.07-0.14	4.5-5.5	Low----------	0.20		
Steprock--------	0-3	8-18	1.30-1.60	2.0-6.0	0.04-0.08	4.5-5.5	Low----------	0.17	3	.5-2
	3-35	10-35	1.30-1.60	0.6-2.0	0.06-0.10	4.5-5.5	Low----------	0.17		
	35-60	---	---	---	---	---	----------	----		

See footnote at end of table.

TABLE 18.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	G/cm³	In/hr	In/in	pH				Pct
27:*										
Mountainburg	0-5	3-10	1.30-1.60	2.0-6.0	0.05-0.10	5.1-6.0	Low	0.15	1	1-3
	5-13	10-25	1.30-1.60	2.0-6.0	0.05-0.10	4.5-5.5	Low	0.24		
	13-15	---	---	---	---	---	---	---		
28	0-5	15-35	1.25-1.60	0.6-2.0	0.15-0.24	5.1-6.5	Low	0.43	3	1-5
Newnata	5-8	25-40	1.25-1.55	0.2-0.6	0.12-0.22	5.1-7.8	Moderate	0.37		
	8-48	35-55	1.15-1.50	0.06-0.2	0.12-0.18	5.1-7.8	High	0.32		
	48-51	---	---	---	---	---	---	---		
	51-53	---	---	---	---	---	---	---		
29,* 30:*										
Newnata	0-4	15-35	1.25-1.60	0.6-2.0	0.10-0.18	5.1-6.5	Low	0.37	3	1-5
	4-8	25-40	1.25-1.55	0.2-0.6	0.12-0.22	5.1-7.8	Moderate	0.37		
	8-48	35-55	1.15-1.50	0.06-0.2	0.12-0.18	5.1-7.8	High	0.32		
	48-51	---	---	---	---	---	---	---		
	51-53	---	---	---	---	---	---	---		
Eden	0-4	27-60	1.45-1.65	0.06-0.6	0.11-0.17	5.6-7.8	Moderate	0.17	3	.5-4
	4-28	40-60	1.45-1.65	0.06-0.2	0.08-0.13	5.6-7.8	Moderate	0.28		
	28-50	---	---	---	---	---	---	0.17		
Moko	0-9	18-35	1.25-1.60	0.6-2.0	0.09-0.14	6.6-7.8	Low	0.24	1	2-6
	9-12	---	---	---	---	---	---	---		
31	0-8	5-25	1.30-1.60	0.6-2.0	0.08-0.10	4.5-5.5	Low	0.32	2	1-3
Nixa	8-15	20-35	1.30-1.60	0.2-0.6	0.08-0.10	4.5-5.5	Low	0.43		
	15-38	20-35	1.40-1.80	<0.06	0.05-0.08	4.5-5.5	Low	0.43		
	38-78	30-50	1.30-1.45	<0.06	0.03-0.06	4.5-5.5	Low	0.37		
32:*										
Nixa	0-8	5-25	1.30-1.60	0.6-2.0	0.08-0.10	4.5-5.5	Low	0.32	2	1-3
	8-15	20-35	1.30-1.60	0.2-0.6	0.08-0.10	4.5-5.5	Low	0.43		
	15-38	20-35	1.40-1.80	<0.06	0.05-0.08	4.5-5.5	Low	0.43		
	38-78	30-50	1.30-1.45	<0.06	0.03-0.06	4.5-5.5	Low	0.37		
Noark	0-12	10-25	1.30-1.50	0.6-2.0	0.10-0.14	5.1-6.5	Low	0.28	3	1-3
	12-16	30-40	1.30-1.50	0.6-2.0	0.10-0.14	4.5-5.5	Low	0.28		
	16-24	45-75	1.20-1.50	0.6-2.0	0.09-0.13	4.5-5.5	Low	0.24		
	24-78	45-75	1.15-1.45	0.6-2.0	0.06-0.09	4.5-5.5	Low	0.24		
33, 34, 35	0-12	10-25	1.30-1.50	0.6-2.0	0.10-0.14	5.1-6.5	Low	0.28	3	1-3
Noark	12-16	30-40	1.30-1.50	0.6-2.0	0.10-0.14	4.5-5.5	Low	0.28		
	16-24	45-75	1.20-1.50	0.6-2.0	0.09-0.13	4.5-5.5	Low	0.24		
	24-78	45-75	1.15-1.45	0.6-2.0	0.06-0.09	4.5-5.5	Low	0.24		
36:*										
Noark	0-12	10-25	1.30-1.50	0.6-2.0	0.10-0.14	5.1-6.5	Low	0.28	3	1-3
	12-16	30-40	1.30-1.50	0.6-2.0	0.10-0.14	4.5-5.5	Low	0.28		
	16-24	45-75	1.20-1.50	0.6-2.0	0.09-0.13	4.5-5.5	Low	0.24		
	24-78	45-75	1.15-1.45	0.6-2.0	0.06-0.09	4.5-5.5	Low	0.24		
Nixa	0-8	5-25	1.30-1.60	0.6-2.0	0.08-0.10	4.5-5.5	Low	0.32	2	1-3
	8-15	20-35	1.30-1.60	0.2-0.6	0.08-0.10	4.5-5.5	Low	0.43		
	15-38	20-35	1.40-1.80	<0.06	0.05-0.08	4.5-5.5	Low	0.43		
	38-78	30-50	1.30-1.45	<0.06	0.03-0.06	4.5-5.5	Low	0.37		
37	0-13	7-20	1.30-1.60	0.6-2.0	0.11-0.15	5.1-6.5	Low	0.24	3	1-3
Portia	13-27	18-35	1.30-1.60	0.6-2.0	0.15-0.24	4.5-6.0	Low	0.32		
	27-42	20-40	1.30-1.60	0.2-2.0	0.10-0.17	4.5-6.0	Low	0.32		
	42-78	20-40	1.20-1.60	0.2-2.0	0.12-0.20	5.1-6.0	Moderate	0.28		
38:*										
Ramsey	0-5	3-10	1.30-1.60	6.0-20	0.06-0.10	4.5-5.5	Low	0.17	1	1-3
	5-12	10-22	1.30-1.60	2.0-6.0	0.06-0.10	4.5-5.5	Low	0.17		
Rock outcrop.										

See footnote at end of table.

TABLE 18.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	G/cm^3	In/hr	In/in	pH				Pct
39, 40----------	0-8	10-25	1.25-1.60	0.6-2.0	0.10-0.22	6.1-7.3	Low----------	0.37	5	1-3
Razort	8-49	18-30	1.25-1.60	0.6-2.0	0.13-0.22	5.6-6.5	Low----------	0.37		
	49-60	10-25	1.25-1.50	2.0-6.0	0.08-0.12	5.6-6.5	Low----------	0.32		
41----------	0-19	27-35	1.25-1.50	0.2-0.6	0.18-0.22	5.6-6.5	Moderate-----	0.43	5	2-4
Samba	19-55	27-55	1.25-1.50	<0.06	0.12-0.18	5.6-7.3	High---------	0.37		
	55-65	27-55	1.25-1.50	<0.06	0.12-0.16	5.6-7.3	High---------	0.37		
42, 43----------	0-6	8-25	1.20-1.40	0.6-2.0	0.13-0.24	4.5-5.5	Low----------	0.43	3	.5-2
Sidon	6-23	18-35	1.20-1.40	0.6-2.0	0.15-0.24	4.5-5.5	Low----------	0.43		
	23-48	18-40	1.40-1.60	0.06-0.6	0.08-0.15	4.5-5.5	Low----------	0.37		
	48-57	18-35	1.30-1.60	0.06-0.6	0.12-0.20	4.5-5.5	Low----------	0.32		
	57-60	---	---	---	---	---	----------	----		
44----------	0-8	10-26	1.30-1.60	0.6-2.0	0.11-0.24	4.5-6.0	Low----------	0.37	5	1-3
Spadra	8-29	18-32	1.30-1.60	0.6-2.0	0.12-0.20	4.5-6.0	Low----------	0.37		
	29-72	15-25	1.30-1.60	0.6-2.0	0.10-0.15	4.5-6.0	Low----------	0.24		
45:*										
Steprock--------	0-3	8-18	1.30-1.60	2.0-6.0	0.04-0.08	4.5-5.5	Low----------	0.17	3	.5-2
	3-35	10-35	1.30-1.60	0.6-2.0	0.06-0.10	4.5-5.5	Low----------	0.17		
	35-60	---	---	---	---	---	----------	----		
Nella----------	0-16	20-35	1.30-1.50	0.6-2.0	0.08-0.15	4.5-5.5	Low----------	0.15	5	.5-3
	16-80	22-35	1.35-1.60	0.6-2.0	0.07-0.14	4.5-5.5	Low----------	0.20		
Mountainburg----	0-5	3-10	1.30-1.60	2.0-6.0	0.05-0.10	5.1-6.0	Low----------	0.15	1	1-3
	5-13	10-25	1.30-1.60	2.0-6.0	0.05-0.10	4.5-5.5	Low----------	0.24		
	13-15	---	---	---	---	---	----------	----		
46----------	0-28	10-27	1.20-1.40	0.6-2.0	0.14-0.24	6.1-7.3	Low----------	0.37	5	1-4
Sturkie	28-85	15-35	1.20-1.40	0.6-2.0	0.16-0.24	6.1-8.4	Low----------	0.37		
47, 48----------	0-10	27-45	1.25-1.50	0.2-0.6	0.16-0.20	5.6-7.3	Moderate-----	0.37	5	2-4
Summit	10-58	40-60	1.35-1.60	0.06-0.2	0.10-0.18	6.1-8.4	High---------	0.32		
	58-76	35-55	1.40-1.65	0.06-0.2	0.10-0.18	6.1-8.4	High---------	0.32		
49----------	0-14	4-18	1.40-1.60	2.0-6.0	0.07-0.15	5.1-6.0	Low----------	0.17	5	.5-1
Wideman	14-30	2-15	1.40-1.60	>6.0	0.06-0.14	5.6-7.3	Low----------	0.17		
	30-34	5-18	1.30-1.50	2.0-6.0	0.06-0.20	5.6-7.3	Low----------	0.20		
	34-49	2-12	1.40-1.60	>6.0	0.05-0.11	5.6-7.3	Low----------	0.17		
	49-85	5-18	1.30-1.50	2.0-6.0	0.10-0.15	5.6-7.3	Low----------	0.17		

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

TABLE 19.--SOIL AND WATER FEATURES

["Flooding" and "high water table" and terms such as "rare," "brief," and "perched" are explained in the text. The symbol > means more than. Absence of an entry indicates that the feature is not a concern]

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---------- Brockwell	B	None--------	---	---	>6.0	---	---	>60	---	Low------	Moderate.
2---------- Ceda	B	Frequent----	Very brief	Jan-May	>6.0	---	---	>60	---	Low------	Moderate.
3, 4---------- Clarksville	B	None--------	---	---	>6.0	---	---	>60	---	Low------	High.
5:*											
Clarksville------	B	None--------	---	---	>6.0	---	---	>60	---	Low------	High.
Nixa----------	C	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
6---------- Cleora	B	Occasional	Very brief	Jan-May	>6.0	---	---	>60	---	Low------	Moderate.
7:*											
Eden----------	C	None--------	---	---	>6.0	---	---	20-40	Soft	Moderate	Low.
Moko----------	D	None--------	---	---	>6.0	---	---	6-20	Hard	Low------	Low.
8---------- Elsah	B	Frequent----	Very brief	Dec-May	>6.0	---	---	>60	---	Low------	Moderate.
9, 10, 11--------- Enders	C	None--------	---	---	>6.0	---	---	40-60	Soft	High-----	High.
12,* 13:*											
Estate----------	C	None--------	---	---	>6.0	---	---	40-60	Hard	Moderate	Moderate.
Portia----------	C	None--------	---	---	>6.0	---	---	>60	---	High-----	High.
Moko----------	D	None--------	---	---	>6.0	---	---	6-20	Hard	Low------	Low.
14---------- Healing	B	Rare--------	---	---	>6.0	---	---	>60	---	Low------	Moderate.
15, 16, 17-------- Linker	B	None--------	---	---	>6.0	---	---	20-40	Hard	Low------	High.
18,* 19:*											
Linker----------	B	None--------	---	---	>6.0	---	---	20-40	Hard	Low------	High.
Mountainburg-----	D	None--------	---	---	>6.0	---	---	12-20	Hard	Low------	Moderate.
20:*											
Moko----------	D	None--------	---	---	>6.0	---	---	6-20	Hard	Low------	Low.
Estate----------	C	None--------	---	---	>6.0	---	---	40-60	Hard	Moderate	Moderate.
21:*											
Moko----------	D	None--------	---	---	>6.0	---	---	6-20	Hard	Low------	Low.
Rock outcrop.											
22, 23---------- Mountainburg	D	None--------	---	---	>6.0	---	---	12-20	Hard	Low------	Moderate.
24,* 25:*											
Nella----------	B	None--------	---	---	>6.0	---	---	>60	---	Low------	Moderate.
Enders----------	C	None--------	---	---	>6.0	---	---	40-60	Soft	High-----	High.
26:*											
Nella----------	B	None--------	---	---	>6.0	---	---	>60	---	Low------	Moderate.

See footnote at end of table.

TABLE 19.--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			
26:* Steprock	B	None	---	---	>6.0	---	---	20-40	Soft	Low	High.
27:* Nella	B	None	---	---	>6.0	---	---	>60	---	Low	Moderate.
Steprock	B	None	---	---	>6.0	---	---	20-40	Soft	Low	High.
Mountainburg	D	None	---	---	>6.0	---	---	12-20	Hard	Low	Moderate.
28 Newnata	C	None	---	---	>6.0	---	---	40-60	Hard	High	Moderate.
29,* 30:* Newnata	C	None	---	---	>6.0	---	---	40-60	Hard	High	Moderate.
Eden	C	None	---	---	>6.0	---	---	20-40	Soft	Moderate	Low.
Moko	D	None	---	---	>6.0	---	---	6-20	Hard	Low	Low.
31 Nixa	C	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
32:* Nixa	C	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
Noark	B	None	---	---	>6.0	---	---	>60	---	Moderate	High.
33, 34, 35 Noark	B	None	---	---	>6.0	---	---	>60	---	Moderate	High.
36:* Noark	B	None	---	---	>6.0	---	---	>60	---	Moderate	High.
Nixa	C	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
37 Portia	C	None	---	---	>6.0	---	---	>60	---	High	High.
38:* Ramsey	D	None	---	---	>6.0	---	---	7-20	Hard	Low	Moderate.
Rock outcrop.											
39, 40 Razort	B	Frequent	Very brief to brief.	Dec-Apr	>6.0	---	---	>60	---	Low	Low.
41 Samba	D	Occasional	Very brief	Jan-May	0-1.0	Perched	Dec-Apr	>60	---	High	Moderate.
42, 43 Sidon	C	None	---	---	2.0-3.0	Perched	Jan-Apr	40-60	Hard	Moderate	Moderate.
44 Spadra	B	Rare	---	---	>6.0	---	---	>60	---	Low	High.
45:* Steprock	B	None	---	---	>6.0	---	---	20-40	Soft	Low	High.
Nella	B	None	---	---	>6.0	---	---	>60	---	Low	Moderate.
Mountainburg	D	None	---	---	>6.0	---	---	12-20	Hard	Low	Moderate.
46 Sturkie	B	Rare	---	---	>6.0	---	---	>60	---	Low	Low.
47, 48 Summit	C	None	---	---	2.0-3.0	Perched	Dec-Apr	>60	---	High	Low.
49 Wideman	A	Rare	---	---	>6.0	---	---	>60	---	Low	Low.

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

TABLE 20.--ENGINEERING INDEX TEST DATA

Soil name and sample number	Depth	Horizon	Classification		Percentage passing sieve number			Liquid limit	Plasticity index	Moisture density	
			AASHTO	Unified	10 (2.0 mm)	40 (0.42 mm)	200 (0.074 mm)			Maximum dry density	Optimum moisture
	In							Pct			Pct
Estate stony fine sandy loam: S79-AR137-1 (1-2, 1-3)	3-6	A2	A-2-4(0)	SM	99.7	97.1	30.6	--	NP	119.8	10.6
	10-28	B21t	A-6(7)	CL	99.8	98.1	63.6	35	14	105.4	20.1

TABLE 21.--PHYSICAL ANALYSES OF SELECTED SOILS

Soil name sample number	Depth	Horizon	Particle-size distribution					
			Very coarse sand through medium sand (2.0-0.25 mm)	Fine sand (0.25-0.10 mm)	Very fine sand (0.10-0.05 mm)	Total sand (2.0-0.05 mm)	Silt (0.05-0.002 mm)	Clay (<0.002 mm)
	In		Percent less than 2.0 millimeters					
Estate stony fine sandy loam: S79-AR137-1 (1-6)	0-3	A1	24.8	29.3	14.9	69.0	24.9	6.1
	3-6	A2	24.6	30.4	5.4	60.4	32.9	6.7
	6-10	B1	23.1	40.3	6.1	69.5	21.9	8.6
	10-28	B21t	12.7	16.0	3.2	31.9	13.1	55.0
	28-46	B22t	13.2	16.5	2.5	32.2	10.5	57.3
	46-55	B23t	12.9	16.6	2.8	32.3	13.1	54.6

TABLE 22.--CHEMICAL ANALYSES OF SELECTED SOILS

Soil and sample number	Depth	Horizon	Extractable bases				Extractable acidity	Base saturation	Reaction (1:1 soil water)	Organic matter
			Ca	Mg	Na	K				
	In		milliequivalents per 100 grams of soil					Pct	pH	Pct
Estate stony fine sandy loam: S79-AR137-1 (1-6)	0-3	A1	11.3	1.9	0.0	0.2	5.0	73	7.0	4.4
	3-6	A2	5.2	1.0	0.0	0.1	5.1	55	6.2	1.8
	6-10	B1	1.0	0.0	0.0	0.0	5.7	23	5.3	0.8
	10-28	B21t	14.7	3.3	0.0	0.6	15.1	55	6.4	1.3
	28-46	B22t	13.5	2.9	0.0	0.6	12.7	57	6.2	0.7
	46-55	B23t	18.4	1.9	0.0	0.4	12.3	63	6.7	0.6

TABLE 23.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Brockwell	Coarse-loamy, siliceous, mesic Typic Paleudults
Ceda	Loamy-skeletal, siliceous, nonacid, thermic Typic Udifluvents
Clarksville	Loamy-skeletal, siliceous, mesic Typic Paleudults
Cleora	Coarse-loamy, mixed, thermic Fluventic Hapludolls
Eden	Fine, mixed, mesic Typic Hapludalfs
Elsah	Loamy-skeletal, mixed, nonacid, mesic Typic Udifluvents
Enders	Clayey, mixed, thermic Typic Hapludults
Estate	Fine, mixed, mesic Typic Hapludalfs
Healing	Fine-silty, mixed, mesic Typic Argiudolls
Linker	Fine-loamy, siliceous, thermic Typic Hapludults
Moko	Loamy-skeletal, mixed, mesic Lithic Hapludolls
Mountainburg	Loamy-skeletal, siliceous, thermic Lithic Hapludults
Nella	Fine-loamy, siliceous, thermic Typic Paleudults
Newnata	Fine, mixed, mesic Typic Hapludalfs
Nixa	Loamy-skeletal, siliceous, mesic Glossic Fragiudults
Noark	Clayey-skeletal, mixed, mesic Typic Paleudults
Portia	Fine-loamy, siliceous, mesic Typic Paleudalfs
Ramsey	Loamy, siliceous, mesic Lithic Dystrochrepts
Razort	Fine-loamy, mixed, mesic Mollic Hapludalfs
Samba	Fine, mixed, thermic Typic Umbraqualfs
Sidon	Fine-loamy, siliceous, thermic Typic Fragiudults
Spadra	Fine-loamy, siliceous, thermic Typic Hapludults
Steprock	Loamy-skeletal, siliceous, thermic Typic Hapludults
Sturkie	Fine-silty, mixed, mesic Cumulic Hapludolls
*Summit	Fine, montmorillonitic, thermic Vertic Argiudolls
Wideman	Sandy, siliceous, mesic Typic Udifluvents

* Taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series.

☆ U.S. GOVERNMENT PRINTING OFFICE: 1983 O - 388-201 QL3

NRCS Accessibility Statement

This document is not accessible by screen-reader software. The Natural Resources Conservation Service (NRCS) is committed to making its information accessible to all of its customers and employees. If you are experiencing accessibility issues and need assistance, please contact our Helpdesk by phone at 1-800-457-3642 or by e-mail at ServiceDesk-FTC@ftc.usda.gov. For assistance with publications that include maps, graphs, or similar forms of information, you may also wish to contact our State or local office. You can locate the correct office and phone number at http://offices.sc.egov.usda.gov/locator/app.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.