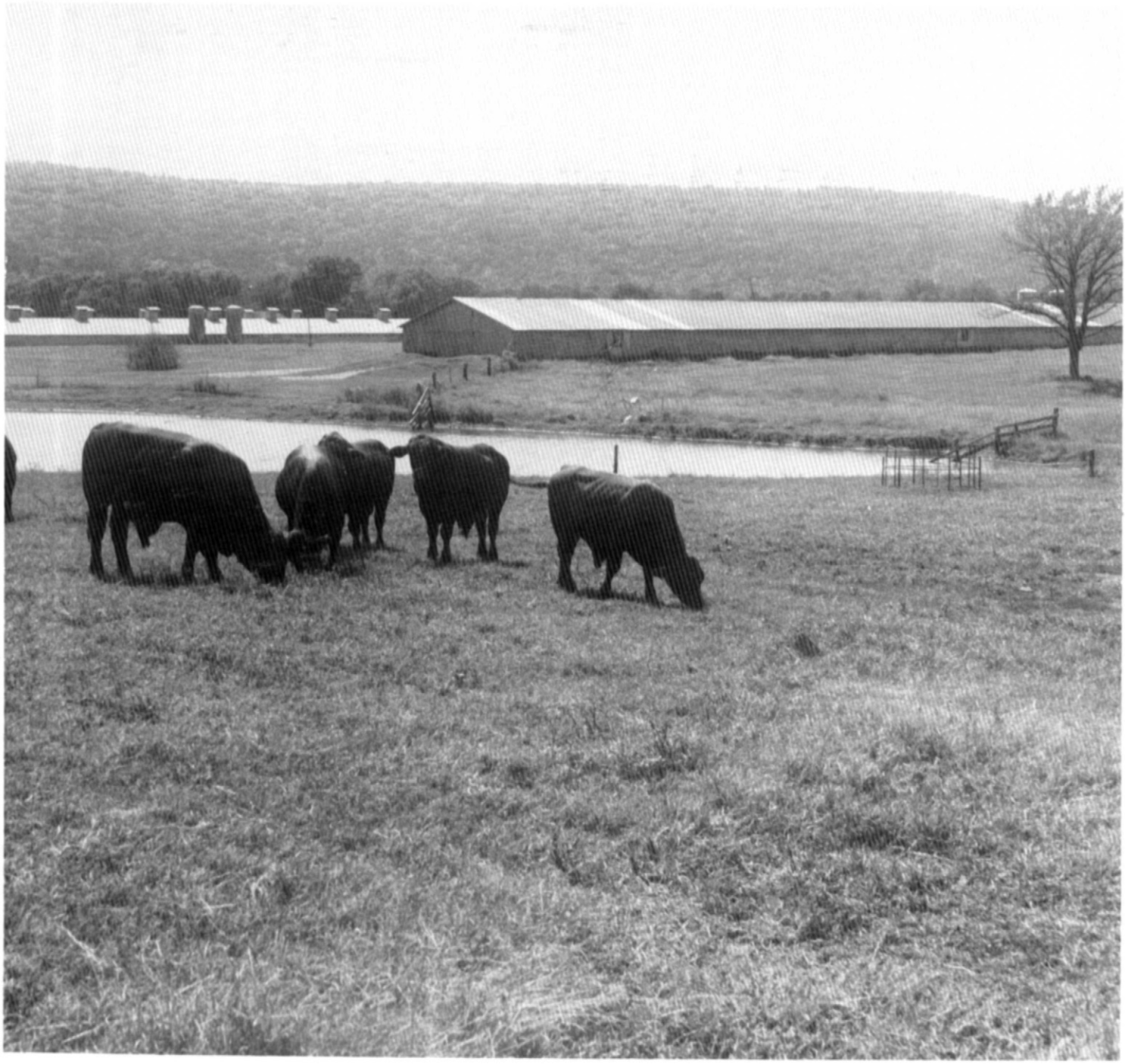
United States Department of Agriculture

Soil Conservation Service

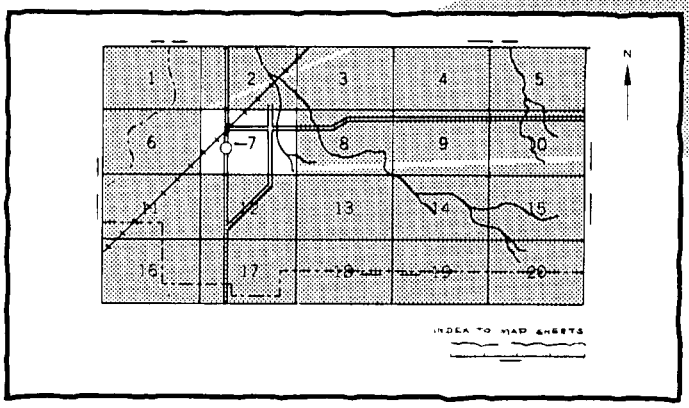
In cooperation with United States Department of Agriculture Forest Service and the Arkansas Agricultural Experiment Station

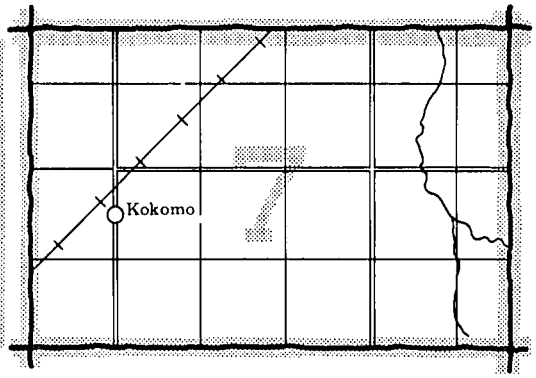
Soil Survey of Yell County, Arkansas



HOW TO USE

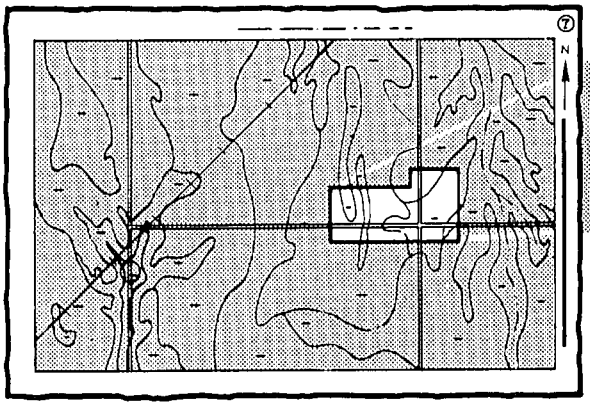
1. Locate your area of interest on the "Index to Map Sheets."

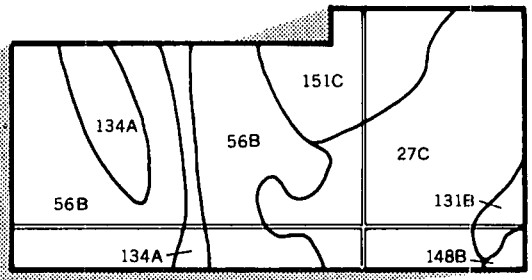




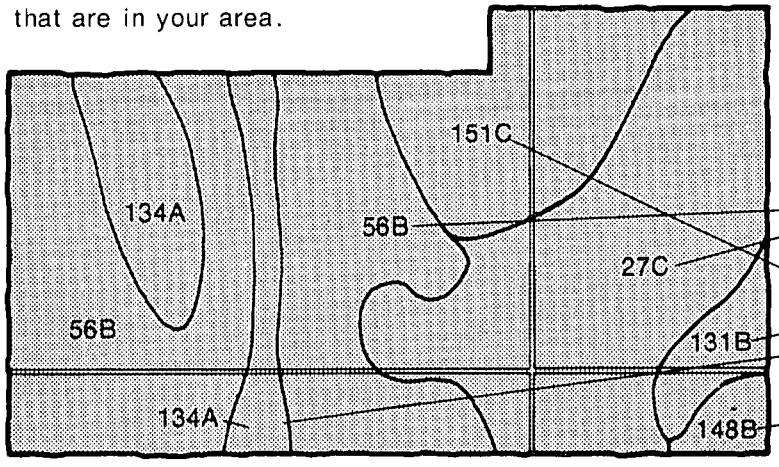
2. Note the number of the map sheet and turn to that sheet.

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





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

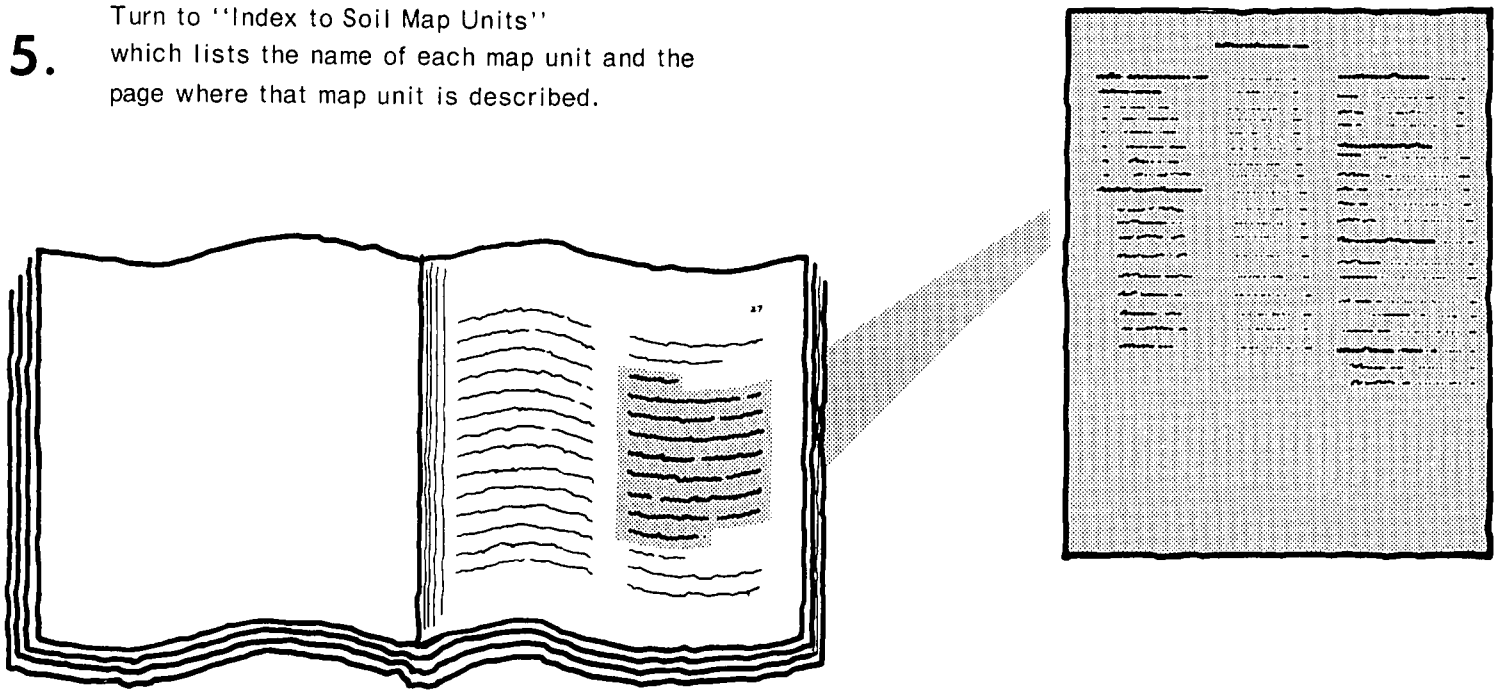


Symbols

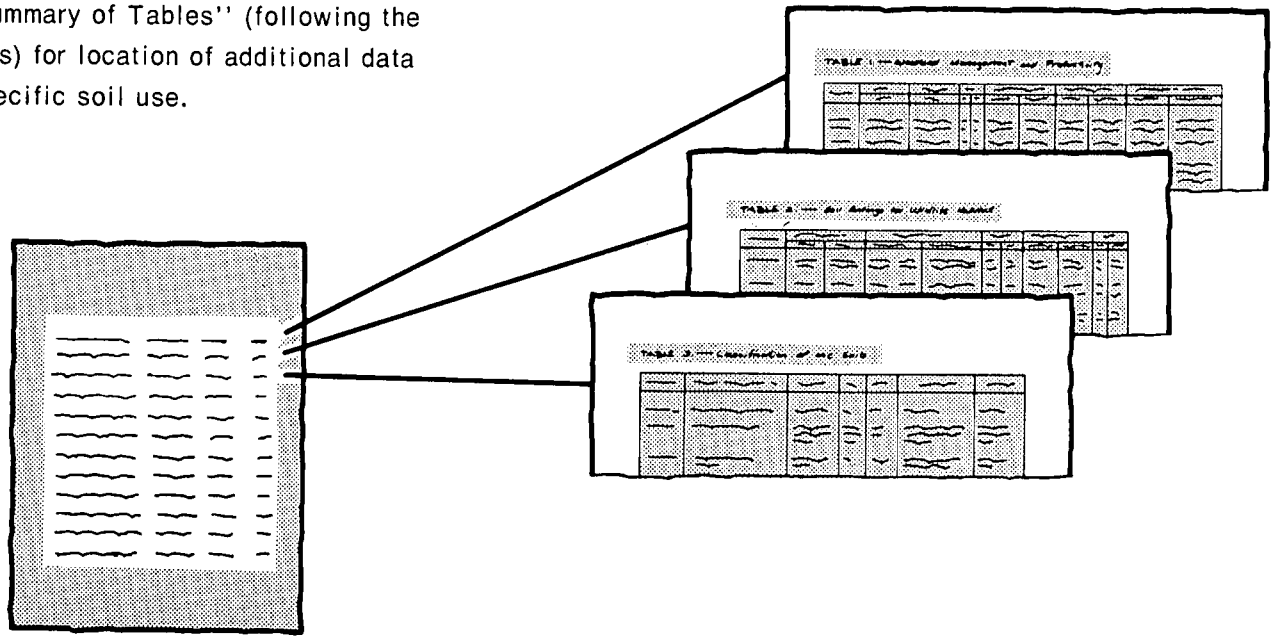
27C
56B
131B
134A
148B
151C

THIS SOIL SURVEY

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



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



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

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

Major fieldwork for this soil survey was completed in 1984. Soil names and descriptions were approved in June 1984. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1984. This soil survey was made cooperatively by the Soil Conservation Service, the Kentucky Natural Resources and Environmental Protection Cabinet, and the Kentucky Agricultural Experiment Station. It is part of the technical assistance furnished to the Crittenden 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: The bottom land soils, Belknap silt loam, occasionally flooded, and Collins silt loam, occasionally flooded, are nearly level and are used for corn and soybeans. The woodland area in the background is on Lenberg-Frondorf silt loams, 20 to 50 percent slopes, extremely bouldery.

Contents

Soil Series

Issued December 1988

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Summary of Tables

Foreword

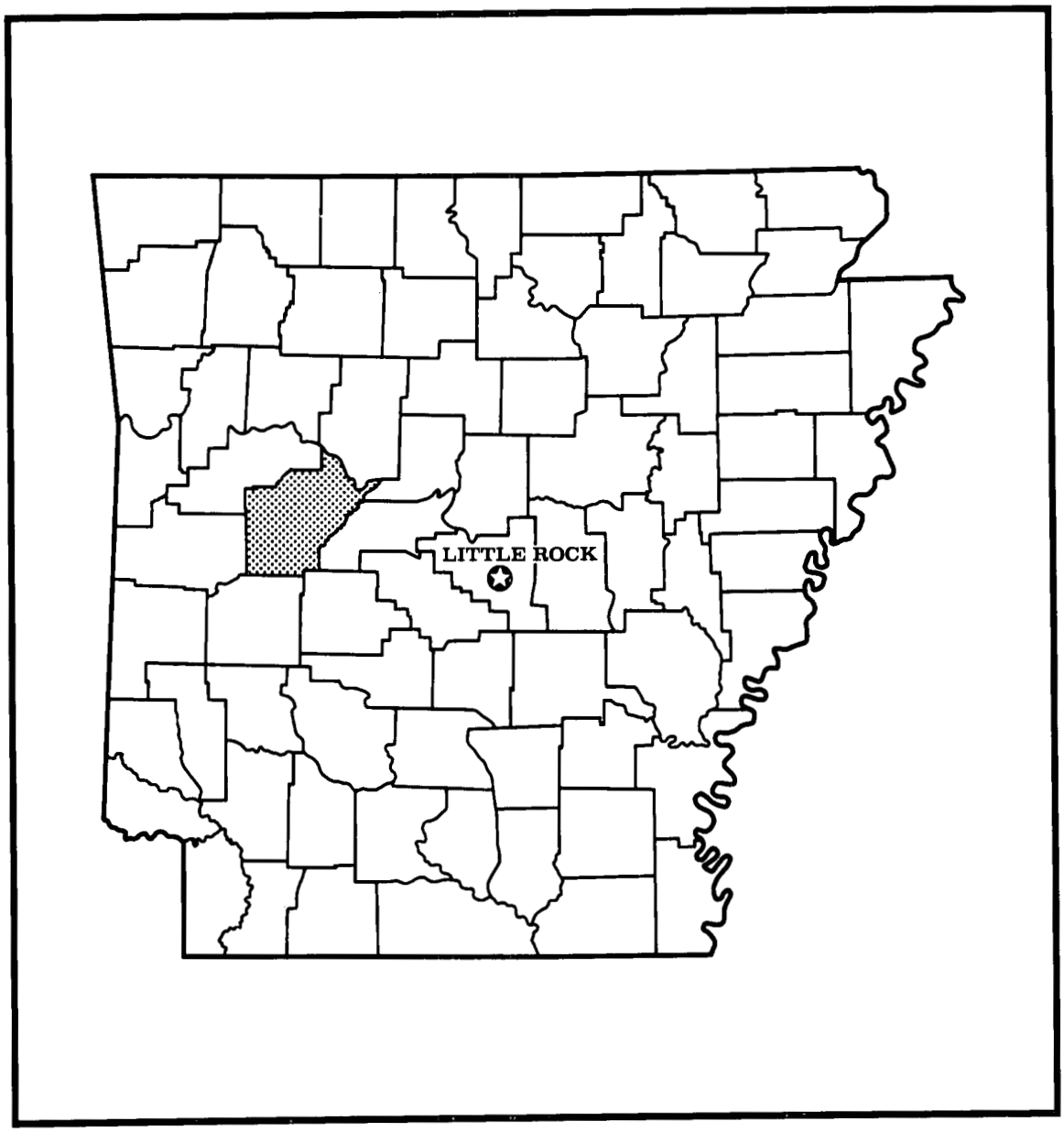
This soil survey contains information that can be used in land-planning programs in Yell County. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of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

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

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

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

Albert E. Sullivan
State Conservationist
Soil Conservation Service



Location of Yell County in Arkansas.

Soil Survey of Yell County, Arkansas

By Frank M. Vodrazka, Soil Conservation Service

Fieldwork by Frank M. Vodrazka, Jeffrey W. Olson,
and Alex Winfrey, Soil Conservation Service

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

YELL COUNTY is in the west central part of Arkansas. It is irregular in shape and extends 38 miles from north to south and 45 miles from east to west. The county is bordered on the north by Logan and Pope Counties, on the east by Conway and Perry Counties, on the south by Garland and Montgomery Counties, and on the west by Logan and Scott Counties. The total area of the county is 607,744 acres, or 950 square miles, which includes 12,367 acres of large bodies of water.

In 1980, the population of Yell County was 17,026. Danville, the main county seat, had a population of 1,698, and Dardanelle, the other county seat and largest town, had a population of 3,621.

The economy of the county is based on livestock and poultry production, row crops, timber, industry, and business. Most of the people in the county, including more than half of the farmers, work in industries or supporting businesses in Danville, Dardanelle, and Russellville.

The first soil survey of Yell County was published in 1917. This survey updates the first survey, provides additional interpretative information, contains more detail, and has aerial photography.

General Nature of the County

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

About 55 percent of the county is mountainous and hilly, and mountains and hills are scattered throughout the county. The elevation ranges from about 400 feet at the base of the hills and mountains to 2,439 feet at the top of Petit Jean Mountain in the western part of the county. The soils in most of the mountainous and hilly areas are too steep for intensive use. They are used mainly as woodland or for native pasture. Some of the less sloping soils are suitable for improved pasture, and some of the soils in narrow valleys are suitable for truck crops.

About 45 percent of the county is level to gently sloping hilltops and mountaintops, valley fill, and alluvial sediment. The elevation ranges from about 280 feet in the eastern part of the county to about 600 feet atop the valley ridges. Except for the intensively farmed soils on bottom lands along the Arkansas River and the less intensively farmed soils along the Petit Jean and Fourche LaFave Rivers, the soils in the level to gently sloping areas are used mainly for forage crops.

Farming

The early settlers of Yell County came between 1830 and 1850 from eastern and southern states. They cleared and farmed the soils that had good natural drainage and that were above the flood plain of the Arkansas River and its tributaries. These soils were mainly in the valleys on uplands. The settlers were subsistence farmers, but they soon started to grow cotton as a cash crop. Corn was also grown but was mainly used on the farm. It was ground into corn meal or used to feed work stock and other livestock. Most areas of the better drained soils were cleared for cotton and corn. The steep, stony, or wet areas were left in woodland.

The clearing and cultivation of new fields continued until 1930. From the 1930's through the 1950's, some farms were abandoned and others changed from cultivated crops to pasture or meadow.

Farming has become diversified. It is generally more intensive on bottom lands and less intensive on uplands. In the upland areas, beef cattle, forage crops, poultry, and hogs provide most of the farm income.

On the bottom lands of the Arkansas River and its tributaries, improved crop varieties, mechanization, insecticides, and other technological advances have led to expansion of crops and pasture into most of the area. Flood control measures have also helped on the bottom lands of the Arkansas River. Most of the lowlands have been cleared, and drainage has been improved for more reliable crop production on most farms.

Soybeans is the main crop on the bottom lands, but rice, wheat, and grain sorghum are also grown. Most of the farmers also have herds of beef cattle.

According to the 1982 Census of Agriculture, about 34 percent of Yell County was in farms. The rest is cities, towns, rural subdivisions, State or Federal land, commercial timber land, and transportation and utility facilities. The number of farms has decreased, while the size has increased slightly. Table 1 shows the number, size, and proportion of farms in Yell County in selected years.

Most farm income is from broilers and laying hens, beef cattle, and crops. Table 2 shows the number of livestock and poultry on farms in selected years, and table 3 shows the number sold. Table 4 shows the acreage of principal crops in Yell County.

Most farms are small enough for the family to do most of the work. Outside labor may be hired during peak seasons. The larger farms are supervised by the owner, manager, or tenant. Tenants pay a fixed rent or a percentage of the crop for use of the land. On most of the farmland, operators have sufficient modern equipment to farm efficiently. Most farmers fertilize according to the needs of the crop and use chemicals for weed control.

Physiography and Drainage

The Arkansas River flows eastward and forms part of the northern boundary of Yell County. Several old filled-in oxbow lakes on the flood plain of the Arkansas River are evidence that the river has meandered from west to east. The other main drainageways are Chickalah Creek, Dutch Creek, Fourche LaFave River, and Petit Jean River.

The flow of the Arkansas River is controlled by large flood control impoundments in its upstream watershed. A series of lakes and dams form navigable pools, and the river is open throughout the year to barge traffic. The Arkansas River provides opportunities for fishing, boating, and waterfowl hunting. It yields sand in quantities large enough to be profitably dredged. With the exception of about 46,000 acres in the Ouachita River Watershed, the stream watersheds in Yell County eventually drain into this river.

Topographically, Yell County is divided into two Major Land Resource Areas, the Arkansas Valley and Ridges and the Ouachita Mountains. The areas range from level bottom lands to very steep hills and mountains.

The alluvial soils on bottom lands are level to undulating, and some are subject to flooding. The Dardanelle, Roellen, and Roxana soils formed on these bottom lands, and they are the most fertile soils in the county. The area is drained by streams that flow from the hilly uplands.

The topography in the Arkansas Valley and Ridges ranges from level to nearly level flood plains along local streams; level to rolling flat-topped hills, long narrow ridges, and broad valleys; and rolling to very steep hillsides and mountainsides. Barling, Spadra, and Guthrie soils are on the flood plains. Cane, Leadvale, Pickwick, and Taft soils are in the broad valleys. Enders, Nella, and Mountainburg soils dominate the hills and mountains, and Linker and Mountainburg soils are on the ridges. This area is drained by streams that include Chickalah Creek, Dutch Creek, Hayes Creek, Spring Creek, Smiley Bayou, and Petit Jean River.

The topography in the Ouachita Mountains ranges from level to nearly level flood plains along local streams; nearly level to gently sloping valleys; and gently sloping hillsides and mountainsides. Barling, Spadra, and Guthrie soils are on the flood plains. Avilla, Cane, Leadvale, Pickwick, and Taft soils are in the valleys. Carnasaw, Sherless, and Clebit soils dominate the hillsides and mountainsides. This area is drained by streams that include Dutch Creek, Gafford Creek, Irons Fork Creek, Fourche LaFave River, and South Fourche LaFave River.

Most tributary streams of the uplands are intermittent, but some flow throughout the year. Livestock water is obtained from creeks, wells, and ponds, and domestic water from wells. In most areas of the uplands, ground water supply is insufficient for irrigation. Water for irrigation of the bottom lands is obtained from deep wells and from the Fourche LaFave and Petit Jean Rivers.

Climate

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

Table 5 gives data on temperature and precipitation for the survey area as recorded at Dardanelle, Arkansas, in the period 1951 to 1979. 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 42 degrees F, and the average daily minimum temperature is 31

degrees. The lowest temperature on record, which occurred at Dardanelle on February 2, 1951, is -14 degrees. In summer the average temperature is 80 degrees, and the average daily maximum temperature is 91 degrees. The highest recorded temperature, which occurred on July 13, 1954, is 110 degrees.

Growing degree days are shown in table 5. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (50 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is 48 inches. Of this, 24 inches, or 50 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 18 inches. The heaviest 1-day rainfall during the period of record was 6.38 inches at Dardanelle on August 13, 1957. Thunderstorms occur on about 56 days each year, and most occur in summer.

The average seasonal snowfall is 5 inches. The greatest snow depth at any one time during the period of record was 7 inches. On an average of 3 days, at least 1 inch of snow is on the ground. The number of such days varies greatly from year to year.

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

How This Survey Was Made

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

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

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

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

While a soil survey is in progress, samples of some of the soils in the area are generally collected for laboratory analyses and for engineering tests. Soil scientists interpreted the data from these analyses and tests as well as the field-observed characteristics and the soil properties in terms of expected behavior of the soils under different uses. Interpretations for all of the soils were field tested through observation of the soils in different uses under different levels of management. Some interpretations are modified to fit local conditions, and new interpretations sometimes are developed to meet local needs. Data were assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management were assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can state with a fairly high degree of probability that a given soil will have

a high water table within certain depths in most years, but they cannot assure that a high water table will always be at a specific level in the soil on a specific date.

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

Map Unit Composition

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

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

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

General Soil Map Units

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

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

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

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

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

1. Nella-Enders-Mountainburg

Well drained, gently sloping to very steep, deep and shallow, gravelly and stony soils; on hills, mountains, ridges, foot slopes, benches, and ledges

These soils are in the northern and western parts of Yell County. They formed in colluvium or residuum weathered from sandstone and shale. Natural drainageways are mainly fast-flowing intermittent streams. A few perennial streams are also in this map unit.

This map unit makes up about 16 percent of the county. It is about 35 percent Nella soils, 32 percent Enders soils, 19 percent Mountainburg soils, and 14 percent soils of minor extent.

The Nella soils are deep and are on hillsides, mountainsides, foot slopes, and benches. They have a dark brown gravelly or stony fine sandy loam surface layer and a yellowish brown gravelly or stony fine sandy loam subsurface layer. The subsoil is yellowish red gravelly loam and yellowish red and red gravelly clay loam.

The Enders soils are deep and are on hillsides, mountainsides, and ridges. They have a dark grayish brown gravelly or stony fine sandy loam surface layer and a yellowish brown gravelly or stony fine sandy loam subsurface layer. The subsoil is yellowish red silty clay loam and red and gray silty clay. The lower part of the subsoil has mottles in shades of red, brown, and gray. The underlying material is level-bedded shale bedrock.

The Mountainburg soils are shallow and are on hilltops, mountaintops, and ledges. These soils have a dark brown gravelly or stony fine sandy loam surface layer and a brown gravelly or stony fine sandy loam subsurface layer. The subsoil is strong brown very gravelly or very stony loam, and the underlying material is level-bedded sandstone bedrock.

Of minor extent in this map unit are the Ceda, Kenn, Linker, and Spadra soils. These soils are well drained. Also included are some areas of water and areas of rock outcrops.

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

These soils are generally not suited to cultivated crops and are poorly suited to pasture. The main limitations are steep slopes and gravel and stones on the surface. Erosion is a very severe hazard. These soils have moderately high to low potential productivity for woodland. Steep slopes and stones on the surface are the main limitations.

Nella soils are moderately suited to poorly suited to most urban uses, and Enders and Mountainburg soils are poorly suited. Slope is the main limitation on Nella soils. Slope, high shrink-swell potential, and low strength as it affects roads and streets are the main limitations on Enders soils. Depth to bedrock and slope are the main limitations on Mountainburg soils. Special design and construction are needed to overcome the limitations, some of which become more difficult to rectify as slope gradient increases.

2. Leadvale-Cane-Taft

Moderately well drained and somewhat poorly drained, level to gently sloping, deep, loamy soils that have a fragipan; on old stream terraces in broad valleys

These soils are scattered throughout the northern two-thirds of the county. They formed in loamy sediment weathered from sandstone and shale washed from local uplands. Natural drainageways are mainly slow-flowing intermittent streams.

This map unit makes up about 22 percent of the county. It is about 39 percent Leadvale soils, 20 percent Cane soils, 16 percent Taft soils, and 25 percent soils of minor extent.

Leadvale soils are moderately well drained. They have a dark brown silt loam surface layer. The subsoil is strong brown silt loam, yellowish brown silty clay loam, brownish yellow silty clay loam that has mottles in shades of gray and brown, and a yellowish brown silty clay loam fragipan that is firm and brittle and has mottles in shades of gray and brown. The underlying material is mottled silty clay loam.

Cane soils are moderately well drained. They have a dark brown loam surface layer. The subsoil is red silty clay loam and a mottled red, yellowish brown, and grayish brown silty clay loam fragipan that is firm and brittle. The underlying material is mottled yellowish red, yellowish brown, and gray silty clay loam.

Taft soils are somewhat poorly drained. They have a dark grayish brown silt loam surface layer and a yellowish brown silt loam subsurface layer. The upper part of the subsoil is yellowish brown silt loam that has mottles in shades of gray and brown. Below that is a layer of grayish brown silt loam that has mottles. The lower part of the subsoil is a mottled, firm and brittle, silty clay loam fragipan and is yellowish red, silty clay that has mottles.

Of minor extent in this map unit are the Guthrie, Pickwick, and Spadra soils. Guthrie soils are poorly drained, and Pickwick and Spadra soils are well drained.

The soils of this map unit are used mainly as pasture (fig. 1). In a few areas, they are used for urban development.

These soils are moderately suited to well suited to cultivated crops and well suited to moderately suited to use as pasture. Erosion is a hazard, and wetness is a limitation.

These soils have moderately high potential productivity for woodland. Wetness is a moderate limitation on Taft soils.

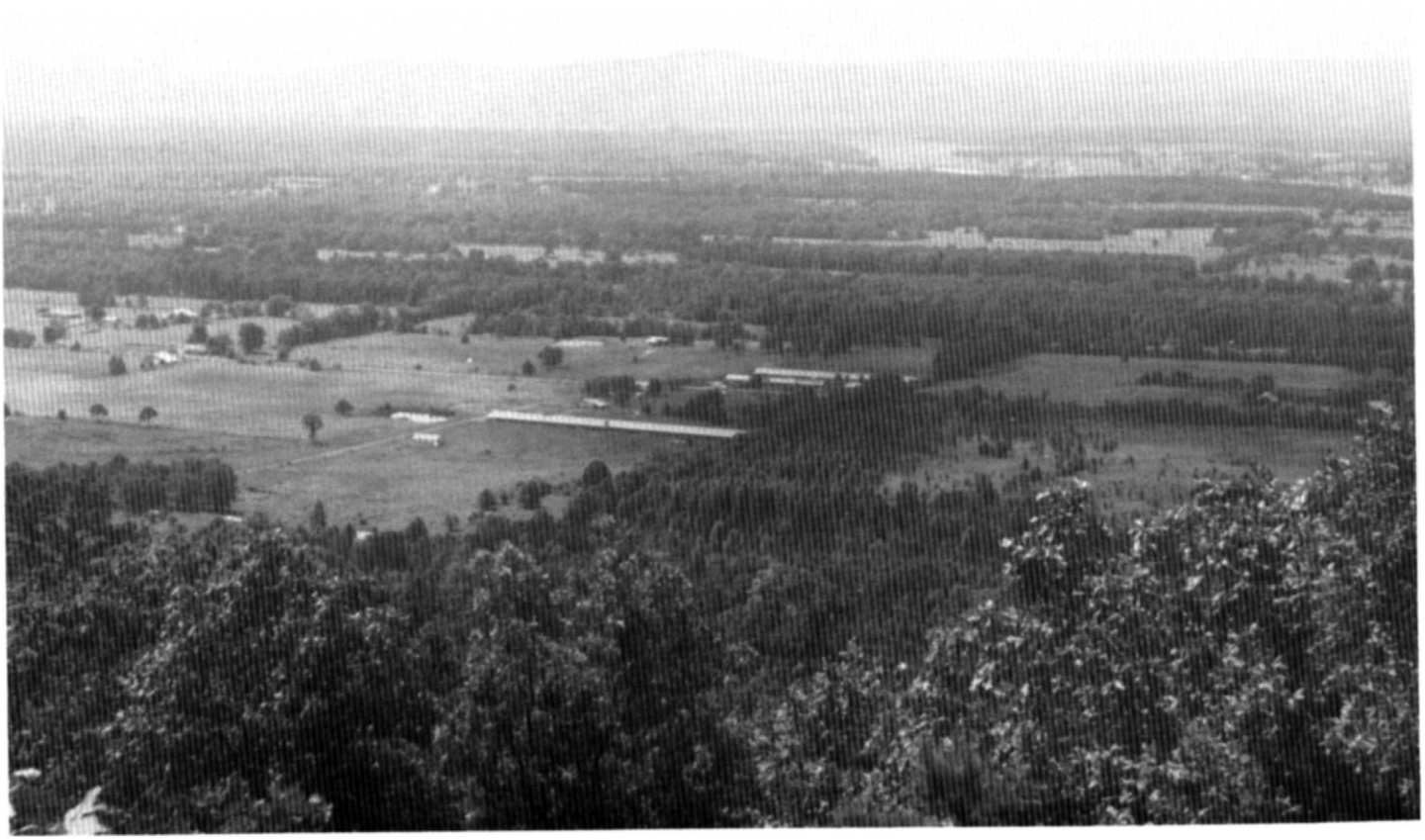


Figure 1.—Leadvale, Cane, and Taft soils are in broad valleys and are used mainly as pasture.

The soils of this map unit are moderately suited to poorly suited to most urban uses. Wetness, low strength as it affects roads and streets, and slow permeability are the main limitations.

3. Linker-Mountainburg

Well drained, nearly level to moderately steep, moderately deep and shallow, loamy, gravelly, and stony soils; on hills, mountains, and ridges

These soils are mainly in the northern part of the county. They formed in loamy residuum weathered from level-bedded sandstone. Natural drainageways are mainly fast-flowing intermittent streams.

This map unit makes up about 5 percent of the county. It is about 50 percent Linker soils, 40 percent Mountainburg soils, and 10 percent soils of minor extent.

The Linker soils are moderately deep and are on tops of hills and mountains. They have a dark brown fine sandy loam surface layer. The subsoil is strong brown loam and yellowish red loam, clay loam, or sandy clay loam. The underlying material is horizontally bedded sandstone bedrock.

The Mountainburg soils are shallow and are on tops and sides of hills, mountains, and ridges. They have a dark brown gravelly or stony fine sandy loam surface layer and a brown gravelly fine sandy loam subsurface layer. The subsoil is strong brown very gravelly loam or very gravelly sandy clay loam. The underlying material is horizontally bedded sandstone bedrock.

Of minor extent in this map unit are the Nella, Enders, Cane, and Leadvale soils. Nella and Enders soils are well drained, and Cane and Leadvale soils are moderately well drained.

The soils of this map unit are used mainly as pasture and woodland. In a few areas, they are used for urban development.

These soils are moderately suited to not suited to cultivated crops. Slope and gravel on the surface are the main limitations, and erosion is a hazard. These soils are well suited to poorly suited to use as pasture depending on slope and depth to bedrock.

These soils have moderate to low potential productivity for woodland depending on depth to bedrock.

Linker soils are moderately suited to poorly suited to most urban uses, and Mountainburg soils are poorly suited. Depth to bedrock and slope are the main limitations.

4. Roxana-Dardanelle-Bruno

Well drained and excessively drained, level and nearly level, deep, loamy and sandy soils; on natural levees and flood plains of the Arkansas River

These soils are in the northeastern part of the county adjacent to the Arkansas River. They formed in loamy and sandy alluvium deposited by the Arkansas River. Natural drainageways are mostly slow-flowing intermittent streams.

This map unit makes up about 4 percent of the county. It is about 54 percent Roxana soils, 20 percent Dardanelle soils, 13 percent Bruno soils, and 13 percent soils of minor extent.

The Roxana soils are well drained and are in intermediate positions on natural levees. They have a dark brown silt loam surface layer and stratified brown very fine sandy loam or loamy very fine sand underlying material.

The Dardanelle soils are well drained and are in lower positions on natural levees. They have a very dark grayish brown and very dark brown silt loam surface layer. The subsoil is dark brown silt loam and reddish brown silt loam or silty clay loam. The underlying material is reddish brown silt loam.

The Bruno soils are excessively drained and are in higher positions on the flood plain. They have a dark brown loamy fine sand surface layer and the substratum is brown or dark grayish brown very fine sandy loam and loamy fine sand.

Of minor extent in this map unit are the Moreland and Roellen soils. Moreland soils are somewhat poorly drained, and Roellen soils are poorly drained. Also included is an area of Udipsamments, dredged, and small areas of water.

The soils of this map unit are used mainly for cultivated crops. In some areas, they are in urban use.

These soils are well suited to moderately suited to cultivated crops. Occasional flooding is a hazard in areas of Roxana soils between the levee and the Arkansas River. Droughtiness is the main limitation for Bruno soils.

These soils are well suited to moderately suited to use as pasture; however, droughtiness of the Bruno soils is a limitation.

The soils of this map unit have very high to high potential productivity for woodland.

The Roxana and Bruno soils are well suited to most urban uses except in the occasionally flooded areas, which are poorly suited. Dardanelle soils are only moderately suited to most urban uses because of shrinking and swelling, low strength as it affects roads and streets, and moderate permeability.

5. Roellen-Moreland

Poorly drained and somewhat poorly drained, level, deep, clayey soils; in slack-water areas on flood plains of the Arkansas River

These soils are in the northeastern part of the county. They formed in clayey alluvium deposited by the Arkansas River. Natural drainageways are mainly slow-flowing intermittent streams.

This map unit makes up about 3 percent of the county. It is about 73 percent Roellen soils, about 6 percent

Moreland soils, and about 21 percent soils of minor extent.

The Roellen soils are poorly drained. They have a very dark gray silty clay and clay surface layer. The subsoil is dark gray clay that has mottles in shades of brown. The underlying material is dark gray clay that has mottles in shades of brown.

The Moreland soils are somewhat poorly drained. They have a dark reddish brown silty clay surface layer. The subsoil is dark reddish brown and reddish brown silty clay.

Of minor extent in this map unit are the Dardanelle soils which are well drained. Also included are some areas of water.

The soils of this map unit are used mainly for cultivated crops. Small areas of hardwood trees are along the drainageways. Wetness is the main limitation for most uses. A high water table is at or near the surface during winter and early in spring.

These soils are well suited to cultivated crops and to use as pasture. Farming operations are delayed several days after a rain because of excess water, and surface drainage is needed.

These soils have high potential productivity for woodland. Wetness is a severe limitation to the use of equipment, and seedling mortality is moderate because of the silty clay surface layer.

These soils are poorly suited to most urban uses. Wetness, slow permeability, shrinking and swelling, and low strength as it affects roads and streets are the main limitations.

6. Spadra-Barling-Pickwick

Well drained and moderately well drained, level to gently sloping, deep, loamy soils; on terraces and flood plains

These soils formed throughout the county in loamy and silty alluvium. Natural drainageways are slow-flowing intermittent streams and perennial streams.

This map unit makes up about 3 percent of the county. It is about 50 percent Spadra soils, 20 percent Barling soils, 20 percent Pickwick soils, and 10 percent soils of minor extent.

The Spadra soils are well drained and are on low terraces. They have a dark brown fine sandy loam surface layer. The subsoil is reddish brown and brown loam. The lower part of the subsoil has yellowish brown mottles. The underlying material is brown gravelly fine sandy loam.

The Barling soils are moderately well drained and are on flood plains. They have a dark brown silt loam surface layer. The subsoil is dark yellowish brown, mottled light brownish gray and dark yellowish brown, and gray silt loam. It has mottles in shades of gray and brown in some parts.

The Pickwick soils are well drained and are on high terraces. They have a dark brown silt loam surface layer. The subsoil is yellowish red and red silty clay loam that has mottles in shades of brown and gray in the lower part.

Of minor extent in this map unit are the Cane, Leadvale, Guthrie, and Taft soils. Cane and Leadvale soils are moderately well drained. Guthrie soils are poorly drained, and Taft soils are somewhat poorly drained.

The soils of this map unit are used mainly as pasture. Small areas of these soils are used as cropland. Occasional flooding is a hazard on the Spadra and Barling soils.

These soils are moderately suited to well suited to cultivated crops, but most areas require erosion control measures. Occasional flooding of the Spadra and Barling soils is also a hazard. The soils of this map unit are well suited to use as pasture.

These soils have moderately high to high potential productivity for woodland. There are no significant limitations for woodland use and management.

Spadra and Barling soils are poorly suited to most urban uses because of flooding. Pickwick soils are moderately suited to most urban uses. Moderate permeability and low strength as it affects roads and streets are limitations.

7. Muskogee-McKamie

Moderately well drained and well drained, nearly level and gently sloping, deep, loamy soils; on terraces adjacent to the Arkansas River flood plain

These soils are in the northeastern part of the county. They formed in loamy and clayey alluvium deposited by the Arkansas River. Natural drainageways are slow- to fast-flowing intermittent streams.

This map unit makes up about 1 percent of the county. It is about 50 percent Muskogee soils, 40 percent McKamie soils, and 10 percent soils of minor extent.

The Muskogee soils are moderately well drained and are in nearly level positions on the landscape. They have a dark brown silt loam surface layer and a yellowish brown silt loam subsurface layer. The subsoil is strong brown silty clay loam, mottled strong brown and yellowish brown silty clay, and gray and yellowish red silty clay that has mottles in shades of red and gray.

The McKamie soils are well drained and are in gently sloping positions on the landscape. They have a dark brown silt loam surface layer. The subsoil is red and reddish brown silty clay. The underlying material is brown silty clay loam that has mottles in shades of brown.

Of minor extent in this map unit are the Pickwick, Cane, and Wrightsville soils. Pickwick soils are well drained, Cane soils are moderately well drained, and Wrightsville soils are poorly drained.

The soils of this map unit are used mainly as pasture. Small areas of these soils are used as woodland. The clayey subsoil is the main limitation for most uses.

These soils are moderately suited to poorly suited to cultivated crops, and most areas require erosion control measures. The soils are well suited to use as pasture.

These soils have moderately high potential productivity for woodland. Seedling mortality is moderate on McKamie soils because of the clayey subsoil.

The soils of this map unit are poorly suited to most urban uses. Wetness, shrinking and swelling, low strength as it affects roads and streets, and slow permeability are the main limitations.

8. Guthrie-Barling

Poorly drained and moderately well drained, level and nearly level, deep, loamy soils; on stream terraces and flood plains

These soils are in the central part of the county along the Fourche LaFave and Petit Jean Rivers. They formed in loamy and silty alluvium from uplands of weathered sandstone and shale. Natural drainageways are slow-flowing intermittent streams and perennial streams.

This map unit makes up about 7 percent of the county. It is about 50 percent Guthrie soils, 40 percent Barling soils, and 10 percent soils of minor extent.

The Guthrie soils are poorly drained. They have a dark grayish brown silt loam surface layer and a gray silt loam subsurface layer. The subsoil is gray silt loam and a gray, compact and brittle, silty clay loam fragipan. Mottles in shades of brown are throughout the profile.

The Barling soils are moderately well drained. They have a dark brown silt loam surface layer. The subsoil is silt loam. It is dark yellowish brown, dark yellowish brown with mottles in shades of brown, mottled light brownish gray and dark yellowish brown, and gray with mottles in shades of brown.

Of minor extent in this map unit are the Spadra soils. They are well drained.

The soils of this map unit are used as pasture and cropland.

These soils are well suited to moderately suited to cultivated crops and to use as pasture. Occasional flooding is a hazard, and poor drainage is a limitation.

These soils have moderately high to high potential productivity for woodland.

These soils are poorly suited to most urban uses because of wetness, flooding, and low strength.

9. Carnasaw-Sherless-Clebit

Well drained, gently sloping to very steep, deep, moderately deep, and shallow, gravelly and stony soils; on hills, mountains, and ridges

These soils are mainly in the central and southern parts of the county. They formed in loamy and clayey residuum weathered from tilted sandstone and shale. Natural drainageways are mainly fast-flowing intermittent streams and a few perennial streams.

This map unit makes up about 37 percent of the county. It is about 52 percent Carnasaw soils, 28 percent Sherless soils, 12 percent Clebit soils, and 8 percent soils of minor extent.

The Carnasaw soils are deep and are on hillsides, mountainsides, and ridges. They have a very dark grayish brown gravelly or stony silt loam surface layer and a yellowish brown gravelly or stony silt loam subsurface layer. The subsoil is yellowish red silty clay loam, red silty clay, and mottled red, yellowish brown, and gray silty clay. The underlying material is tilted and fractured shale and sandstone bedrock.

The Sherless soils are moderately deep and are on ridgetops, side slopes, and foot slopes. They have a dark grayish brown gravelly or stony fine sandy loam surface layer and a yellowish brown fine sandy loam subsurface layer. The subsoil is strong brown loam, yellowish red sandy clay loam, and yellowish red gravelly sandy clay loam that has mottles in shades of red and brown. The underlying material is fractured and tilted sandstone bedrock.

The Clebit soils are shallow and are on ridgetops and side slopes. They have a dark brown very stony fine sandy loam surface layer. The subsoil is yellowish brown or strong brown very gravelly fine sandy loam or loam. The underlying material is fractured and tilted sandstone bedrock.

Of minor extent in this map unit are the Bismarck, Kenn, and Ceda soils. Bismarck soils are somewhat excessively drained. Kenn and Ceda soils are well drained. Also included are some areas of rock outcrops.

The soils of this map unit are used mainly as woodland. In a few areas, they are used as pasture.

Carnasaw and Sherless soils are moderately suited to not suited to use for cultivated crops or pasture, depending upon the slope. Clebit soils are not suited to cultivated crops or pasture because of surface stones, depth to bedrock, and slope.

Carnasaw and Sherless soils have moderately high potential productivity for woodland. Steep slopes and stones on the surface are the main limitations. Clebit soils have low potential productivity because of surface stones, depth to bedrock, and slope.

Carnasaw soils are poorly suited to most urban uses. Low strength as it affects roads and streets, slope, slow permeability, and high shrink-swell potential are the main limitations. Sherless soils are moderately suited to poorly suited to most urban uses, and Clebit soils are poorly suited. Depth to bedrock and slope are the main limitations on the Sherless and Clebit soils.

10. Avilla-Kenn-Ceda

Deep, level to gently sloping, well drained, loamy and gravelly soils; on terraces and flood plains

These soils are in the southern part of the county along the South Fork of the Fourche LaFave River and

Irons Fork Creek. The soils formed in loamy and gravelly alluvium.

This map unit makes up about 2 percent of the county. It is about 50 percent Avilla soils, 20 percent Kenn soils, 20 percent Ceda soils, and 10 percent soils of minor extent.

The Avilla soils are nearly level to gently sloping and are on terraces. They have a dark brown silt loam surface layer. The subsoil is yellowish red silt loam, yellowish red clay loam, red clay loam, and red very gravelly clay loam. Mottles in shades of brown and gray are in the lower part of the subsoil.

The Kenn soils are level and nearly level and are on flood plains. They have a dark brown fine sandy loam surface layer. The subsoil is yellowish red sandy clay loam and mottled yellowish red and strong brown very gravelly sandy clay loam. The underlying material is mottled strong brown and yellowish brown very gravelly sandy clay loam.

The Ceda soils are level and nearly level and are on flood plains. They have a dark grayish brown gravelly fine sandy loam surface layer. The underlying material is dark brown, strong brown, and yellowish brown very gravelly loam.

Of minor extent in this map unit are the Carnasaw, Sherless, and Spadra soils. Carnasaw and Sherless soils are on adjacent side slopes, and Spadra soils are on terraces.

The soils of this map unit are used mainly as pasture or woodland. In a few areas, they are used for cultivated crops. The hazards of flooding and erosion are the main limitations to farming and most other uses.

Avilla soils are well suited to moderately suited to cultivated crops, but most areas require erosion control measures. These soils are well suited to use as pasture and have moderately high potential productivity for woodland. Because of the droughtiness and occasional flooding of the Kenn and Ceda soils and the gravelly surface layer of the Ceda soils, these soils are poorly suited to cultivated crops. They are moderately suited to use as pasture and have moderately high potential productivity for woodland. Seedling mortality is moderate on Ceda soils because of the rock fragments.

Avilla soils are well suited to moderately suited to most urban uses. Limitations increase as slope gradient increases. Kenn and Ceda soils are not suited to most urban uses because of flooding.

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, Enders gravelly fine sandy loam, 3 to 8 percent slopes, is one of several phases in the Enders series.

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

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

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.

1—Avilla silt loam, 1 to 3 percent slopes. This soil is deep, well drained, and nearly level. It is on stream terraces. Individual areas range from about 10 to 100 acres in size.

Typically, the surface layer is dark brown silt loam to a depth of about 7 inches. The subsoil extends to a depth of at least 72 inches. It is yellowish red silt loam to a depth of about 15 inches and yellowish red clay loam to a depth of about 26 inches. To a depth of about 60 inches, the subsoil is red clay loam that has mottles in shades of brown and gray. Below that, it is red, very gravelly clay loam that has light brownish gray mottles.

This soil is low in natural fertility and organic matter content. It is strongly acid or very strongly acid throughout. Permeability is moderate, and the available water capacity is high. Crops and grasses respond well to fertilization, and tilth is easy to maintain.

Included with this soil in mapping are a few small areas of Leadvale and Spadra soils. Leadvale soils are on similar landscapes as the Avilla soil, and Spadra soils are on lower landscapes nearest the stream channel. Also included are a few small areas of soils that have a gravelly or cobbly surface layer.

This Avilla soil is well suited to cultivated crops. Erosion, however, is a moderate hazard. With good management that includes conservation tillage, contour cultivation, and terracing on long slopes, crops that leave a large amount of residue can be grown year after year. Suitable crops include soybeans, truck crops, grain sorghum, and small grains.

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

This soil has the capability of producing about 100 cubic feet per acre per year of shortleaf pine commercial forest products. Suitable trees include loblolly pine,

shortleaf pine, southern red oak, and cherrybark oak. There are no significant limitations for woodland use and management.

This soil is moderately suited to most urban uses. Moderate permeability is a limitation for septic tank absorption fields. This limitation can be minimized by increasing the size of the absorption field or by using a specially designed or alternative system. There are no significant limitations for dwellings, small commercial buildings, or local roads and streets.

This Avilla soil is in capability subclass IIe and in woodland suitability group 8A7.

2—Avilla silt loam, 3 to 8 percent slopes. This soil is deep, well drained, and gently sloping. It is on stream terraces. Individual areas range from about 10 to 200 acres in size.

Typically, the surface layer is dark brown silt loam to a depth of about 7 inches. The subsoil extends to a depth of at least 72 inches. It is yellowish red silt loam to a depth of about 15 inches and yellowish red clay loam to a depth of about 26 inches. To a depth of about 60 inches, the subsoil is red clay loam that has mottles in shades of brown and gray. Below that, it is red very gravelly clay loam that has light brownish gray mottles.

This soil is low in natural fertility and organic matter content. It is strongly acid or very strongly acid throughout. Permeability is moderate, and the available water capacity is high. Crops and grasses respond well to fertilization, and tilth is easy to maintain.

Included with this soil in mapping are a few small areas of Leadvale soils on similar landscapes. Also included are a few small areas of soils that have a gravelly or cobbly surface layer.

This Avilla soil is moderately suited to cultivated crops. Erosion, however, is a severe hazard. With good management that includes conservation tillage, contour cultivation, and terraces, crops that leave a large amount of residue can be safely grown year after year. Conservation treatment needs intensify as slope increases. Suitable crops include grain sorghum, small grains, and soybeans.

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

This soil has the capability of producing about 100 cubic feet per acre per year of shortleaf pine commercial forest products. Suitable trees include loblolly pine, shortleaf pine, southern red oak, and cherrybark oak. There are no significant limitations for woodland use and management.

This soil is moderately suited to most urban uses. Moderate permeability is a limitation for septic tank absorption fields. This limitation can be minimized by increasing the size of the absorption field or by using a specially designed or alternative system. Slope is a moderate limitation for small commercial buildings. Designs that conform to the natural contour help to offset this limitation. There are no significant limitations for dwellings or local roads and streets.

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

3—Barling silt loam, occasionally flooded. This soil is deep, moderately well drained, and level and nearly level. It is on flood plains of local streams. Individual areas range from about 50 to 500 acres in size. Slopes are 0 to 2 percent.

Typically, the surface layer is dark brown silt loam about 12 inches thick. The subsoil to a depth of at least 72 inches is silt loam. It is dark yellowish brown to a depth of about 26 inches and has mottles in shades of brown below a depth of 18 inches. To a depth of about 55 inches, the subsoil is light brownish gray and dark yellowish brown, and below that, it is gray with mottles in shades of brown.

This soil is moderate in natural fertility and organic matter content. It is slightly acid to strongly acid in the surface layer and slightly acid to very strongly acid in the subsoil. Permeability is moderate, and the available water capacity is high. A seasonal high water table is within 12 inches of the surface from December through April. Crops respond well to fertilization. This soil is easy to till and can be cultivated throughout a wide range of moisture content. Flooding is expected occasionally under usual weather conditions for very brief periods from December through April. If the soil does not have a plant cover, fast-moving floodwater can cause severe damage in a short time.

Included with this soil in mapping are small areas of Guthrie and Spadra soils. Guthrie soils are in level to depressional areas, and Spadra soils are on similar landscapes as the Barling soil.

This Barling soil is well suited to cultivated crops, such as soybeans, truck crops, grain sorghum (fig. 2), and small grains. A sizeable acreage is used for soybeans. Erosion is a slight to moderate hazard, and excess water and occasional flooding delay farming operations for several days after heavy rains. Under good management that includes winter cover crops, crops that leave large amounts of residue can be safely grown year after year.

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

This soil has the capacity of producing about 130 cubic feet per acre per year of shortleaf pine commercial forest products. Suitable trees include sweetgum, eastern cottonwood, cherrybark oak, loblolly pine, and shortleaf pine. There are no significant limitations for woodland use and management.

Figure 2.—Barling silt loam, occasionally flooded, produces good yields of grain sorghum.

This soil is poorly suited to most urban uses. Occasional flooding and wetness severely limit the use of this soil for septic tank absorption fields. Flooding also severely limits the use for dwellings, small commercial buildings, and local roads and streets. Other sites or included soils in this map unit that are above flood-prone areas should be considered for most urban uses.

This Barling soil is in capability subclass IIw and in woodland suitability group 9A7.

4—Bismarck shaly silt loam, 3 to 8 percent slopes. This soil is shallow, somewhat excessively drained, and gently sloping. It is on side slopes and ridges. Individual areas range from about 10 to 120 acres in size.

Typically, the surface layer is dark brown shaly silt loam about 3 inches thick. The subsurface layer is brown very shaly silt loam to a depth of about 7 inches. The subsoil is yellowish brown very shaly silt loam to a depth of about 14 inches. The underlying bedrock is gray, red, and brown soft, weakly cemented shale bedrock that is fractured and tilted.

Bismarck soil is low in natural fertility and organic matter content. It is strongly acid or very strongly acid throughout. Permeability is moderate, and the available water capacity is very low. Grasses respond moderately well to fertilization.

Included with this soil in mapping are a few small areas of Carnasaw and Sherless soils on similar landscapes. Also included are a few small areas of soils that have a stony surface layer, a few small areas of shale outcrop, and a few small areas of soils that have slopes of more than 8 percent.

This Bismarck soil is not suited to cultivated crops. It is poorly suited to pasture, but this is the main use. Suitable pasture plants include bahiagrass, bermudagrass, and lespedeza. This soil is very droughty, and erosion is a severe hazard. Concerns in management include proper stocking, rotation grazing, and weed and brush control.

This soil has the capacity of producing about 57 cubic feet per acre per year of shortleaf pine commercial forest products. Suitable trees include eastern redcedar, loblolly pine, and shortleaf pine. Seedling mortality is moderate.

This soil is moderately suited to most urban uses. Depth to bedrock is a severe limitation for septic tank absorption fields. This limitation is difficult and often impractical to overcome. A better suited soil should be selected. Depth to bedrock is a moderate limitation for dwellings, small commercial buildings, and local roads and streets. Constructing dwellings and small commercial buildings on sites above the bedrock and landscaping with additional fill is a possible method of overcoming this limitation. Slope is also a moderate limitation for small commercial buildings. This limitation can be minimized by using designs that conform to the natural contour of the landscape. Construction of local roads and streets may require heavy equipment with rippers, which will add to the construction cost. Use of better suited soils should be considered.

This Bismarck soil is in capability subclass VIe and in woodland suitability group 4D8.

5—Bruno loamy fine sand, 0 to 3 percent slopes. This soil is deep, excessively drained, and level and nearly level. It is on flood plains of the Arkansas River. Individual areas range from about 20 to 400 acres in size.

Typically, the surface layer is dark brown loamy fine sand about 7 inches thick. The underlying material is stratified brown loamy fine sand, very fine sandy loam, loamy sand, and fine sandy loam to a depth of 63 inches and dark grayish brown silt loam to a depth of 72 inches or more.

This soil is low in natural fertility and organic matter content. It is medium acid to mildly alkaline throughout. Permeability is rapid, and the available water capacity is low. Plants respond poorly to fertilization, but tilth is easy to maintain. Although this soil is on flood plains, most of it is protected from flooding by levees that parallel the river. The areas of this soil in the city of Dardanelle and adjacent areas to the west are not protected by levees; however, they are high enough in elevation that they are not flooded.

Included with this soil in mapping are a few small areas of Dardanelle and Roxana soils. These soils are in slightly lower positions on the landscape than the Bruno soil. Also included are a few small areas of soils that have a fine sandy loam or silt loam surface layer.

This Bruno soil is moderately suited to cultivated crops. Droughtiness, however, is a severe limitation during the summer months, and wind erosion is a severe hazard in the spring if the soil is bare. Under good management that includes winter cover crops, crops that leave large amount of residue can be safely grown. Suitable crops include soybeans and small grains.

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

This soil has the capability of producing about 128 cubic feet per acre per year of eastern cottonwood commercial forest products. Suitable trees include American sycamore, eastern cottonwood, sweetgum, loblolly pine, and shortleaf pine. Seedling mortality caused by droughtiness and equipment limitations are moderate concerns in management.

This soil is well suited to most urban uses; however, poor filtration is a severe limitation for septic tank absorption fields. This limitation is difficult and often impractical to overcome. The selection of a better suited soil should be considered. There are no significant limitations for dwellings, small commercial buildings, and local roads and streets.

This Bruno soil is in capability subclass IIIs and in woodland suitability group 9S8.

6—Bruno loamy fine sand, occasionally flooded. This soil is deep, excessively drained, and level and nearly level. It is on flood plains of the Arkansas River. Slopes are 0 to 3 percent. Individual areas range from about 20 to 500 acres in size.

Typically, the surface layer is dark brown loamy fine sand about 7 inches thick. The underlying material is stratified brown loamy fine sand, very fine sandy loam, loamy sand, and fine sandy loam to a depth of 63 inches and dark grayish brown silt loam to a depth of 72 inches or more.

This soil is low in natural fertility and organic matter content. It is medium acid to mildly alkaline throughout. Permeability is rapid, and the available water capacity is low. Plants respond poorly to fertilization, but tilth is easy to maintain. This soil is flooded occasionally for brief periods of 1 to 2 days during December through June. If the soil does not have a plant cover, fast-moving floodwaters can cause severe erosion of the topsoil.

Included with this soil in mapping are a few small areas of Roxana soils. The Roxana soils are in slightly lower positions on the landscape than the Bruno soil. Also included are a few small areas of soils that have a fine sandy loam or silt loam surface layer.

This Bruno soil is moderately suited to cultivated crops. Droughtiness, however, is a severe limitation during the summer months, and wind erosion is a severe hazard in the spring if the soil is left bare. Suitable crops include soybeans and small grains. Under good management that includes winter cover crops, crops that leave large amounts of residue can be safely grown.

This soil is moderately suited to pasture, and this is the main use. Suitable pasture plants include bahiagrass, bermudagrass, and weeping lovegrass. Concerns in

management include proper stocking, rotation grazing, and weed and brush control.

This soil has the capability of producing about 128 cubic feet per acre per year of eastern cottonwood commercial forest products. Suitable trees include American sycamore, eastern cottonwood, sweetgum, loblolly pine, and shortleaf pine. Seedling mortality caused by droughtiness and equipment limitations are moderate concerns in management.

This soil is not suited to most urban uses. Poor filtration and flooding severely limit the use of this soil for septic tank absorption fields. Flooding also severely limits the use of this soil for dwellings, small commercial buildings, and local roads and streets. Flooding can be overcome only by major flood control measures. The selection of a better suited soil should be considered.

This Bruno soil is in capability subclass IIIs and in woodland suitability group 9S8.

7—Cane loam, 1 to 3 percent slopes. This soil is deep, moderately well drained, and nearly level. It is on old stream terraces in broad valleys. Individual areas range from about 10 to 100 acres in size.

Typically, the surface layer is dark brown loam about 9 inches thick. The subsoil extends to a depth of at least 72 inches. It is red silty clay loam to a depth of about 26 inches and mottled red, yellowish brown, and grayish brown silty clay loam to a depth of about 42 inches. Below that, the subsoil is mottled yellowish red, yellowish brown, and gray, silty clay loam. It has a compact and brittle fragipan at a depth of 26 to 60 inches.

This soil is low in natural fertility and organic matter content. It is medium acid or strongly acid in the surface layer and strongly acid or very strongly acid in the subsoil. Permeability is moderate above the fragipan and slow in the fragipan. The available water capacity is moderate. The fragipan restricts root penetration and slows the movement of water through the soil. A seasonal high water table is within 24 inches of the surface from November through March. Crops and grasses respond well to fertilization, and tilth is easy to maintain.

Included with this soil in mapping are a few small areas of Leadvale, Pickwick, and Taft soils. Leadvale and Pickwick soils are in similar positions on the landscape as the Cane soil, and Taft soils are in lower positions.

This Cane soil is well suited to cultivated crops. Suitable crops include soybeans, truck crops, grain sorghum, and small grains. Erosion is a moderate hazard. With good management that includes conservation tillage, contour cultivation, and terracing on long slopes, crops that leave a large amount of residue can be grown year after year.

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

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

This soil is moderately suited to most urban uses. Wetness and slow permeability are severe limitations for septic tank absorption fields. These limitations can be minimized by installing a drainage system around the absorption field, by enlarging the absorption field, or by using a specially designed alternative system. Wetness is a moderate limitation for dwellings and small commercial buildings. Possible corrective measures include constructing tile drains by footings and shaping the site so runoff is diverted away from dwellings. An alternative is to build in a high area of the map unit. Wetness is also a moderate limitation for local roads and streets. This limitation can be corrected by constructing on raised fill material or installing a drainage system.

This Cane soil is in capability subclass IIe and in woodland suitability group 8A7.

8—Cane loam, 3 to 8 percent slopes. This soil is deep, moderately well drained, and gently sloping. It is on colluvial foot slopes and old stream terraces in broad valleys. Individual areas ranges from about 10 to 300 acres in size.

Typically, the surface layer is dark brown loam about 9 inches thick. The subsoil extends to a depth of at least 72 inches. It is red silty clay loam to a depth of about 26 inches and mottled red, yellowish brown, and grayish brown silty clay loam to a depth of about 42 inches. Below that, the subsoil is mottled yellowish red, yellowish brown, and gray silty clay loam. It has a compact and brittle fragipan at a depth of 26 to 60 inches.

This soil is low in natural fertility and organic matter content. It is medium acid or strongly acid in the surface layer and strongly acid or very strongly acid in the subsoil. Permeability is moderate above the fragipan and slow in the fragipan. The available water capacity is moderate. The fragipan restricts root penetration and slows the movement of water through the soil. A seasonal high water table is within 24 inches of the surface from November through March. Crops and grasses respond well to fertilization, and tilth is easy to maintain.

Included with this soil in mapping are a few small areas of Enders, Leadvale, and Pickwick soils. The Enders soils are in higher positions on the landscape than the Cane soil. The Leadvale and Pickwick soils are in similar positions as the Cane soil.

This soil is moderately suited to cultivated crops; however, runoff is rapid, and erosion is a severe hazard. With good management that includes conservation

tillage, contour cultivation, and terraces, crops that leave a large amount of residue can be safely grown year after year. Conservation treatment needs intensify as slope increases. Suitable crops include soybeans, truck crops, grain sorghum, and small grains.

This soil is well suited to pasture, and this is the main use. Suitable pasture plants include bahiagrass, bermudagrass (fig. 3), tall fescue, white clover, and lespedeza. Concerns in management include proper stocking, rotation grazing, and weed and brush control.

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

This soil is moderately suited to most urban uses. Wetness and slow permeability are severe limitations for septic tank absorption fields. Constructing a drainage system around the absorption field, enlarging the absorption field, or using a specially designed alternative system can help overcome these limitations. Wetness is a moderate limitation for dwellings and small commercial buildings. Possible corrective measures include constructing tile drains by footings and shaping the site so runoff is diverted away from the dwelling. An alternative is to build in a high area of the map unit. Slope is also a moderate limitation for small commercial buildings. Landshaping or adapting the design to conform with the natural slope are possible corrective measures. Wetness is a moderate limitation for local roads and streets. Possible corrective measures include constructing on raised fill material or installing a drainage system.

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

9—Carnasaw gravelly silt loam, 3 to 8 percent slopes. This soil is deep, well drained, and gently sloping. It is on ridgetops and side slopes. Individual area ranges from 20 to 140 acres in size.

Typically, the surface layer is very dark grayish brown gravelly silt loam about 3 inches thick. The subsurface layer is yellowish brown gravelly silt loam to a depth of 6 inches. The subsoil extends to a depth of 54 inches. It is yellowish red silty clay loam to a depth of 11 inches and red silty clay to a depth of 27 inches. To a depth of 48 inches, the subsoil is red, silty clay that has mottles in

Figure 3.—Common bermudagrass pasture is the main use of Cane loam, 3 to 8 percent slopes.

shades of brown, and below that, it is mottled red, yellowish brown, and gray silty clay. The underlying bedrock is fractured and tilted soft shale laminated with sandstone.

This soil is low in natural fertility and organic matter content. It is medium acid or strongly acid in the surface and subsurface layers and strongly acid or very strongly acid in the subsoil. Permeability is slow, and the available water capacity is moderate. Crops and grasses respond well to fertilization.

Included with this soil in mapping are a few small areas of Bismarck and Sherless soils. These soils are in similar positions on the landscape as those of the Carnasaw soil.

This Carnasaw soil is poorly suited to cultivated crops. Runoff is medium to rapid, and erosion is a very severe hazard. Contour farming, conservation tillage, terraces, and cover crops reduce runoff and help to control erosion.

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

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

This soil is poorly suited to most urban uses. Slow permeability is a severe limitation for septic tank absorption fields. A specially designed alternative system may be needed. High shrink-swell potential is a severe limitation for dwellings and small commercial buildings. Possible corrective measures include using extra reinforcement in footings and backfilling with sandy material. High shrink-swell potential and low strength are severe limitations for local roads and streets. Suitable subgrade or base material helps to prevent damage to roads and streets.

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

10—Carnasaw gravelly silt loam, 8 to 12 percent slopes. This soil is strongly sloping, deep, and well drained. It is on ridgetops and side slopes. Individual areas range from 20 to 150 acres in size.

Typically, the surface layer is very dark grayish brown gravelly silt loam about 3 inches thick. The subsurface layer is yellowish brown gravelly silt loam to a depth of 6 inches. The subsoil extends to a depth of 54 inches. It is yellowish red silty clay loam to a depth of 11 inches and red silty clay to a depth of 27 inches. To a depth of 48 inches, the subsoil is red silty clay that has mottles in shades of brown, and below that, it is mottled red, yellowish brown, and gray silty clay. The underlying bedrock is fractured and tilted soft shale laminated with sandstone.

This soil is low in natural fertility and organic matter content. It is medium acid or strongly acid in the surface and subsurface layers, and strongly acid or very strongly acid in the subsoil. Permeability is slow, and the available water capacity is moderate. Grasses respond well to fertilization.

Included with this soil in mapping are a few small areas of Bismarck and Sherless soils. These soils are in positions on the landscape similar to those of the Carnasaw soil.

This Carnasaw soil is not suited to cultivated crops. Runoff is rapid, and erosion is a very severe hazard. The slope and gravelly surface layer also restrict the use of some farm equipment.

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

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

This soil is poorly suited to most urban uses. Slow permeability is a severe limitation for septic tank absorption fields. A specially designed alternative system may be needed. High shrink-swell potential is a severe limitation for dwellings and small commercial buildings. Possible corrective measures include using extra reinforcement in footings and backfilling with sandy material. Slope is also a severe limitation for small commercial buildings. Landscaping or adapting the design to conform with the natural slope are possible alternatives. High shrink-swell potential and low strength are severe limitations for local roads and streets. Suitable subgrade or base material helps to prevent damage to roads and streets.

This Carnasaw soil is capability subclass VIe and in woodland suitability group 8A7.

11—Carnasaw-Sherless complex, 3 to 8 percent slopes. This complex consists of soils that are well drained and deep to moderately deep. The soils of this complex are too intermingled to be mapped separately. They are on gently sloping side slopes and hilltops. Individual areas of this complex range from 30 to 300 acres in size.

The Carnasaw soil makes up about 60 percent of the complex. Typically, the surface layer is very dark grayish brown gravelly silt loam about 3 inches thick. The subsurface layer is yellowish brown gravelly silt loam to a depth of 6 inches. The subsoil extends to a depth of 54 inches. It is yellowish red silty clay loam to a depth of 11

inches and red silty clay to a depth of 27 inches. To a depth of 48 inches, the subsoil is red silty clay that has mottles in shades of brown, and below that it is mottled red, yellowish brown, and gray silty clay. The underlying bedrock is fractured and tilted soft shale laminated with sandstone.

This soil is deep and is low in natural fertility and organic matter content. It is medium acid or strongly acid in the surface and subsurface layers and strongly acid or very strongly acid in the subsoil. Permeability is slow, and the available water capacity is moderate. Crops respond well to fertilization.

The Sherless soil makes up about 30 percent of the complex. Typically, the surface layer is dark grayish brown gravelly fine sandy loam about 3 inches thick. The subsurface layer is brown fine sandy loam to a depth of about 9 inches. The subsoil extends to a depth of 36 inches. It is strong brown loam to a depth of about 14 inches and yellowish red sandy clay loam to a depth of about 28 inches. Below that, the subsoil is yellowish red gravelly sandy clay loam that has mottles in shades of red and brown. The underlying material to a depth of about 38 inches or more is tilted soft sandstone that has lenses of clay loam and shale.

This soil is moderately deep and is low in natural fertility and organic matter content. It is medium acid or strongly acid in the surface and subsurface layers and strongly acid or very strongly acid in the subsoil. Permeability is moderate, and the available water capacity is low. Crops respond well to fertilization.

Included with this complex in mapping are a few small areas of Bismarck, Ceda, Clebit, and Kenn soils. Also included are a few small areas of soils that are stony. The included soils make up about 10 percent of the complex.

The soils in this complex are poorly suited to cultivated crops, but grain sorghum and small grains can be grown. Runoff is rapid, and erosion is a very severe hazard. Under management that includes conservation tillage, contour farming, terracing on the steeper slopes, and crop rotation, sown crops that leave a large amount of residue can be grown occasionally in a system that keeps close-growing cover crops on the soil most of the time. Conservation treatment needs intensify as slope length and gradient increase.

Carnasaw and Sherless soils are moderately suited to use as pasture. Suitable pasture plants include bermudagrass, bahiagrass, clover, lespedeza, and tall fescue. Concerns in management include proper stocking, rotation grazing, and weed and brush control.

These soils are mainly used as woodland. The Carnasaw and Sherless soils each have the capability of producing about 110 cubic feet per acre per year of shortleaf pine commercial forest products. Suitable trees include loblolly pine, shortleaf pine, southern red oak, and white oak. These soils have no significant limitations to woodland use or management.

Carnasaw soil is poorly suited to most urban uses, and Sherless soil is moderately suited. Slow permeability of the Carnasaw soil and depth to bedrock of the Sherless soil are severe limitations for septic tank absorption fields. These limitations are difficult to overcome. A better suited soil is often the best solution. Possible methods to offset the permeability limitation include increasing the size of the absorption field or using a specially designed alternative system. The high shrink-swell potential of the Carnasaw soil is a severe limitation for dwellings and small commercial buildings. Slope is a moderate limitation of Sherless soil for small commercial buildings, but this soil has no significant limitations for dwellings. The high shrink-swell potential limitation generally can be overcome by adding extra reinforcement to the foundation. Designs that conform to the natural contour of the landscape can help offset the slope limitation. Low strength and high shrink-swell potential of the Carnasaw soil are severe limitations for local roads and streets. These limitations can be minimized by adding fill of suitable subgrade material to the roadbed. The Sherless soil has no significant limitations for local roads and streets.

The soils in this complex are in capability subclass IVe and in woodland suitability group 8A7.

12—Carnasaw-Sherless-Clebit complex, 8 to 20 percent slopes. This complex consists of soils that are well drained and range from deep to shallow. The soils of this complex are too intermingled to be mapped separately. They are on strongly sloping to moderately steep ridges and side slopes. These soils developed in residuum of sandstone and shale. Individual areas of this complex range from 30 to 1,000 acres in size.

The Carnasaw soil makes up about 55 percent of the complex. Typically, the surface layer is very dark grayish brown stony silt loam about 3 inches thick. The subsurface layer is yellowish brown gravelly silt loam to a depth of 6 inches. The subsoil extends to a depth of 54 inches. It is yellowish red silty clay loam to a depth of 11 inches and red silty clay to a depth of 27 inches. To a depth of 48 inches, the subsoil is red silty clay that has mottles in shades of brown, and below that it is mottled red, yellowish brown, and gray silty clay. The underlying bedrock is fractured and tilted soft shale laminated with sandstone.

This soil is deep and is low in natural fertility and organic matter content. It is medium acid or strongly acid in the surface and subsurface layers and strongly acid or very strongly acid in the subsoil. Permeability is slow, and the available water capacity is moderate.

The Sherless soil makes up about 25 percent of the complex. Typically, the surface layer is very dark grayish brown cobbly fine sandy loam about 3 inches thick. The subsurface layer is brown fine sandy loam to a depth of about 9 inches. The subsoil extends to a depth of 36 inches. It is strong brown loam to a depth of about 14

inches and yellowish red sandy clay loam to a depth of about 28 inches. Below that, the subsoil is yellowish red, gravelly sandy clay loam that has mottles in shades of red and brown. The underlying material to a depth of about 38 inches is soft, tilted, platy sandstone that has strong brown clay loam between plates.

This soil is moderately deep and is low in natural fertility and organic matter content. It is medium acid or strongly acid in the surface and subsurface layers and strongly acid or very strongly acid in the subsoil. Permeability is moderate, and the available water capacity is low.

The Clebit soil makes up about 15 percent of the complex. Typically, the surface layer is dark brown stony fine sandy loam about 3 inches thick. The subsoil is yellowish brown very gravelly fine sandy loam to a depth of 6 inches and strong brown very gravelly loam to a depth of 14 inches. The underlying bedrock is hard, gray, yellow, and brown sandstone that is fractured and tilted.

This soil is shallow and is low in natural fertility and organic matter content. It is medium acid or strongly acid in the surface layer and strongly acid or very strongly acid in the subsoil. Permeability is moderately rapid, and the available water capacity is very low.

Included with this complex in mapping are a few small areas of Bismarck, Ceda, and Kenn soils. Also included are a few small areas of soils that have a gravelly or very stony surface layer and a few small areas of rock outcrop. The included soils make up about 5 percent of the complex.

The soils in this complex are not suited to cultivated crops and are poorly suited to pasture because of surface stones, slope, and depth to bedrock. Suitable pasture plants include bermudagrass, bahiagrass, clover, lespedeza, and tall fescue. Concerns in management include proper stocking, rotation grazing, and brush and weed control.

These soils are mainly used as woodland. The Carnasaw and Sherless soils each have the capability of producing about 110 cubic feet per acre per year of shortleaf pine commercial forest products, and the Clebit soil has the capability of producing about 47 cubic feet per acre per year. Suitable trees include loblolly pine, shortleaf pine, southern red oak, and white oak on Carnasaw and Sherless soils, and shortleaf pine, eastern redcedar, southern red oak, and post oak on the Clebit soil. Sherless soil has no significant limitations for woodland use and management. Carnasaw and Clebit soils have moderate equipment use limitations because of surface stones. Seedling mortality is moderate on Clebit soil because of the shallow rooting depth.

Carnasaw and Clebit soils are poorly suited to most urban uses, and Sherless soil is moderately suited to poorly suited. The slow permeability of the Carnasaw soil and depth to bedrock of the Sherless and Clebit soils are severe limitations to the use of these soils for septic tank absorption fields. These limitations are difficult to overcome, and a better suited soil is often the best solution. Possible methods to offset the slow permeability limitation include increasing the size of the absorption field or using a specially designed alternative system. For dwellings and small commercial buildings, the high shrink-swell potential of the Carnasaw soil and the depth to bedrock of the Clebit soil are severe limitations. For dwellings, slope is a moderate limitation for the use of Sherless soil and a severe limitation for Carnasaw and Clebit soils. For small commercial buildings, slope is a severe limitation for all the soils. The effects of the high shrink-swell potential can generally be overcome by adding extra reinforcement to the foundation. Limitations caused by slope can be offset by designs that conform to the natural contour of the landscape. The low strength and high shrink-swell potential of the Carnasaw soil and depth to bedrock of the Clebit soil are severe limitations to the use of these soils for local roads and streets. Slope is a moderate limitation of the Sherless soil. The low strength limitation and the effects of the shrink-swell potential can be minimized by adding fill of suitable subgrade material to the roadbed. Limitations caused by slope are difficult to overcome and often require extensive cut and fill operations. Depth to bedrock is a limitation that is difficult and generally not practical to overcome. A better suited soil should be selected.

The soils in this complex are in capability subclass VIs. Carnasaw soil is in woodland suitability group 8X8, Sherless soil is in 8A7, and Clebit soil is in 3X8.

13—Carnasaw-Sherless-Clebit complex, 20 to 40 percent slopes. This complex consists of soils that are steep, well drained, and deep to shallow. The soils of this complex are too intermingled to be mapped separately. These soils are on side slopes of hills and mountains. They developed in residuum of sandstone and shale. Individual areas of this complex range from 40 to 1,000 acres in size.

The Carnasaw soil makes up about 50 percent of the complex. Typically, the surface layer is very dark grayish brown stony silt loam about 3 inches thick. The subsurface layer is yellowish brown gravelly silt loam to a depth of 6 inches. The subsoil extends to a depth of 54 inches. It is yellowish red silty clay loam to a depth of 11 inches and red silty clay to a depth of 27 inches. To a depth of 48 inches, the subsoil is red silty clay that has yellowish brown mottles, and below that it is mottled red, yellowish brown, and gray silty clay. The underlying bedrock is fractured and tilted soft shale laminated with sandstone.

This soil is deep and is low in natural fertility and organic matter content. It is medium acid or strongly acid in the surface and subsurface layers and strongly acid or very strongly acid in the subsoil. Permeability is slow, and the available water capacity is moderate.

The Sherless soil makes up about 25 percent of the complex. Typically, the surface layer is very dark grayish brown cobbly fine sandy loam about 3 inches thick. The subsurface layer is brown fine sandy loam to a depth of about 9 inches. The subsoil extends to a depth of 36 inches. It is strong brown loam to a depth of about 14 inches and yellowish red sandy clay loam to a depth of about 28 inches. Below that, the subsoil is yellowish red gravelly sandy clay loam that has mottles in shades of red and brown. The underlying material to a depth of about 38 inches is soft, tilted, platy sandstone that has strong brown clay loam between plates.

This soil is moderately deep and is low in natural fertility and organic matter content. It is medium acid or strongly acid in the surface and subsurface layers and strongly acid or very strongly acid in the subsoil. Permeability is moderate, and the available water capacity is low.

The Clebit soil makes up about 15 percent of the complex. Typically, the surface layer is dark brown stony fine sandy loam about 3 inches thick. The subsoil is yellowish brown very gravelly fine sandy loam to a depth of 6 inches and strong brown very gravelly loam to a depth of 14 inches. The underlying bedrock is hard, gray, yellow, and brown sandstone that is fractured and tilted.

This soil is shallow (fig. 4) and is low in natural fertility and organic matter content. It is medium acid or strongly acid in the surface layer and strongly acid or very strongly acid in the subsoil. Permeability is moderately rapid, and the available water capacity is very low.

Included with this complex in mapping are a few small areas of Bismarck, Ceda and Kenn soils; a few small areas of soils that have a gravelly or very stony surface

Figure 4.—The Clebit soil is shallow, and the underlying hard bedrock is tilted and fractured. This soil is in an area of Carnasaw-Sherless-Clebit complex, 20 to 40 percent slopes.

layer; and a few small areas of rock outcrop. The included soils make up 10 percent of the complex.

The soils in this complex are not suited to cultivated crops or pasture because of surface stones, depth to bedrock, and slopes.

These soils are mainly used as woodland. Carnasaw soil has the capability of producing about 110 cubic feet per acre per year of shortleaf pine commercial forest products; Sherless soil has the capability of producing about 99 cubic feet per acre per year, and Clebit soil has the capability of producing about 47 cubic feet per acre per year. Suitable trees for Carnasaw and Sherless soils include shortleaf pine, loblolly pine, southern red oak, and white oak. Suitable trees for Clebit soil include shortleaf pine, eastern redcedar, and post oak. These soils have moderate limitations for equipment use. Erosion is a moderate hazard to woodland use and management. Seedling mortality is moderate on the Clebit soil because of the shallow rooting depth.

The soils in this complex are poorly suited to most urban uses. The slow permeability of the Carnasaw soil and depth to bedrock of the Sherless and Clebit soils are severe limitations to the use of these soils for septic tank absorption fields. These limitations are difficult to overcome. A better suited soil is often the best solution. Possible methods of offsetting the permeability limitation include increasing the size of the absorption field or using a specially designed alternative system. Steepness of slope is a severe limitation of each of the soils for dwellings and small commerical buildings. High shrink-swell potential is also a severe limitation of the Carnasaw soil. Steepness of slope is difficult to overcome, but designs that conform to the natural contour of the landscape can help offset this limitation. The effects of the high shrink-swell potential generally can be overcome by adding extra reinforcement to the foundation. Steepness of slope is a severe limitation of each of the soils for local roads and streets. Low strength and high shrink-swell potential are additional limitations of the Carnasaw soil. Steepness of slope is difficult to overcome and often requires extensive cut and fill operations. The low strength limitation and the effects of the shrink-swell potential can be minimized by adding fill of suitable subgrade material to the roadbed.

The soils in this complex are in capability subclass VIIs. Carnasaw soil is in woodland suitability group 8R8, Sherless soil is in 7R8, and Clebit soil is in 3R8.

14—Ceda gravelly fine sandy loam, frequently flooded. This soil is deep, well drained, and level and nearly level. It is on narrow flood plains of small streams. Slopes are 0 to 3 percent. Individual areas range from about 10 to 60 acres in size.

Typically, the surface layer is dark grayish brown gravelly fine sandy loam about 7 inches thick. The underlying material is very gravelly loam to a depth of about 72 inches. It is dark brown to a depth of 24 inches, strong brown to a depth of about 44 inches, and yellowish brown below that.

This soil is low in natural fertility and organic matter content. It is slightly acid or medium acid throughout. Permeability is rapid, and the available water capacity is low. Grasses respond poorly to fertilization. This soil is subject to flooding for very brief periods at least once during January through May in most years. If the soil does not have a plant cover, fast-moving floodwaters can cause severe damage in a short time.

Included with this soil in mapping are a few small areas of Kenn soils. Kenn soils are in a complex with Ceda soil and are in similar positions on the landscape.

Because of droughtiness and flooding, this Ceda soil is not suited to cultivated crops and is only moderately suited to pasture. Suitable pasture plants include bermudagrass, bahiagrass, tall fescue, and white clover. Concerns in management include proper stocking, rotation grazing, and weed and brush control.

This soil has the capability of producing about 99 cubic feet per acre per year of shortleaf pine commercial forest products. Suitable trees include loblolly pine, shortleaf pine, American Sycamore, and sweetgum. Seedling mortality is moderate because of flooding.

This soil is poorly suited to most urban uses. Frequent flooding severely limits the use of this soil for septic tank absorption fields, dwellings, small commercial buildings, and local roads and streets. Major flood control structures are needed to overcome the flooding. Other sites or the included soils in this map unit that are above flood-prone areas are more suitable for most urban uses.

This Ceda soil is in capability subclass VIIs and in woodland suitability group 7W8.

15—Clebit-Carnasaw-Sherless complex, 40 to 60 percent slopes. This complex consists of soils that are very steep, well drained, and shallow to deep. The soils of this complex are too intermingled to be mapped separately. These soils are on side slopes of hills and mountains. They developed in residuum of sandstone and shale. Individual areas of this complex range from 30 to 1,000 acres in size.

The Clebit soil makes up about 40 percent of the complex. Typically, the surface layer is dark brown very stony fine sandy loam about 3 inches thick. The subsoil is yellowish brown very gravelly fine sandy loam to a depth of 6 inches and strong brown very gravelly loam to a depth of 14 inches. The underlying bedrock is gray, yellow, and brown sandstone that is fractured and tilted.

This soil is shallow and is low in natural fertility and organic matter content. It is medium acid or strongly acid in the surface layer and strongly acid or very strongly acid in the subsoil. Permeability is moderately rapid, and the available water capacity is very low.

The Carnasaw soil makes up about 40 percent of the complex. Typically, the surface layer is very dark grayish brown stony silt loam about 3 inches thick. The

subsurface layer is yellowish brown gravelly silt loam to a depth of 6 inches. The subsoil extends to a depth of 54 inches. It is yellowish red silty clay loam to a depth of 11 inches and red silty clay to a depth of 27 inches. To a depth of 48 inches, the subsoil is red silty clay that has mottles in shades of brown, and below that it is mottled red, yellowish brown, and gray silty clay. The underlying bedrock is fractured and tilted soft shale laminated with sandstone.

This soil is deep and is low in natural fertility and organic matter content. It is medium acid or strongly acid in the surface and subsurface layers and strongly acid or very strongly acid in the subsoil. Permeability is slow, and the available water capacity is moderate.

The Sherless soil makes up about 15 percent of the complex, and it is on the less sloping part of the map unit. Typically, the surface layer is very dark grayish brown cobbly fine sandy loam about 3 inches thick. The subsurface layer is brown fine sandy loam to a depth of about 9 inches. The subsoil extends to a depth of 36 inches. It is strong brown loam to a depth of about 14 inches and yellowish red sandy clay loam to a depth of about 28 inches. Below that, the subsoil is yellowish red gravelly sandy clay loam that has mottles in shades of red and brown. The underlying material to a depth of about 38 inches is soft, tilted, platy sandstone that has strong brown clay loam between plates.

This soil is moderately deep and is low in natural fertility and organic matter content. It is medium acid or strongly acid in the surface and subsurface layers and strongly acid or very strongly acid in the subsoil. Permeability is moderate, and the available water capacity is low.

Included with this complex in mapping are a few small areas of rock outcrop and a few small areas of soils that have a gravelly surface layer. The included soils make up about 5 percent of the complex.

The soils of this complex are not suited to cultivated crops or to pasture. Slope and sandstone fragments are the major limitations.

These soils are mainly used as woodland. Clebit soil has the capability of producing about 47 cubic feet per acre per year of shortleaf pine commercial forest products. The Carnasaw and Sherless soils have the capability of producing about 99 cubic feet per acre per year. Suitable trees are shortleaf pine and eastern redcedar on the Clebit soil and loblolly pine, shortleaf pine, and southern red oak on the Carnasaw and Sherless soils. Erosion is a severe hazard, and equipment limitations are severe because of slope and surface stones. Seedling mortality is severe on Clebit soil because of the shallow rooting depth.

The soils in this complex generally are not suited to most urban uses. Steepness of slope is a severe limitation to the use of these soils for septic tank absorption fields. Slow permeability of the Carnasaw soil and depth to bedrock of the Sherless and Clebit soils are also severe limitations. Steepness of slope is a severe limitation of the soils in this complex for dwellings and small commercial buildings. In addition, high shrink-swell potential is a severe limitation of the Carnasaw soil. Steepness of slope is a severe limitation of each soil for local roads and streets. High shrink-swell potential and low strength are additional severe limitations of the Carnasaw soil. The limitations for urban use of all the soils in this complex are difficult and expensive to overcome.

The soils in this complex are in capability subclass VIIs. Clebit soil is in woodland suitability group 3R9, and Carnasaw and Sherless soils are in 7R9.

16—Dardanelle silt loam, 0 to 1 percent slopes. This soil is deep, well drained, and level. It is on flood plains of the Arkansas River. Individual areas range from about 50 to 400 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 8 inches thick and very dark brown silt loam to a depth of about 29 inches. The subsoil is dark brown silt loam to a depth of about 39 inches, and reddish brown silt loam to a depth of about 68 inches. The underlying material is massive, reddish brown silt loam to a depth of 84 inches or more.

This soil is high in natural fertility and moderate in organic matter content. It is medium acid to neutral in the surface layer and subsoil and medium acid to mildly alkaline in the underlying material. Permeability is moderate, and the available water capacity is high. Crops respond well to fertilization, and tilth is easy to maintain. Although this soil is on flood plains, most of it is protected from flooding by levees that parallel the river. Other areas of this soil in the city of Dardanelle or adjacent areas to the west are not protected by levees; however, they are high enough in elevation that the soil is not subject to flooding.

Included with this soil in mapping are a few small areas of Moreland, Roxana, and Roellen soils. The Roxana soils are in slightly higher positions on the landscape than the Dardanelle soil. The Moreland and Roellen soils are in the lower slack-water areas. Also included are a few small areas of soils that have a dark color surface layer less than 20 inches thick.

This Dardanelle soil is well suited to cultivated crops, and this is the main use. The principal crop is soybeans. Other suitable crops include corn, grain sorghum, small grains (fig. 5), truck crops, and alfalfa.

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

This soil has the capability of producing about 141 cubic feet per acre per year of eastern cottonwood commercial forest products. Suitable trees include eastern cottonwood, sweetgum, loblolly pine, shortleaf

Figure 5.—Wheat is one of the main crops grown on Dardanelle silt loam, 0 to 1 percent slopes.

pine, American sycamore, and black walnut. There are no significant limitations for woodland use or management.

This soil is moderately suited to most urban uses. Moderate permeability is a limitation for septic tank absorption fields. This limitation can be minimized by increasing the size of the absorption field or by using a specially designed alternative system. Moderate shrink-swell potential is a limitation for dwellings and small commercial buildings. Possible corrective measures include using extra reinforcement in footings and backfilling with sandy material. Low strength is a severe limitation for local roads and streets; however, suitable subgrade or base material can help minimize this limitation.

This Dardanelle soil is in capability class I and in woodland suitability group 10A4.

17—Dardanelle silt loam, 1 to 3 percent. This soil is deep, well drained, and nearly level. It is on flood plains of the Arkansas River. Individual areas range from about 50 to 500 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 8 inches thick and very dark brown silt loam to a depth of about 29 inches. The subsoil is dark reddish brown silt loam to a depth of about 39 inches and reddish brown silty clay loam to a depth of about 68 inches. The underlying material is massive, reddish brown silt loam to a depth of 84 inches or more.

This soil is high in natural fertility and moderate in organic matter content. It is medium acid to neutral in the surface layer and subsoil and medium acid to mildly alkaline in the underlying material. Permeability is moderate, and the available water capacity is high. Crops respond well to fertilization, and tilth is easy to maintain. Although this soil is on flood plains, most of it is protected from flooding by levees that parallel the river. Other areas of this soil in the city of Dardanelle or adjacent areas to the west are not protected by levees; however, they are high enough in elevation that the soil is not subject to flooding.

Included with this soil in mapping are a few small areas of Moreland, Roxana, and Roellen soils. The Roxana soils are in slightly higher positions on the landscape than the Dardanelle soil. The Moreland and Roellen soils are in lower slack-water areas. Also included are a few small areas of soils that have a dark color surface layer less than 20 inches thick.

This Dardanelle soil is well suited to cultivated crops, and this is the main use. Runoff, however, is moderate and erosion is a moderate hazard (fig. 6). The principal crop is soybeans. Other suitable crops include corn, grain sorghum, small grains, truck crops, and alfalfa.

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

This soil has the capability of producing about 141 cubic feet per acre per year of eastern cottonwood commercial forest products. Suitable trees include

Figure 6.—Erosion is a moderate hazard on Dardanelle silt loam, 0 to 3 percent slopes.

eastern cottonwood, sweetgum, loblolly pine, shortleaf pine, American sycamore, and black walnut. There are no significant limitations for woodland use or management.

This soil is moderately suited to most urban uses. Moderate permeability is a limitation for septic tank absorption fields. This limitation can be minimized by increasing the size of the absorption field or by using a specially designed alternative system. Moderate shrink-swell potential is a limitation for dwellings and small commercial buildings. Possible corrective measures include using extra reinforcement in footings and backfilling with sandy material. Low strength is a severe limitation for local roads and streets; however, suitable subgrade or base material can help minimize this limitation.

This Dardanelle soil is in capability subclass IIe and in woodland suitability group 10A4.

18—Enders gravelly fine sandy loam, 3 to 8 percent slopes. This soil is deep, well drained, and gently sloping. It is on crests and toe slopes of ridges and hills. Individual areas range from about 10 to 100 acres in size.

Typically, the surface layer is dark grayish brown gravelly fine sandy loam about 3 inches thick. The subsurface layer is yellowish brown gravelly fine sandy loam to a depth of about 7 inches. The subsoil extends to a depth of 59 inches. It is yellowish red silty clay loam to a depth of about 11 inches and red silty clay to a depth of about 31 inches. To a depth of about 53 inches, the subsoil is red silty clay that has mottles in shades of brown and gray. Below that, it is gray silty clay that has mottles in shades of red and brown. The underlying bedrock is soft, weathered shale.

This soil is low in natural fertility and organic matter content. It is strongly acid or very strongly acid throuoghout. Permeability is very slow, and the available water capacity is moderate. Crops respond fairly well to fertilization, and tilth is difficult to maintain.

Included with this soil in mapping are a few small areas of Cane, Leadvale, Linker, Mountainburg, and Nella soils. The Cane, Leadvale, and Nella soils are on adjacent colluvial foot slopes. The Linker and Mountainburg soils are on ridgetops. Also included are a few small areas of soils that have a silt loam surface layer.

This Enders soil is poorly suited to cultivated crops. Runoff is rapid, and erosion is a very severe hazard (fig. 7). Under good management, sown crops can be grown occasionally in a cropping system that includes a sustained cover of close-growing crops.

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

This soil has the capability of producing about 88 cubic feet per acre per year of shortleaf pine commercial forest products. Suitable trees include loblolly pine, shortleaf pine, and southern red oak. There are no significant limitations for woodland use and management.

This soil is poorly suited to most urban uses. Very slow permeability is a severe limitation for septic tank absorption fields, and a specially designed alternative system may be needed. High shrink-swell potential is a severe limitation for dwellings and small commercial buildings. Possible corrective measures include using extra reinforcement in footings and backfilling with sandy material. High shrink-swell potential and low strength are severe limitations for local roads and streets. Suitable subgrade or base material can help to prevent damage to roads and streets.

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

19—Enders gravelly fine sandy loam, 8 to 12 percent slopes. This soil is deep, well drained, and very slowly permeable. It is on strongly sloping crests and toe slopes of ridges and hills. Individual areas range from about 10 to 100 acres in size.

Typically, the surface layer is dark grayish brown gravelly fine sandy loam about 3 inches thick. The subsurface layer is yellowish brown gravelly fine sandy loam to a depth of about 7 inches. The subsoil extends to a depth of 59 inches. It is yellowish red silty clay loam to a depth of about 11 inches and red silty clay to a depth of about 31 inches. To a depth of about 53 inches, the subsoil is red silty clay that has mottles in shades of brown or gray. Below that, it is gray silty clay that has mottles in shades of red and brown. The underlying bedrock is soft weathered shale.

This soil is low in natural fertility and organic matter content. It is strongly acid or very strongly acid throughout. Permeability is very slow, and the available water capacity is moderate.

Included with this soil in mapping are a few small areas of Nella and Mountainburg soils. The Nella soils are deep and are on adjacent colluvial slopes, and the Mountainburg soils are shallow and are on ridgetops.

This Enders soil is not suited to cultivated crops. It is moderately suited to pasture, and this is the main use. Runoff is rapid, and erosion is a very severe hazard. Suitable pasture plants include bermudagrass, bahiagrass, tall fescue, and lespedeza. Concerns in management include proper stocking, rotation grazing, and weed and brush control.

This soil has the capability of producing about 100 cubic feet per acre per year of shortleaf pine commercial forest products. Suitable trees include loblolly pine, shortleaf pine, and southern red oak. There are no significant limitations for woodland use and management.

Figure 7.—Sliding and slumping on Enders gravelly fine sandy loam, 3 to 8 percent slopes, limits the use of this soil for cultivated crops or most urban development.

This soil is poorly suited to most urban uses. Very slow permeability is a severe limitation for septic tank absorption fields, and a specially designed alternative system may be needed. High shrink-swell potential is a severe limitation for dwellings and small commercial buildings. Possible corrective measures include using extra reinforcement in footings and backfilling with sandy material. Slope is also a severe limitation for small commercial buildings. Landscaping or adapting the design to conform with the natural slope are possible alternatives. High shrink-swell potential and low strength are severe limitations for local roads and streets; however, suitable subgrade or base material can help to prevent damage.

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

20—Enders stony fine sandy loam, 12 to 20 percent slopes. This soil is deep, well drained, and moderately steep. It is on side slopes of ridges and hills. Individual areas range from about 10 to 500 acres in size.

Typically, the surface layer is dark grayish brown stony fine sandy loam about 3 inches thick. The subsurface layer is yellowish brown gravelly fine sandy loam to a depth of about 7 inches. The subsoil extends to a depth of 59 inches. It is yellowish red silty clay loam to a depth of about 11 inches and red silty clay to a depth of about 31 inches. To a depth of about 53 inches, the subsoil is red silty clay that has mottles in shades of brown and gray. Below that, it is gray silty clay that has mottles in shades of red and brown. The underlying bedrock is soft weathered shale.

This soil is low in natural fertility and organic matter content. It is strongly acid or very strongly acid throughout. Permeability is very slow, and the available water capacity is moderate.

Included with this soil in mapping are a few small areas of Mountainburg and Nella soils. The Nella soils are deep and are on adjacent colluvial slopes, and the Mountainburg soils are shallow and are on ridgetops. Also included are a few areas of soils that have a gravelly silt loam surface layer.

This Enders soil is not suited to cultivated crops and is poorly suited to pasture. Rapid runoff and steepness of slope are severe limitations, and erosion is a very severe hazard. Surface stones are a moderate limitation for equipment use. Suitable pasture plants include bermudagrass, bahiagrass, tall fescue, annual lespedeza, and sericea lespedeza.

This soil has the capability of producing about 86 cubic feet per acre per year of shortleaf pine commercial forest products. Suitable trees include loblolly pine, shortleaf pine, and southern red oak. Concerns in management include moderate equipment use limitations.

This soil is poorly suited to most urban uses. Very slow permeability and slope are severe limitations for septic tank absorption fields, and a specially designed alternative system may be needed. Slope and a high shrink-swell potential are severe limitations for dwellings and small commercial buildings. Possible corrective measures include using extra reinforcement in footings and backfilling with sandy material. Landscaping or adapting the design to conform with the natural slope are possible alternatives. Slope, high shrink-swell potential, and low strength are severe limitations for local roads and streets; however, suitable subgrade or base material can help to prevent damage.

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

21—Enders-Mountainburg stony fine sandy loams, 8 to 20 percent slopes. This map unit consists of soils that are strongly sloping to moderately steep, deep and shallow, and well drained. These soils are on upland side slopes. The soils in this map unit are too intermingled to be mapped separately. The Enders soil is deep and is on slopes between sandstone ledges and on foot slopes. This soil formed from predominately acid shale bedrock. The Mountainburg soil is shallow and is on narrow sandstone ledges and benches. It developed from acid sandstone bedrock. Individual areas of these soils range from about 50 to 600 acres in size.

The Enders soil makes up about 55 percent of this map unit. Typically, the surface layer is dark grayish brown stony fine sandy loam about 3 inches thick. The subsurface layer is yellowish brown gravelly fine sandy loam to a depth of about 7 inches. The subsoil extends to a depth of about 59 inches. It is yellowish red silty clay loam to a depth of about 11 inches and red silty clay to a depth of about 31 inches. To a depth of about 53 inches, the subsoil is red silty clay that has mottles in shades of brown and gray. Below that, it is gray silty clay that has mottles in shades of red and brown. The underlying bedrock is soft weathered shale.

This soil is low in natural fertility and organic matter content. It is strongly acid or very strongly acid throughout. Permeability is very slow, and the available water capacity is moderate.

The Mountainburg soil makes up about 40 percent of this map unit. Typically, the surface layer is dark brown stony fine sandy loam about 5 inches thick. The subsurface layer is yellowish brown stony fine sandy loam to a depth of about 9 inches. The subsoil is strong brown very gravelly loam to a depth of about 17 inches. The underlying bedrock is level-bedded, acid sandstone.

This soil is low in natural fertility and organic matter content. It is medium acid to very strongly acid in the surface and subsurface layers and strongly acid or very strongly acid in the subsoil. Permeability is moderately rapid, and the available water capacity is very low.

Included with these soils in mapping are a few small areas of Nella soils that are well drained and are on benches and foot slopes, a few small areas of rock outcrops, and a few small areas of soils that have a gravelly or very stony surface layer. The included soils make up about 5 percent of the map unit.

The soils of this map unit are not suited to cultivated crops and are poorly suited to pasture because of surface stones, slope, and depth to bedrock. Suitable pasture plants include bermudagrass, bahiagrass, white clover, lespedeza, and tall fescue. Concerns in management include proper stocking, rotation grazing, and brush and weed control.

These soils are mainly used as woodland. Enders soil has the capability of producing about 88 cubic feet per acre per year of shortleaf pine commercial forest products. Mountainburg soil has the capability of producing about 68 cubic feet per acre per year. Suitable trees include loblolly pine, shortleaf pine, eastern redcedar, and southern red oak on the Enders soil; and loblolly pine, shortleaf pine, and eastern redcedar on the Mountainburg soil. Because of surface stones, equipment use limitations are moderate. Seedling mortality is moderate on Mountainburg soil because of the shallow rooting depth.

These soils are poorly suited to most urban uses. Slow permeability in the Enders soil and depth to bedrock in the Mountainburg soil are severe limitations for septic tank absorption fields. These limitations are difficult or impractical to overcome. Possible methods to offset the limitations caused by slow permeability include increasing the size of the absorption field or using a specially designed alternative system. The high shrink-swell potential of the Enders soil and depth to bedrock of the Mountainburg soil are severe limitations for

dwellings and small commercial buildings. Slope is a severe limitation to the use of the Enders and Mountainburg soils for small commercial buildings. The effects of the high shrink-swell potential can generally be overcome by adding reinforcement to the foundations. Depth to bedrock is a limitation that is difficult and generally not practical to overcome. A better soil should be selected. Slope is also a difficult limitation to overcome and often requires extreme cut and fill operations. Designs that conform to the natural contour of the landcape can help offset slope limitations. Low strength and high shrink-swell potential of the Enders soil and depth to bedrock of the Mountainburg soil are severe limitations for local roads and streets. The low strength limitation and the effects of the shrink-swell potential can be minimized by adding fill of suitable subgrade material to the roadbed.

The Enders and Mountainburg soils are in capability subclass VIs. Enders soil is in woodland suitability group 6X8, and Mountainburg soil is in 5X2.

22—Enders-Mountainburg stony fine sandy loams, 20 to 40 percent slopes. This map unit consists of soils that are steep, deep and shallow, and well drained. They are on side slopes. These soils are too intermingled to be mapped separately. The Enders soil is deep and is on slopes between sandstone ledges or benches and on foot slopes. It formed from predominately acid shale bedrock. The Mountainburg soil is shallow and is on narrow sandstone ledges and benches. It developed from acid sandstone bedrock. Individual areas of these soils range from about 50 to 600 acres in size.

The Enders soil makes up about 60 percent of this map unit. Typically, the surface layer is dark grayish brown stony fine sandy loam about 3 inches thick. The subsurface layer is yellowish brown gravelly fine sandy loam to a depth of about 7 inches. The subsoil extends to a depth of about 59 inches. It is yellowish red silty clay loam to a depth of about 11 inches and red silty clay to a depth of about 31 inches. To a depth of about 53 inches, the subsoil is red silty clay that has mottles in shades of brown and gray. Below that, it is gray silty clay that has mottles in shades of red and brown. The underlying bedrock is soft weathered shale.

This soil is low in natural fertility and organic matter content. It is strongly acid or very strongly acid throughout. Permeability is very slow, and the available water capacity is moderate.

The Mountainburg soil makes up about 35 percent of this map unit. Typically, the surface layer is dark brown stony fine sandy loam about 5 inches thick. The subsurface layer is yellowish brown stony fine sandy loam to a depth of about 9 inches. The subsoil is strong brown very gravelly loam to a depth of about 17 inches. The underlying bedrock is level-bedded, acid sandstone.

This soil is low in natural fertility and organic matter content. It is medium acid to very strongly acid in the surface and subsurface layers and strongly acid or very strongly acid in the subsoil. Permeability is moderately rapid, and the available water capacity is very low.

Included with these soils in mapping are a few small areas of Nella soils that are deep and are on benches and foot slopes, a few small areas of rock outcrop, and a few small areas of soils that have a gravelly or very stony surface layer. The included soils make up about 5 percent of the map unit.

The soils in this map unit are not suited to cultivated crops or to pasture. The main limitations are steep slopes, surface stones, and droughtiness.

These soils are used mainly as woodland. Enders soil has the capability of producing about 88 cubic feet per acre per year of shortleaf pine commercial forest products, and Mountainburg soil has the capability of producing about 68 cubic feet per acre per year. Suitable trees include loblolly pine, shortleaf pine, eastern redcedar, and southern red oak on the Enders soil; and loblolly pine, shortleaf pine, and eastern redcedar on the Mountainburg soil. Because of surface stones and steep slopes, equipment use limitations are moderate. Erosion is a moderate hazard on the steep slopes. Seeding mortality is moderate on Mountainburg soil because of the shallow rooting depth.

The soils in this map unit are poorly suited to most urban uses. Steepness of slope is a severe limitation to the use of these soils for septic tank absorption fields. The very slow permeability of the Enders soil and depth to bedrock of the Mountainburg soil are severe limitations that are difficult to overcome. Possible methods to offset the permeability limitation include increasing the size of the absorption field or using a specially designed alternative system. Steepness of slope is also a severe limitation of these soils for dwellings and small commercial buildings. The high shrink-swell potential of the Enders soil and the depth to bedrock of the Mountainburg soil are also severe limitaions. Designs that conform to the natural contour of the landscape can help offset slope limitations. Limitations caused by the shrinking and swelling can generally be overcome by adding reinforcement to the foundations. Depth to bedrock is difficult and generally not practical to overcome. A better suited soil should be selected. Steepness of slope is a severe limitation of each soil for local roads and streets. High shrink-swell potential and low strength are also severe limitations of the Enders soil. Depth to bedrock is a severe limitation of the Mountainburg soil. Steepness of slope and depth to bedrock are difficult and not practical to overcome. Extensive cut and fill operations are often required because of slope. The effects of shrinking and swelling and the low strength limitation can be minimized by adding fill of suitable subgrade material to the roadbed.

The Enders and Mountainburg soils are in capability subclass VIIs. Enders soil is in woodland suitability group 6R8, and Mountainburg soil is in 5R2.

23—Guthrie silt loam, 0 to 1 percent slopes. This soil is deep, poorly drained, and level. It is on old stream terraces in broad valleys. Individual areas range from about 5 to 100 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 5 inches thick. The subsurface layer, to a depth of about 10 inches, is gray silt loam that has mottles in shades of brown. The subsoil extends to a depth of at least 72 inches. To a depth of about 22 inches, it is gray silt loam that has strong brown mottles. Below that, the subsoil is compact and brittle silty clay loam. To a depth of about 40 inches, it is gray with mottles in shades of brown and red. It is mottled gray, light yellowish brown, and strong brown to a depth of about 55 inches and mottled yellowish brown and gray below that.

This soil is low in natural fertility and organic matter content. Reaction is very strongly acid throughout except where lime has been added. Permeability is slow, and the available water capacity is moderate. The seasonal high water table is within 6 inches of the surface in winter and early in spring. Crops and grasses respond well to fertilization.

Included with this soil in mapping are a few small areas of Leadvale and Taft soils. These soils are on higher landscapes and are better drained than the Guthrie soil. Also included are a few small areas that have low mounds on the surface.

This soil is moderately suited to cultivated crops, including soybeans, grain sorghum, and winter small grains, if surface drainage is adequate. Rice is also a suitable crop for this soil. Excess surface water is a severe limitation because runoff is slow and seepage is received from adjacent slopes. Farming operations are often delayed several days after a rain. Adequate surface drainage is needed to minimize this limitation. Other good management practices include conservation tillage and crop residue management.

This soil is moderately suited to pasture, and this is the main use. Suitable pasture plants include bermudagrass, tall fescue, white clover, and lespedeza. Seasonal wetness is a moderate limitation for pasture, and adequate surface drainage is needed. Other good management practices include proper stocking, rotation grazing, and weed and brush control.

This soil has the capability of producing about 110 cubic feet per acre per year of shortleaf pine commercial forest products. Suitable trees include loblolly pine, shortleaf pine, and sweetgum. Equipment use limitations and seedling mortality are moderate because of wetness. The equipment use limitations can be minimized by timing operations to avoid seasonal wetness. Special site preparation, such as bedding or surface drainage, can reduce seedling mortality.

This soil is poorly suited to most urban uses. Wetness and slow permeability are severe limitations for septic tank absorption fields. Possible alternatives include installing diversions to intercept water from higher places, constructing a drainage system around absorption fields, or using a specially designed alternative system. Wetness is a severe limitation for dwellings and small commercial buildings. Possible methods of minimizing this limitation include constructing drains by footings, shaping land so surface water moves away from the structure, and constructing on raised fill material. Low strength is a severe limitation for local roads and streets; however, providing suitable subgrade or base material can help to minimize this limitation.

This Guthrie soil is in capability subclass IIIw and in woodland suitability group 3w8.

24—Guthrie silt loam, occasionally flooded. This soil is deep, poorly drained, and level. It is on low terraces of local streams. Slope is 0 to 1 percent. Individual areas range from about 10 to 500 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 5 inches thick. The subsurface layer, to a depth of about 10 inches, is gray silt loam that has mottles in shades of brown. The subsoil extends to a depth of at least 72 inches. To a depth of about 22 inches, it is gray silt loam that has strong brown mottles. Below that, the subsoil is compact and brittle silty clay loam. To a depth of about 40 inches, it is gray with mottles in shades of brown and red. It is mottled gray, light yellowish brown, and strong brown to a depth of about 55 inches and mottled yellowish brown and gray below that.

This soil is low in natural fertility and organic matter content. It is very strongly acid throughout except where lime has been added. Permeability is slow, and the available water capacity is moderate. The seasonal high water table is within 6 inches of the surface in winter and early in spring. Crops and grasses respond well to fertilization. Flooding is infrequent under usual weather conditions. It generally occurs between December and April and lasts from 1 to 2 days. If the soil does not have a plant cover, fast-moving floodwaters can cause severe scouring.

Included with this soil in mapping are a few small areas of Barling and Spadra soils. These soils are on higher landscapes and are better drained than the Guthrie soil.

This Guthrie soil is poorly suited to cultivated crops. Soybeans, grain sorghum, and winter small grains can be grown if surface drainage is adequate. Rice is also a suitable crop for this soil (fig. 8). Excess surface water is a severe limitation because runoff is slow and seepage is received from adjacent slopes. Farming operations are often delayed several days after a rain. Adequate surface drainage is needed to minimize this limitation. Other good management practices include conservation tillage and crop residue management.

This soil is moderately suited to pasture. Suitable pasture plants include common bermudagrass, bahiagrass, white clover, and tall fescue. The main limitation is seasonal wetness, and surface drainage generally is needed. Concerns in management include proper stocking, rotation grazing, and weed and brush control.

This soil has the capability of producing about 110 cubic feet per acre per year of shortleaf pine commercial forest products. Suitable trees include loblolly pine, shortleaf pine, and sweetgum. Equipment use limitations and seedling mortality are moderate because of wetness. The equipment use limitations can be minimized by timing operations to avoid seasonal wetness. Special site preparation, such as bedding or surface drainage, can reduce seedling mortality.

This soil is poorly suited to most urban uses, mainly because of flooding. Slow permeability and wetness are severe limitations for septic tank absorption fields. Wetness is also a severe limitation for dwellings, small commercial buildings, and local roads and streets. Low strength is also a severe limitation for local roads and streets. Other sites or the included soils in this map unit that are better suited should be considered for most urban uses.

Figure 8.—Guthrie silt loam, occasionally flooded, produces good yields of rice.

This Guthrie soil is in capability subclass IVw and in woodland suitability group 8w8.

25—Kenn-Ceda complex, occasionally flooded. This complex consists of soils that are deep and well drained. They are on level or nearly level flood plains along streams in narrow valleys. The soils of this complex are too intermingled to be mapped separately. Slopes are 0 to 3 percent. Individual areas range from about 3 to 200 acres in size.

Kenn soil makes up about 55 percent of the complex. Typically, the surface layer is dark brown fine sandy loam about 7 inches thick. The subsoil is yellowish red sandy clay loam to a depth of about 24 inches and mottled yellowish red and strong brown very gravelly sandy clay loam to a depth of about 42 inches. The substratum is mottled strong brown and yellowish brown very gravelly sandy clay loam to a depth of about 72 inches.

This soil is moderate in natural fertility and organic matter content. It ranges from slightly acid to strongly acid in the surface layer and is strongly acid or very strongly acid in the subsoil and substratum. Permeability and the available water capacity are moderate.

Ceda soil makes up about 35 percent of the complex. Typically, the surface layer is dark grayish brown gravell fine sandy loam about 7 inches thick. The underlying material is very gravelly loam to a depth of about 72 inches. It is dark brown to a depth of about 24 inches, strong brown to a depth of about 44 inches, and yellowish brown below that.

This soil is low in natural fertility and organic matter content. It is slightly acid or medium acid throughout. Permeability is rapid, and the available water capacity is low. Flooding is infrequent under usual weather conditions. It generally occurs between January and May and lasts from 1 to 2 days. If the soil does not have plant cover, fast-moving floodwaters can cause severe scouring.

Included with this complex in mapping are small areas of Spadra soils and small areas of soils that have a stony surface layer. The included soils make up about 10 percent of the complex.

The soils of this complex are used mainly as woodland.

These soils are poorly suited to cultivated crops. The delineations of this map unit are generally long and narrow, and the individual areas of each soil are so small that row cropping generally is not practical. Grain sorghum and other small grains are suitable crops.

These soils are moderately suited to pasture. Suitable pasture plants include bermudagrass, bahiagrass, tall fescue, and white clover. Concerns in management include proper stocking, rotation grazing, and weed and brush control.

The Kenn soil has the capability of producing about 110 cubic feet per acre per year of shortleaf pine commercial forest products, and the Ceda soil has the capability of producing about 99 cubic feet per acre per year. Suitable trees include loblolly pine, shortleaf pine, and southern red oak on Kenn soil and loblolly pine, shortleaf pine, American sycamore, and sweetgum on Ceda soil. Seedling mortality is moderate on Kenn and Ceda soils.

These soils are poorly suited to most urban uses. Occasional flooding severely limits the use of these soils for septic tank absorption fields, dwellings, small commercial buildings, and local roads and streets. Other sites or the included soils in this map unit that are above flood-prone areas should be considered for most urban uses.

The Kenn and Ceda soils are in capability subclass IVe. The Kenn soil is in woodland suitability group 8W8, and the Ceda soil is in 7W8.

26—Leadvale silt loam, 1 to 3 percent slopes. This soil is deep, moderately well drained, and nearly level. It is on old stream terraces in broad valleys. Individual areas range from about 10 to 200 acres in size.

Typically, the surface layer is dark brown silt loam 6 inches thick. The subsoil extends to a depth of at least 72 inches. It is strong brown silt loam to a depth of about 10 inches and yellowish brown silty clay loam to a depth of about 20 inches. To a depth of 25 inches, the subsoil is brownish yellow silty clay loam that has gray and strong brown mottles; and to a depth of 51 inches, it is yellowish brown silty clay loam that has gray mottles. Below that, the subsoil is mottled yellowish brown and light brownish gray silty clay loam. A compact and brittle fragipan is at a depth of 25 to 51 inches.

This soil is low in natural fertility and moderate in organic matter content. It is strongly acid or very strongly acid throughout. Permeability is moderate above the fragipan and slow in the fragipan. The available water capacity is moderate. The fragipan restricts root penetration and slows the movement of water through the soil. The seasonal high water table is within 24 inches of the surface in winter and early in spring. Crops and grasses respond well to fertilization, and tilth is easy to maintain.

Included with this soil in mapping are a few small areas of Cane, Guthrie, Pickwick, and Taft soils. The Cane soil is in similar positions on the landscape as the Leadvale soil. The Guthrie and Taft soils are in level to depressional areas. The Pickwick soils are in higher positions. Also included are a few small areas that have a few low mounds on the surface and a few small areas of soils; some have slopes of less than 1 percent and others have sodium in the subsoil.

This Leadvale soil is well suited to cultivated crops, including soybeans, truck crops, grain sorghum, and winter small grains. Erosion is a moderate hazard. Under good management that includes adequate erosion control, crops can be safely grown. Terraces, contour

cultivation, conservation tillage, proper management of crop residue, and cover crops reduce runoff and help to control erosion.

This soil is well suited to use as pasture and hayland, and this is the main use (fig. 9). Suitable pasture plants include bahiagrass, common bermudagrass, tall fescue, white clover, and sericea lespedeza. Concerns in management include proper stocking, rotation grazing, and weed and brush control.

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

This soil is moderately suited to most urban uses. Wetness and slow permeability are severe limitations for septic tank absorption fields. Constructing a drainage system around the absorption field, enlarging the absorption field, or using a specially designed alternative system can minimize the limitations. Wetness is a moderate limitation for dwellings and small commercial buildings. Possible corrective measures include constructing tile drains by footings, shaping the site so that runoff is diverted away from the dwelling, or building in a high area of the map unit. Low strength is a moderate limitation for local roads and streets. Suitable subgrade or base material helps to minimize this limitation. Wetness is also a moderate limitation for local roads and streets. Possible corrective measures include constructing on raised fill material or installing a drainage system.

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

27—Leadvale silt loam, 3 to 8 percent slopes. This soil is deep, moderately well drained, and gently sloping. It is on colluvial foot slopes and old stream terraces in broad valleys. Individual areas range from about 10 to 300 acres in size.

Figure 9.—Tall fescue and white clover pasture on Leadvale silt loam, 1 to 3 percent slopes, is one of the main uses of this soil.

Typically, the surface layer is dark brown silt loam 6 inches thick. The subsoil extends to a depth of at least 72 inches. It is strong brown silt loam to a depth of about 10 inches and yellowish brown silty clay loam to a depth of about 20 inches. To a depth of 25 inches, the subsoil is brownish yellow silty clay loam that has strong brown mottles; and to a depth of about 51 inches, it is yellowish brown silty clay loam. Below that, the subsoil is mottled yellowish brown and light brownish gray silty clay loam. A compact and brittle fragipan is at a depth of 25 to 51 inches.

This soil is low in natural fertility and moderate in organic matter content. It is strongly acid or very strongly acid throughout. Permeability is moderate above the fragipan and slow in the fragipan. The available water capacity is moderate. The fragipan restricts root penetration and slows the movement of water through the soil. The seasonal high water table is within 24 inches of the surface in winter and early in spring. Crops and grasses respond well to fertilization, and tilth is easy to maintain.

Included with this soil in mapping are a few small areas of Cane and Enders soils. Cane soils are in similar positions on the landscape as the Leadvale soil, and Enders soils are in higher positions.

This Leadvale soil is moderately suited to cultivated crops, including soybeans, truck crops, grain sorghum, and small grains. Erosion is a severe hazard; however, under good management that includes adequate erosion control, clean tilled crops can be grown. Terraces, contour cultivation, conservation tillage, proper management of crop residue, and cover crops reduce runoff and help control erosion. Conservation treatment needs intensify as slope length and gradient increase.

This soil is well suited to use as pasture and hayland, and this is the main use (fig. 10). Suitable pasture plants include bahiagrass, bermudagrass, tall fescue, white clover, sericea lespedeza, and annual lespedeza. Concerns in management include proper stocking, rotation grazing, and weed and brush control.

This soil has the capability of producing about 110 cubic feet per acre per year of shortleaf pine commercial

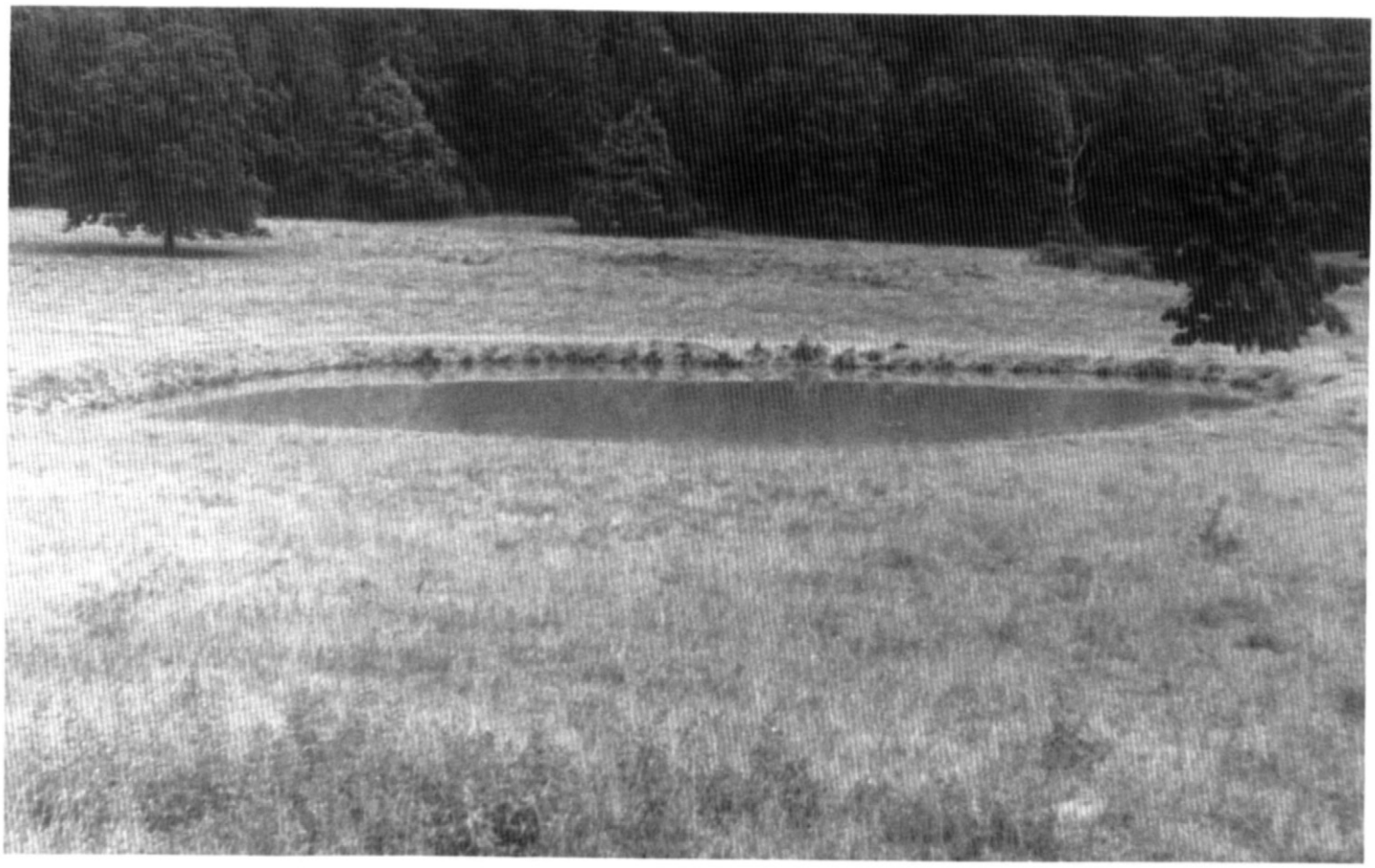


Figure 10.—Leadvale silt loam, 3 to 8 percent slopes, is rated moderate for pond reservoirs.

forest products. Suitable trees include loblolly pine, shortleaf pine, southern red oak, and white oak. There are no significant limitations for woodland management.

This soil is moderately suited to most urban uses. Wetness and slow permeability are severe limitations for septic tank absorption fields. Possible alternatives include constructing a drainage system around the absorption field, enlarging the absorption field, or using a specially designed alternative system. Wetness is a moderate limitation for dwellings and small commercial buildings. Possible corrective measures include constructing tile drains by footings, shaping the site so runoff is diverted away from the dwelling, or building in a high area of the map unit. Slope is also a moderate limitation for small commercial buildings. Possible corrective measures include landshaping or adapting the design to conform to the natural slope. Wetness is a moderate limitation for local roads and streets. Possible corrective measures include constructing on raised fill material or installing a drainage system. Low strength is also a moderate limitation for local roads and streets. Suitable subgrade or base material can help to minimize this limitation.

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

28—Linker fine sandy loam, 3 to 8 percent slopes. This soil is moderately deep and well drained. It is on gently sloping hilltops and mountaintops. Individual areas range from 10 to 200 acres in size.

Typically, the surface layer is dark brown fine sandy loam about 6 inches thick. The subsoil is strong brown loam to a depth of about 10 inches and yellowish red loam to a depth of about 36 inches. The underlying bedrock is level-bedded, acid sandstone.

This soil is low in natural fertility and organic matter content. It is strongly acid or very strongly acid throughout. Permeability is moderate, and the available water capacity is low. Crops and grasses respond well to fertilization, and tilth is easy to maintain.

Included with this soil in mapping are a few small areas of Enders, Mountainburg, and Nella soils. The Enders and Nella soils are deep and are on the sides of the hills, mountains, and ridges. The Mountainburg soils are shallow and are on landscapes similar to those of the Linker soil. Also included are a few small areas of soils; some have a gravelly surface layer and others are deeper than 40 inches to sandstone bedrock.

This Linker soil is moderately suited to cultivated crops, including soybeans, grain sorghum, winter small grains, and truck crops. Erosion is a severe hazard. Under good management that includes adequate erosion control, crops can be grown in rotation with grasses. Terraces, contour cultivation, conservation tillage, proper management of crop residue, and cover crops reduce runoff and help to control erosion. Conservation treatment needs intensify as slope length and gradient increase.

This soil is moderately suited to use as pasture and hayland, and this is the main use. Suitable pasture plants include bermudagrass, bahiagrass, tall fescue, and white clover. There are no significant limitations for pasture, but concerns in management include proper stocking, rotation grazing, and weed and brush control.

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

This soil is moderately suited to most urban uses. Depth to bedrock is a severe limitation for septic tank absorption fields. This limitation is generally difficult to overcome, and a special design or other alternative system may be needed. Depth to bedrock is also a moderate limitation for dwellings and small commercial buildings. Possible alternatives include building where the soil is deeper to bedrock or in areas of the deeper included soils, landscaping with additional fill, or selecting a better site. Slope is also a moderate limitation for small commercial buildings. Possible corrective measures include using designs that conform to the natural slope and shaping the land. Depth to bedrock is a moderate limitation for local roads and streets; however, this limitation can be overcome by planning grades and locations to avoid removal of rock, by ripping the rock where it is soft enough, and by blasting the rock when necessary.

This Linker soil is in capability subclass IIIe and in woodland suitability group 6A1.

29—Linker-Mountainburg complex, 1 to 8 percent slopes. This complex consists of soils that are well drained, moderately deep and shallow, and nearly level to gently sloping. These soils are on hilltops and mountaintops. They developed from acid sandstone bedrock. The soils are too intermingled to be mapped separately. Individual areas of this complex range from 50 to 200 acres in size.

The Linker soil makes up about 55 percent of the complex. Typically, the surface layer is dark brown fine sandy loam about 6 inches thick. The subsoil is strong brown loam to a depth of about 10 inches and yellowish red loam to a depth of about 36 inches. The underlying bedrock is level-bedded, acid sandstone.

This soil is moderately deep and is low in natural fertility and organic matter content. It is strongly acid or very strongly acid throughout. Permeability is moderate, and the available water capacity is low. Crops and grasses respond well to fertilization, and tilth is easy to maintain.

The Mountainburg soil makes up about 40 percent of the complex. Typically, the surface layer is dark brown

gravelly fine sandy loam about 5 inches thick. The subsurface layer is yellowish brown gravelly fine sandy loam to depth of about 9 inches. The subsoil is strong brown very gravelly loam to a depth of about 17 inches. The underlying bedrock is level-bedded, acid sandstone.

This soil is shallow and is low in natural fertility and organic matter content. It is medium acid to very strongly acid in the surface and subsurface layers and strongly acid or very strongly acid in the subsoil. Permeability is moderately rapid, and the available water capacity is very low. Crops and grasses respond poorly to fertilization.

Included with this complex in mapping are a few small areas of Enders and Nella soils on side slopes. Also included are a few small areas of rock outcrop and a few small areas of other soils, some have a stony surface layer and others are deeper than 40 inches to sandstone bedrock. The included soils make up about 5 percent of the complex.

The soils in this complex are poorly suited to cultivated crops because erosion is a very severe hazard and the available water capacity is low and very low. Suitable crops include grain sorghum and small grains. Under management systems that include contour cultivation, conservation tillage, and proper management of crop residue, clean tilled crops can be grown occasionally. A cropping system is needed that includes a sustained cover of close-growing crops. Conservation treatment needs intensify as slope length and gradient increase.

These soils are poorly suited to pasture, and this is the main use. Suitable pasture plants include bermudagrass, bahiagrass, tall fescue, and white clover. Linker soil has no significant limitations for pasture, but Mountainburg soil has severe limitations because of the very low available water capacity and depth to bedrock. Concerns in management include proper stocking, rotation grazing, and weed and brush control.

Linker soil has the capability of producing about 88 cubic feet per acre per year of shortleaf pine commercial forest products, and Mountainburg soil has the capability of producing about 68 cubic feet per acre per year. Suitable trees include shortleaf pine, loblolly pine, southern red oak, and eastern redcedar. Linker soil has no significant limitations for woodland use or management. Seedling mortality is moderate on Mountainburg soil because of the shallow depth to bedrock and very low available water capacity. Seedling mortality can be reduced by limiting compaction so that infiltration rates remain high for critical summer rains.

The soils in this complex are poorly suited to most urban uses. Depth to bedrock is a severe limitation to the use of these soils for septic tank absorption fields. This limitation generally is difficult to overcome, and a special design or other alternative system may be needed. Depth to bedrock is also a moderate limitation of Linker soil and a severe limitation of Mountainburg soil for dwellings and small commercial buildings. Possible alternatives include building where the soil is deeper to bedrock or in areas of the deeper included soils, landscaping with additional fill, or selecting a better site. Slope is also a moderate limitation for small commercial buildings. Possible corrective measures include using a design that conforms to the natural slope and shaping the land. Depth to bedrock is a moderate limitation in Linker soil and a severe limitation in Mountainburg soil for local roads and streets; however, this limitation can be overcome by planning grades and locations to avoid removal of rock, by ripping the rock where it is soft enough, and by blasting the rock when necessary.

The Linker and Mountainburg soils are in capability subclass IVe. The Linker soil is in woodland suitability 6A1, and the Mountainburg soil is in 5D2.

30—McKamie silt loam, 3 to 8 percent slopes, eroded. This soil is deep and well drained. It is on gently sloping high terraces along the Arkansas River. Individual areas range from about 10 to 200 acres in size.

Typically, the surface layer is dark brown silt loam about 4 inches thick. The subsoil is silty clay. It extends to a depth of about 59 inches. It is red to a depth of about 23 inches, reddish brown to a depth of 42 inches, and red below that. The substratum to a depth of 72 inches is brown silty clay loam that has dark brown mottles.

This soil is moderate in natural fertility and low in organic matter content. It ranges from slightly acid to strongly acid in the surface layer and medium acid to very strongly acid in the upper part of the subsoil. Below a depth of about 30 inches, this soil ranges from very strongly acid to moderately alkaline and is calcareous in places. Permeability is very slow, and the available water capacity is high. Crops and grasses respond well to fertilization. Sheet and rill erosion have reduced the thickness of the surface layer in most areas and exposed the subsoil in some places. Where this soil has been cultivated, plowing has mixed the surface layer with the subsoil.

Included with this soil in mapping are a few small areas of Muskogee soils. Muskogee soils are on slightly lower landscapes than the McKamie soil and are moderately well drained. Also included are a few small areas of soils that have slopes of more than 8 percent.

This McKamie soil is poorly suited to cultivated crops. Runoff is medium to rapid, and the hazard of erosion is very severe. Contour farming, conservation tillage, terraces, and cover crops reduce runoff and help to control erosion. A thin surface layer is also a limitation for cultivated crops.

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

rotation grazing, maintaining the fertility level, and brush and weed control.

This soil has the capability of producing about 110 cubic feet per acre per year of shortleaf pine commercial forest products. Suitable trees include loblolly pine and shortleaf pine. Equipment use limitations are moderate because of the clayey subsoil.

This soil is poorly suited to most urban uses. Very slow permeability is a severe limitation for septic tank absorption fields, and a specially designed alternative system may be needed. High shrink-swell potential is a severe limitation for dwellings and small commercial buildings. Possible corrective measures include using extra reinforcement in footings and backfilling with sandy material. High shrink-swell potential and low strength are severe limitations for local roads and streets; however, suitable subgrade or base material can help to minimize this limitation.

This McKamie soil is in capability subclass VIe and in woodland suitability group 8C2.

31—Moreland silty clay, 0 to 1 percent slopes. This soil is deep and somewhat poorly drained. It is in level slack water areas on flood plains of the Arkansas River. Individual areas range from about 20 to 200 acres in size.

Typically, the surface layer is dark reddish brown silty clay about 7 inches thick. The subsoil is silty clay. It extends to a depth of at least 72 inches. It is dark reddish brown to a depth of about 55 inches and reddish brown below that.

This soil is high in natural fertility and moderate in organic matter content. It ranges from slightly acid to mildly alkaline in the surface layer and from neutral to moderately alkaline in the subsoil. In some places, the subsoil is calcareous between depths of 10 and 40 inches. Permeability is very slow, and the available water capacity is high. The seasonal high water table is at or near the surface in winter and early in spring. Levees that parallel the Arkansas River protect this soil from flooding. Crops respond well to fertilization.

Included with this soil in mapping are a few small areas of Dardanelle and Roellen soils. Dardanelle soils are on higher landscapes than the Moreland soil and Roellen soils are on similar landscapes. Also included are a few small areas that have gently undulating topography and a few small areas of soils that are occasionally flooded during the winter.

This Moreland soil is moderately suited to cultivated crops if surface drainage is adequate. The main crop is soybeans. Other suitable crops include corn, grain sorghum, and rice. Farming operations commonly are delayed several days after a rain because of excess water. Surface drainageways are needed in some areas.

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

This soil has the capability of producing about 128 cubic feet per acre per year of eastern cottonwood commercial forest products. Suitable trees include eastern cottonwood, American sycamore, and cherrybark oak. Equipment use limitations are moderate because of wetness, and seedling mortality is moderate because of the high clay content of the soil. The equipment use limitations can be overcome by logging during the drier season.

This soil is poorly suited to most urban uses. Very slow permeability and wetness are severe limitations for septic tank absorption fields, and a specially designed alternative system may be needed. High shrink-swell potential and wetness are severe limitations for dwellings and small commercial buildings. Possible corrective measures include using extra reinforcement in footings and backfilling with sandy material. High shrink-swell potential, wetness, and low strength are severe limitations for local roads and streets; however, construction on a raised fill of subgrade or base material helps to minimize this limitation.

This soil is in capability subclass IIIw and in woodland suitability group 9W5.

32—Mountainburg gravelly fine sandy loam, 3 to 8 percent slopes. This soil is shallow and well drained. It is on gently sloping hilltops, mountaintops, and ridges. Individual areas range from about 10 to 200 acres in size.

Typically, the surface layer is dark brown gravelly fine sandy loam about 5 inches thick. The subsurface layer is yellowish brown gravelly fine sandy loam to a depth of about 9 inches. The subsoil is strong brown very gravelly loam to a depth of about 17 inches. The underlying bedrock is level-bedded, acid sandstone.

This soil is low in natural fertility and organic matter content. It is medium acid to very strongly acid in the surface and subsurface layers and strongly acid or very strongly acid in the subsoil. Permeability is moderately rapid, and the available water capacity is very low. Crops respond poorly to fertilization.

Included with this soil in mapping are a few small areas of Enders and Linker soils. The Enders soils are deep and are on side slopes. The Linker soils are moderately deep and are on landscapes similar to the Mountainburg soil. Also included are a few small areas of soils that have a stony surface layer and a few small areas of rock outcrop.

This Mountainburg soil is poorly suited to cultivated crops. Depth to bedrock and high content of sandstone fragments cause the soil to have a very low available water capacity. Erosion is a very severe hazard, and the high content of sandstone fragments impedes tillage operations.

This soil is poorly suited to pasture. Depth to bedrock and the high content of sandstone fragments cause the soil to be droughty. Suitable pasture plants include bermudagrass, bahiagrass, and lespedeza. Concerns in management include proper stocking, rotation grazing, and weed and brush control.

This soil has the capability of producing about 68 cubic feet per acre per year of shortleaf pine commercial forest products. Suitable trees include eastern redcedar, loblolly pine, and shortleaf pine. Seedling mortality is moderate.

This soil is poorly suited to most urban uses. Depth to bedrock is a severe limitation for septic tank absorption fields, dwellings, small commercial buildings, and local roads and streets. This limitation is difficult and often impractical to overcome. The selection of better suited soils should be considered.

This Mountainburg soil is in capability subclass IVe and in suitability group 5D2.

33—Mountainburg gravelly fine sandy loam, 8 to 12 percent slopes. This soil is shallow and well drained. It is on strongly sloping side slopes and tops of hills, mountains, and ridges. Individual areas range from about 10 to 150 acres in size.

Typically, the surface layer is dark brown gravelly fine sandy loam about 5 inches thick. The subsurface layer is yellowish brown gravelly fine sandy loam to a depth of about 9 inches. The subsoil is strong brown very gravelly loam to a depth of about 17 inches. The underlying bedrock is level-bedded, acid sandstone.

This soil is low in natural fertility and organic matter content. It is medium acid to very strongly acid in the surface and subsurface layers and strongly acid or very strongly acid in the subsoil. Permeability is moderately rapid, and the available water capacity is very low. Grasses respond poorly to fertilization.

Included with this soil in mapping are a few small areas of Enders, Linker, and Nella soils. The Enders soils are deep and are on side slopes. The Linker soils are moderately deep and are on landscapes similar to those of the Mountainburg soil. The Nella soils are deep and are on side slopes, foot slopes, and benches. Also included are a few small areas of soils that have a stony surface layer and a few small areas of rock outcrop.

This Mountainburg soil is not suited to cultivated crops. Depth to bedrock and high content of sandstone fragments cause the soil to have a very low available water capacity. Erosion is a very severe hazard, and the high content of sandstone fragments impedes tillage operations.

This soil is poorly suited to pasture. Depth to bedrock and the high content of fragments cause the soil to be droughty. Suitable pasture plants include bermudagrass, bahiagrass, and lespedeza. Concerns in management include proper stocking, rotation grazing, and weed and brush control.

This soil has the capability of producing about 68 cubic feet per acre per year of shortleaf pine commercial forest products. Suitable trees include eastern redcedar, loblolly pine, and shortleaf pine. Seedling mortality is moderate.

This soil is poorly suited to most urban uses. Depth to bedrock is a severe limitation for septic tank absorption fields, dwellings, small commercial buildings, and local roads and streets. Slope is also a severe limitation for small commercial buildings. These limitations are difficult and often impractical to overcome. The selection of better suited soils should be considered.

This Mountainburg soil is in capability subclass VIe and in woodland suitability group 5D2.

34—Mountainburg stony fine sandy loam, 1 to 12 percent slopes. This soil is shallow and well drained. It is on nearly level to strongly sloping side slopes and tops of hills, mountains, and ridges. Individual areas range from about 10 to 300 acres in size.

Typically, the surface layer is dark brown stony fine sandy loam about 5 inches thick. The subsurface layer is yellowish brown stony fine sandy loam to a depth of about 9 inches. The subsoil is strong brown very gravelly loam to a depth of about 17 inches. The underlying bedrock is level-bedded, acid sandstone.

This soil is low in natural fertility and organic matter content. It is medium acid to very strongly acid in the surface and subsurface layers and strongly acid or very strongly acid in the subsoil. Permeability is moderately rapid, and the available water capacity is very low.

Included with this soil in mapping are a few small areas of Enders, Linker, and Nella soils. The Enders soils are deep and are on side slopes. The Linker soils are moderately deep and are in positions similar to those of the Mountainburg soil. The Nella soils are deep and are on side slopes, foot slopes, and benches. Also included are a few small areas of soils that have a gravelly surface layer and a few small areas of rock outcrop.

This Mountainburg soil is not suited to cultivated crops or to pasture. Depth to bedrock and high content of sandstone fragments cause the soil to have a very low available water capacity. Surface stones limit the use of equipment.

This soil has the capability of producing about 68 cubic feet per acre per year of shortleaf pine commercial forest products. Suitable trees include eastern redcedar, loblolly pine, and shortleaf pine. Seedling mortality is moderate. Surface stones are a moderate limitation for equipment use.

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

and often impractical to overcome. The selection of better suited soils should be considered.

This Mountainburg soil is in capability subclass VIs and in woodland suitability group 5X2.

35—Mountainburg stony fine sandy loam, 12 to 40 percent slopes. This soil is shallow and well drained (fig. 11). It is on moderately steep and steep side slopes and tops of hills, mountains, and ridges. Individual areas range from about 10 to 400 acres in size.

Typically, the surface layer is dark brown stony fine sandy loam about 5 inches thick. The subsurface layer is yellowish brown stony fine sandy loam to a depth of about 9 inches. The subsoil is strong brown very gravelly loam to a depth of about 17 inches. The underlying bedrock is level-bedded, acid sandstone.

This soil is low in natural fertility and organic matter content. It is medium acid to very strongly acid in the surface and subsurface layers and strongly acid or very strongly acid in the subsoil. Permeability is moderately rapid, and the available water capacity is very low.

Included with this soil in mapping are a few small areas of Enders and Nella soils. These soils are deep. The Enders soils are on side slopes and the Nella soils are on side slopes, foot slopes, and benches. Also included are a few small areas of rock outcrop and a few small areas of other soils; some have a gravelly surface layer and others have slopes of more than 40 percent.

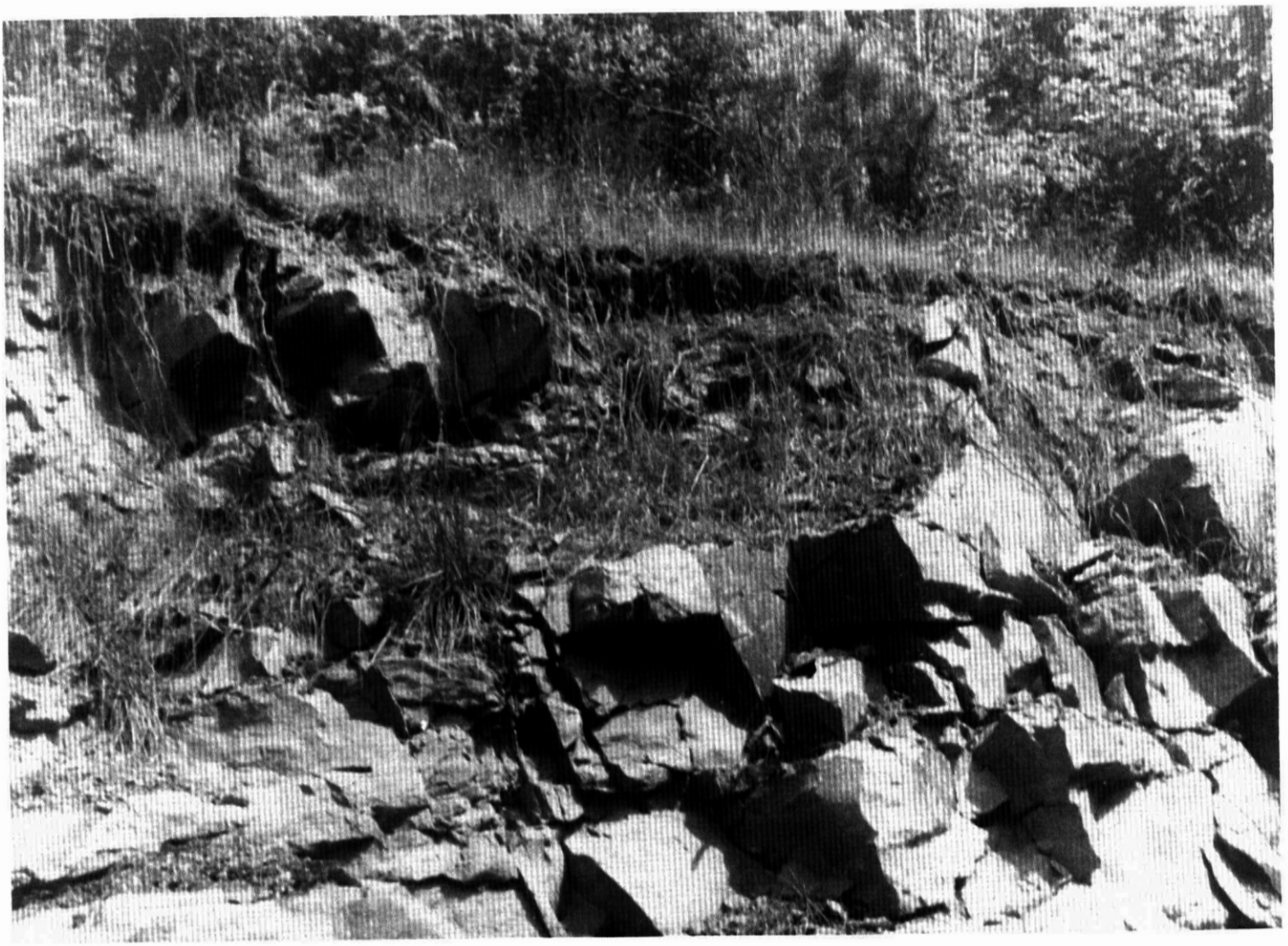


Figure 11.—Because of shallow depth to bedrock, Mountainburg stony fine sandy loam, 12 to 40 percent slopes, is droughty and rooting depth is restricted.

This Mountainburg soil is not suited to cultivated crops or to pasture. Depth to bedrock, slope, and high content of sandstone fragments cause the soil to have a very low available water capacity.

This soil has the capability of producing about 68 cubic feet per acre per year of shortleaf pine commercial forest products. Suitable trees include eastern redcedar, loblolly pine, and shortleaf pine. Seedling mortality is moderate. Surface stones and slope are moderate limitations for equipment use.

This soil is poorly suited to most urban uses. Depth to bedrock and slope are severe limitations for septic tank absorption fields, dwellings, small commercial buildings, and local roads and streets. These limitations are difficult and often impractical to overcome. The selection of better suited soils should be considered.

This Mountainburg soil is in capability subclass VIIs and in woodland suitability group 5R2.

36—Muskogee silt loam, 1 to 3 percent slopes. This soil is deep and moderately well drained. It is on nearly level high terraces along the Arkansas River. Individual areas range from about 10 to 100 acres in size.

Typically, the surface layer is dark brown silt loam about 5 inches thick. The subsurface layer is yellowish brown silt loam to a depth of about 9 inches. The subsoil extends to a depth of at least 72 inches. It is strong brown silty clay loam to a depth of about 24 inches and mottled strong brown, yellowish brown, and gray silty clay to a depth of about 34 inches. To a depth of 61 inches, the subsoil is gray silty clay that has red mottles. Below that, it is yellowish red silty clay that has gray mottles.

This soil is moderate in natural fertility and organic matter content. It ranges from medium acid to very strongly acid in the surface layer, subsurface layer, and upper part of the subsoil. The lower part of the subsoil is strongly acid to mildly alkaline, and in some pedons, it contains calcareous concretions. Permeability is slow, and the available water capacity is high. The seasonal high water table is within 12 inches of the surface in winter and early in spring. Crops respond well to fertilization, and tilth is easy to maintain.

Included with this soil in mapping are a few small areas of Leadvale, McKamie, and Wrightsville soils. The Leadvale soils are on slightly higher landscapes farther away from the river than the Muskogee soil. The McKamie soils are on slightly higher landscapes, and the Wrightsville soils are on slightly lower landscapes.

This Muskogee soil is well suited to cultivated crops. Erosion is a moderate hazard. With good management that includes contour cultivation and terracing on long slopes, crops that leave large amounts of residue can be safely grown year after year. Suitable crops include soybeans, truck crops, grain sorghum, and small grains.

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

This soil has the capability of producing about 110 cubic feet per acre per year of shortleaf pine commercial forest products. Suitable trees include loblolly pine, shortleaf pine and sweetgum. Because of wetness, equipment use limitations are moderate. The limitations can be overcome by logging only during the drier season.

This soil is poorly suited to most urban uses. Slow permeability and wetness are severe limitations for septic tank absorption fields. These limitations are difficult to overcome, and a specially designed alternative system may be needed. High shrink-swell potential and wetness are severe limitations for dwellings and small commercial buildings. Possible corrective measures include using extra reinforcement in footings, installing drains around footings and surface diversions, and backfilling with sandy material. High shrink-swell potential, wetness, and low strength are severe limitations for local roads and streets. Construction on a raised fill of suitable subgrade or base material helps to minimize these limitations.

This Muskogee soil is in capability subclass IIe and in woodland suitability group 8A7.

37—Nella gravelly fine sandy loam, 3 to 8 percent slopes. This soil is deep and well drained. It is on gently sloping foot slopes and benches. Individual areas range from about 10 to 200 acres in size.

Typically, the surface layer is dark brown gravelly fine sandy loam about 3 inches thick. The subsurface layer is yellowish brown gravelly fine sandy loam to a depth of about 7 inches. The subsoil extends to a depth of at least 72 inches. It is yellowish red gravelly loam to a depth of about 14 inches, yellowish red gravelly clay loam to a depth of about 24 inches, and red gravelly clay loam to a depth of about 56 inches. Below that, the subsoil is yellowish red gravelly clay loam that has mottles in shades of brown.

This soil is low in natural fertility and organic matter content. It is strongly acid or very strongly acid throughout. Permeability is moderate, and the available water capacity is moderate. Crops and grasses respond well to fertilization.

Included with this soil in mapping are a few small areas of Enders, Linker, and Mountainburg soils. The Enders soils are on upland side slopes and ridgecrests, and the Linker and Mountainburg soils are on mountaintops and benches. Also included are a few small areas of soils that have a fine sandy loam or stony surface layer.

This Nella soil is moderately suited to cultivated crops including grain sorghum, small grains, and soybeans. Erosion, however, is a severe hazard. Under management that includes conservation tillage, contour

farming, crop rotation, and terracing of the steeper slopes, crops that leave large amounts of residue can be safely grown year after year. Conservation treatment needs intensify as slope length and gradient increase.

This soil is used mainly as pasture and is well suited to this use. Suitable pasture plants include bermudagrass, bahiagrass, white clover, and lespedeza. Concerns in management include proper stocking, rotation grazing, and weed and brush control.

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

This soil is moderately suited to most urban uses. Moderate permeability is a limitation for septic tank absorption fields. This limitation can be minimized by increasing the size of the absorption field or by using a specially designed alternative system. There are no significant limitations for dwellings and local roads and streets, but slope is a moderate limitation for small commercial buildings. Designs that conform to the natural contour of the landscape help to offset this limitation.

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

38—Nella gravelly fine sandy loam, 8 to 12 percent slopes. This soil is deep and well drained. It is on strongly sloping foot slopes and benches. Individual areas range from about 10 to 200 acres in size.

Typically, the surface layer is dark brown gravelly fine sandy loam about 3 inches thick. The subsurface layer is yellowish brown gravelly fine sandy loam to a depth of about 7 inches. The subsoil extends to a depth of at least 72 inches. It is yellowish red gravelly loam to a depth of about 14 inches, yellowish red gravelly clay loam to a depth of about 24 inches, and red gravelly clay loam to a depth of about 56 inches. Below that, the subsoil is yellowish red gravelly clay loam that has mottles in shades of brown.

This soil is low in natural fertility and organic matter content. It is strongly acid or very strongly acid throughout. Permeability and the available water capacity are moderate. Grasses respond well to fertilization.

Included with this soil in mapping are a few small areas of Enders, Linker, and Mountainburg soils. The Enders soils are in similar positions on the landscape as the Nella soil. The Linker and Mountainburg soils are on mountaintops and benches. Also included are a few small areas of soils that have a fine sandy loam or stony surface layer.

This Nella soil is poorly suited to cultivated crops. Runoff is rapid, and erosion is a very severe hazard. Under good management, sown crops can occasionally be grown in a cropping system that includes a sustained cover of close-growing crops.

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

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

This soil is moderately suited to most urban uses. Moderate permeability is also a limitation for septic tank absorption fields. This moderate limitation can be minimized by increasing the size of the absorption field or by using a specially designed alternative system. Slope is a moderate limitation for dwellings and local roads and streets. It is a severe limitation for small commercial buildings. Adapting designs to conform to the natural slope or landscaping are possible alternatives.

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

39—Nella-Enders gravelly fine sandy loams, 8 to 20 percent slopes. This map unit consists of soils that are deep and well drained. These soils are on rolling hillsides and mountainsides. The soils of this map unit are too intermingled to be mapped separately. The Nella soil is on foot slopes, side slopes, and benches. It formed in loamy colluvium from acid sandstone and shale. The Enders soil is on side slopes and benches. It developed from acid shale bedrock. Individual areas range from about 50 to 600 acres in size.

The Nella soil makes up about 60 percent of this map unit. Typically, the surface layer is dark brown gravelly fine sandy loam about 3 inches thick. The subsurface layer is yellowish brown gravelly fine sandy loam to a depth of about 7 inches. The subsoil extends to a depth of at least 72 inches. It is yellowish red gravelly loam to a depth of about 14 inches, yellowish red gravelly clay loam to a depth of about 24 inches, and red gravelly clay loam to a depth of about 56 inches. Below that, the subsoil is yellowish red gravelly clay loam that has mottles in shades of brown.

This soil is low in natural fertility and organic matter content. It is strongly acid or very strongly acid throughout. Permeability and the available water capacity are moderate.

Enders soil makes up about 35 percent of this map unit. Typically, the surface layer is dark grayish brown gravelly fine sandy loam about 3 inches thick. The subsurface layer is yellowish brown gravelly fine sandy loam to a depth of about 7 inches. The subsoil extends to a depth of about 59 inches. It is yellowish red silty

clay loam to a depth of about 11 inches and red silty clay to a depth of about 31 inches. To a depth of about 53 inches, the subsoil is red silty clay that has mottles in shades of brown and gray. Below that, it is gray, silty clay that has mottles in shades of red and brown. The underlying bedrock is weathered shale.

This soil is low in natural fertility and organic matter content. It is strongly acid or very strongly acid throughout. Permeability is very slow, and the available water capacity is moderate.

Included with these soils in mapping are a few small areas of Linker and Mountainburg soils. These soils are on ridgetops. The Linker soils are moderately deep, and Mountainburg soils are shallow. Also included in mapping are a few small areas of rock outcrops and a few small areas of soils that have a stony surface layer.

The soils in this map unit are not suited to cultivated crops. Runoff is rapid, and erosion is a very severe hazard.

These soils are moderately suited to pasture. Suitable pasture plants include bahiagrass, bermudagrass, tall fescue, and lespedeza. Concerns in management include proper stocking, rotation grazing, and weed and brush control.

The soils in this map unit are used mostly as woodland. Nella soil has the capability of producing about 110 cubic feet per acre per year of shortleaf pine commercial forest products, and Enders soil has the capability of producing about 88 cubic feet per acre per year. Suitable trees include shortleaf pine, loblolly pine, and northern red oak on the Nella soil; and shortleaf pine, loblolly pine, and southern red oak on the Enders soil. There are no significant management problems on these soils.

The soils in this map unit are moderately suited to poorly suited to most urban uses. Steepness of slope and moderate permeability are moderate limitations to the use of Nella soil for septic tank absorption fields. Very slow permeability is a severe limitation of the Enders soil for this use. Permeability is difficult to overcome; however, possible methods to offset this limitation include increasing the size of the absorption field or using a specially designed alternative system. Steepness of slope is a moderate limitation to the use of Nella soil for dwellings and a severe limitation of Nella and Enders soils for small commercial buildings. In addition, shrinking and swelling is a severe limitation of the Enders soil for this use. Slope is difficult to overcome, but designs that conform to the natural contour of the landscape can help offset this limitation. Shrinking and swelling can generally be overcome by adding extra reinforcement to the foundation. Low strength and high shrink-swell potential are severe limitations to the use of Enders soil for local roads and streets. Slope is a moderate limitation of the Nella soil for this use. Low strength and shrinking and swelling can be minimized by adding fill of suitable subgrade material to the roadbed. Slope is difficult to overcome and often requires extensive cut and fill operations.

The Nella and Enders soils are in capability subclass VIe. Nella soil is in woodland suitability group 8A7, and Enders soil is in 6A7.

40—Nella-Enders stony fine sandy loams, 20 to 40 percent slopes. This map unit consists of soils that are deep and well drained. These soils are on steep hillsides and mountainsides. They are too intermingled to be mapped separately. The Nella soil is on foot slopes, side slopes, and benches. It formed in loamy colluvium from acid sandstone and shale. The Enders soil is on side slopes and benches, and it developed from acid shale bedrock. Individual areas range from about 50 to 1,000 acres in size.

The Nella soil makes up about 55 percent of this map unit. Typically, the surface layer is dark brown stony fine sandy loam about 3 inches thick. The subsurface layer is yellowish brown cobbly sandy loam to a depth of about 7 inches. The subsoil extends to a depth of at least 72 inches. It is yellowish red gravelly loam to a depth of about 14 inches, yellowish red gravelly clay loam to a depth of about 24 inches, and red gravelly clay loam to a depth of about 56 inches. Below that, the subsoil is yellowish red gravelly clay loam that has mottles in shades of brown.

This soil is low in natural fertility and organic matter content. It is strongly acid or very strongly acid throughout. Permeability and the available water capacity are moderate.

The Enders soil makes up about 30 percent of this map unit. Typically, the surface layer is dark grayish brown stony fine sandy loam about 3 inches thick. The subsurface layer is yellowish brown stony fine sandy loam to a depth of about 7 inches. The subsoil extends to a depth of about 59 inches. It is yellowish red silty clay loam to a depth of about 11 inches and red silty clay to a depth of about 31 inches. To a depth of about 53 inches, the subsoil is red silty clay that has mottles in shades of brown and gray. Below that, it is gray silty clay that has mottles in shades of red and brown. The underlying bedrock is weathered shale.

This soil is low in natural fertility and organic matter content. It is strongly acid or very strongly acid throughout. Permeability is very slow, and the available water capacity is moderate.

Included with these soils in mapping are a few small areas of Mountainburg soils. The Mountainburg soils are shallow. Also included are small areas of soils that have a gravelly surface layer, soils that have a very stony surface layer, and a few small areas of rock outcrop. The included soils make up about 15 percent of this map unit.

The soils in this map unit are not suited to cultivated crops or to pasture. The main limitations are steep

slopes and surface stones. Erosion is a very severe hazard.

The soils in this map unit are used mostly as woodland. Nella soil has the capability of producing about 110 cubic feet per acre per year of shortleaf pine commercial forest products, and Enders soil has the capability of producing about 88 cubic feet per acre per year. Suitable trees include shortleaf pine, loblolly pine, and northern red oak on the Nella soil; and shortleaf pine, loblolly pine, and southern red oak on the Enders soil. Because of surface stones and steep slopes, equipment use limitations are moderate. Erosion is a moderate hazard on Enders soil because of steep slopes.

These soils are poorly suited to most urban uses. Steepness of slope is a severe limitation to the use of these soils for septic tank absorption fields. In addition, very slow permeability is a severe limitation of Enders soil. These limitations are difficult to overcome. A better suited soil is often the best solution; however, possible methods to offset the permeability limitation include increasing the size of the absorption field or using a specially designed alternative system. Steepness of slope is also a severe limitation to the use of these soils for dwellings and small commercial buildings. High shrink-swell potential is an additional limitation of the Enders soil for this use. Designs that conform to the natural contour of the landscape can help offset the slope limitation. The effects of the high shrink-swell potential generally can be overcome by adding extra reinforcement to the foundation. Steepness of slope is a severe limitation to the use of these soils for local roads and streets. Low strength and high shrink-swell potential are also limitations of the Enders soil for this use. Slope is difficult to overcome and often requires extensive cut and fill operations. The low strength limitation and the effects of the high shrink-swell potential can be minimized by adding fill of suitable subgrade material to the roadbed.

The Nella and Enders soils in this map unit are in capability subclass VIIs. Nella soil is in woodland suitability group 8R8, and Enders soil is in 6R8.

41—Nella-Enders-Mountainburg stony fine sandy loams, 40 to 65 percent slopes. This map unit consists of soils that are deep and shallow and well drained. These soils are on very steep hillsides and mountainsides. They are too intermingled to be mapped separately. The Nella soil is deep and is on foot slopes, side slopes, and benches. It formed in loamy colluvium from acid sandstone and shale. The Enders soil is deep and is on side slopes and benches. It developed from acid shale bedrock. The Mountainburg soil is shallow and is on narrow sandstone ledges and on benches. This soil developed from acid sandstone bedrock. Individual areas range from 50 to 1,000 acres in size.

The Nella soil makes up about 35 percent of this map unit. Typically, the surface layer is dark brown stony fine sandy loam about 3 inches thick. The subsurface layer is yellowish brown cobbly fine sandy loam to a depth of about 7 inches. The subsoil extends to a depth of at least 72 inches. It is yellowish red gravelly loam to a depth of about 14 inches, yellowish red gravelly clay loam to a depth of about 24 inches, and red gravelly clay loam to a depth of about 56 inches. Below that, the subsoil is yellowish red gravelly clay loam that has mottles in shades of brown.

This soil is low in natural fertility and organic matter content. It is strongly acid or very strongly acid throughout. Permeability and the available water capacity are moderate.

The Enders soil makes up about 30 percent of this map unit. Typically, the surface layer is dark grayish brown stony fine sandy loam about 3 inches thick. The subsurface layer is yellowish brown stony fine sandy loam to a depth of about 7 inches. The subsoil extends to a depth of about 59 inches. It is yellowish red silty clay loam to a depth of about 11 inches and red silty clay to a depth of about 31 inches. To a depth of about 53 inches, the subsoil is red silty clay that has mottles in shades of brown and gray. Below that, it is gray silty clay that has mottles in shades of red and brown. The underlying bedrock is weathered shale.

This soil is low in natural fertility and organic matter content. It is strongly acid or very strongly acid throughout. Permeability is very slow, and the available water capacity is moderate.

The Mountainburg soil makes up about 25 percent of this map unit. Typically, the surface layer is dark brown stony fine sandy loam about 5 inches thick. The subsurface layer is yellowish brown stony fine sandy loam to a depth of about 9 inches. The subsoil is strong brown very gravelly loam to a depth of about 17 inches. The underlying bedrock is level-bedded, acid sandstone.

This soil is low in natural fertility and organic matter content. It is medium acid to very strongly acid in the surface and subsurface layers and strongly acid or very strongly acid in the subsoil. Permeability is moderately rapid, and the available water capacity is very low.

Included with these soils in mapping are a few small areas of rock outcrop and a few small areas of soils that have a very stony surface layer.

The soils in this map unit are not suited to cultivated crops or to pasture. The main limitations are very steep slopes and surface stones.

These soils are used mainly as woodland. Nella soil has the capability of producing about 110 cubic feet per acre per year of shortleaf pine commercial forest products, Enders soil has the capability of producing about 88 cubic feet per acre per year, and Mountainburg soil has the capability of producing about 68 cubic feet per acre per year. Suitable trees include shortleaf pine, loblolly pine, and northern red oak on the Nella soil;

shortleaf pine, loblolly pine, and southern red oak on the Enders soil; and shortleaf pine, loblolly pine, and eastern redcedar on the Mountainburg soil. Equipment use limitations are severe because of very steep slopes. Erosion is a severe hazard on Enders soil and a moderate hazard on Nella and Mountainburg soils. Seedling mortality is moderate on Mountainburg soil because of the shallow rooting depth.

The soils in this map unit are poorly suited to most urban uses. Steepness of slope is a severe limitation to the use of these soils for septic tank absorption fields. In addition, very slow permeability is a severe limitation of Enders soil and shallow depth to bedrock is a severe limitation of Mountainburg soil. Steepness of slope is a severe limitation to the use of these soils for dwellings and small commercial buildings. The high shrink-swell potential of Enders soil and the shallow depth to bedrock of Mountainburg soil are additional severe limitations for these uses. For local roads and streets, slope is a severe limitation for each of the soils. The high shrink-swell potential and low strength of the Enders soil and the shallow depth to bedrock of the Mountainburg soil are also severe limitations. The steepness of slope, high shrink-swell potential, low strength, and shallow depth to bedrock limitations are difficult and generally not practical to overcome.

The soils in this map unit are in capability subclass VIIs. Nella soil is in woodland suitability group 8R9. Enders soil is in 6R9, and Mountainburg soil is in 5R3.

42—Pickwick silt loam, 1 to 3 percent slopes. This soil is deep and well drained. It is on nearly level stream terraces. Individual areas range from about 10 to 100 acres in size.

Typically, the surface layer is dark brown silt loam to a depth of about 6 inches. The subsoil is silty clay loam. It extends to a depth of at least 72 inches. The subsoil is yellowish red to a depth of about 17 inches and red to a depth of about 38 inches. Below that, it is red with mottles in shades of brown and gray.

This soil is low in natural fertility and organic matter content. It is strongly acid or very strongly acid throughout except where lime has been added. Permeability is moderate, and the available water capacity is high. Crops and grasses respond well to fertilization, and tilth is easy to maintain.

Included with this soil in mapping are a few small areas of Cane, Leadvale, and Spadra soils. The Cane and Leadvale soils are on landscapes similar to those of the Pickwick soil. Spadra soils are on lower landscapes nearer the streams.

This Pickwick soil is well suited to cultivated crops. Erosion is a moderate hazard. With good management that includes conservation tillage, contour cultivation, and terracing on long slopes, crops that leave a large amount of residue can be grown year after year. Suitable crops include soybeans, truck crops, grain sorghum, and small grains.

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

This soil has the capability of producing about 110 cubic feet per acre per year of shortleaf pine commercial forest products (fig. 12). Suitable trees include loblolly pine, shortleaf pine, and white oak. There are no significant limitations for woodland use and management.

This soil is moderately suited to most urban uses. Moderate permeability is a limitation for septic tank absorption fields. This limitation can be minimized by increasing the size of the absorption field or by using a specially designed alternative system. There are no significant limitations for dwellings and small commercial buildings. Low strength is a severe limitation for local roads and streets; however, suitable subgrade or base material can help minimize this limitation.

This Pickwick soil is in capability subclass IIe and in woodland suitability group 8A7.

43—Pickwick silt loam, 3 to 8 percent slopes. This soil is deep and well drained. It is on gently sloping stream terraces. Individual areas range from about 10 to 200 acres in size.

Typically, the surface layer is dark brown silt loam to a depth of about 6 inches. The subsoil is silty clay loam. It extends to a depth of at least 72 inches. The subsoil is yellowish red to a depth of about 17 inches, and red to a depth of about 38 inches. Below that, it is red with yellowish brown and gray mottles.

This soil is low in natural fertility and organic matter content. It is strongly acid or very strongly acid throughout except where lime has been added. Permeability is moderate, and the available water capacity is high. Crops and grasses respond well to fertilization, and tilth is easy to maintain.

Included with this soil in mapping are a few small areas of Cane and Leadvale soils. These soils are on landscapes similar to those of the Pickwick soil.

This Pickwick soil is moderately suited to cultivated crops. Erosion is a severe hazard. With good management that includes conservation tillage, contour cultivation, and terraces, crops that leave a large amount of residue can be safely grown year after year. Conservation treatment needs intensify as slope increases. Suitable crops include grain sorghum, small grains, and soybeans.

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

Figure 12.—Pickwick silt loam, 1 to 3 percent slopes, has moderately high potential productivity for commercial forest products.

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

This soil is moderately suited to most urban uses. Moderate permeability is a limitation for septic tank absorption fields. This limitation can be minimized by increasing the size of the absorption field or by using a specially designed alternative system. There are no significant limitations for dwellings. Slope is a moderate limitation for small commercial buildings, but designs that conform to the natural contour of the landscape help to offset this limitation. Low strength is a severe limitation for local roads and streets; however, suitable subgrade or base material can help to minimize this limitation.

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

44—Roellen silty clay, 0 to 1 percent slopes. This soil is deep, poorly drained, and level. It is in slack-water areas on the flood plain of the Arkansas River. Individual areas range from about 30 to 1,000 acres in size.

Typically, the surface layer is about 20 inches thick. It is very dark gray silty clay to a depth of about 7 inches and very dark gray clay below that. The subsoil extends to a depth of about 44 inches. It is dark gray clay that has strong brown mottles. The underlying material to a depth of about 72 inches is dark gray clay that has reddish brown mottles.

This soil is high in natural fertility and organic matter content. It ranges from medium acid to neutral in the surface layer and from slightly acid to mildly alkaline in the subsoil and underlying material. Permeability is slow, and the available water capacity is high. The seasonal high water table is at or near the surface in winter and early in spring. Levees that parallel the Arkansas River protect this soil from flooding. A small area of this soil in the city of Dardanelle is not protected by levees; however, it is high enough in elevation that the soil is not subject to flooding. Crops respond well to fertilization.

Included with this soil in mapping are a few small areas of Dardanelle and Moreland soils. The Dardanelle soils are on higher landscapes than the Roellen soil, and the Moreland soils are on similar landscapes. Also included are a few small areas of soils that are subject to occasional flooding.

This Roellen soil is moderately suited to cultivated crops if surface drainage is adequate. The main crop is soybeans. Other adapted crops include corn, grain sorghum, and rice. Farming operations are commonly delayed several days after a rain because of excess water. Surface drainageways are needed in some areas.

This soil is well suited to use as pasture. Suitable pasture plants include bermudagrass and tall fescue. Concerns in management include proper stocking, rotation grazing, and weed and brush control.

This soil has the capability of producing about 128 cubic feet per acre per year of eastern cottonwood commercial forest products. Suitable trees include eastern cottonwood and sweetgum. Equipment use limitations are moderate because of wetness, and seedling mortality is moderate because of the high clay content of the soil. The equipment limitations can be overcome by logging during the drier periods.

This soil is poorly suited to most urban uses. Slow permeability and wetness are severe limitations for septic tank absorption fields, and a specially designed alternative system may be needed. High shrink-swell potential (fig. 13) and wetness are severe limitations for dwellings and small commercial buildings. Possible corrective measures include extra reinforcement in footings and backfilling with sandy material. High shrink-swell potential, wetness, and low strength are severe limitations for local roads and streets. Construction on a raised fill of suitable subgrade or base material can help to minimize these limitations.

This Roellen soil is in capability subclass IIIw and in woodland suitability group 9W5.

45—Roellen silty clay, occasionally flooded. This soil is deep, poorly drained, and level. It is in slack-water areas on flood plains of the Arkansas River, Smiley Bayou, and the lower part of the Petit Jean River. Slopes are less than 1 percent. Individual areas range from about 30 to 100 acres in size.

Typically, the surface layer is about 20 inches thick. It is very dark gray silty clay to a depth of about 7 inches and very dark gray clay below that. The subsoil extends to a depth of about 44 inches. It is dark gray clay that has mottles in shades of brown. The underlying material to a depth of about 72 inches is dark gray clay that has mottles in shades of brown.

This soil is high in natural fertility and organic matter content. It ranges from medium acid to neutral in the surface layer and from slightly acid to mildly alkaline in the subsoil and underlying material. Permeability is slow, and the available water capacity is high. The seasonal high water table is at or near the surface in winter and early in spring. Crops respond well to fertilization. This soil is subject to occasional flooding for brief periods from December through June. If not vegetated, fast-moving floodwaters can cause scouring.

Included with this soil in mapping are a few small areas of Moreland soils. These soils are on landscapes similar to those of the Roellen soil. Also included are small areas of soils that are in lower positions and are subject to flooding at least once every two years for short periods.

This Roellen soil is poorly suited to cultivated crops, but this is the main use. The principal crop is soybeans. Other suitable crops include corn, grain sorghum, and rice. Farming operations commonly are delayed several days after a rain because of excess water. Surface drainageways are needed in some areas.

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

This soil has the capability of producing about 128 cubic feet per acre per year of eastern cottonwood commercial forest products. Suitable trees include eastern cottonwood and sweetgum. Equipment use limitations are moderate because of wetness, and seedling mortality is moderate because of the high clay content of the soil. The equipment limitations can be overcome by logging during the drier periods.

This soil is poorly suited to most urban uses. Slow permeability, flooding, and wetness severely limit the use of this soil for septic tank absorption fields. Flooding, wetness, and high shrink-swell potential severely limit the use for dwellings and small commercial buildings. Flooding, wetness, and low strength severely limit the use for local roads and streets. Other sites or areas of

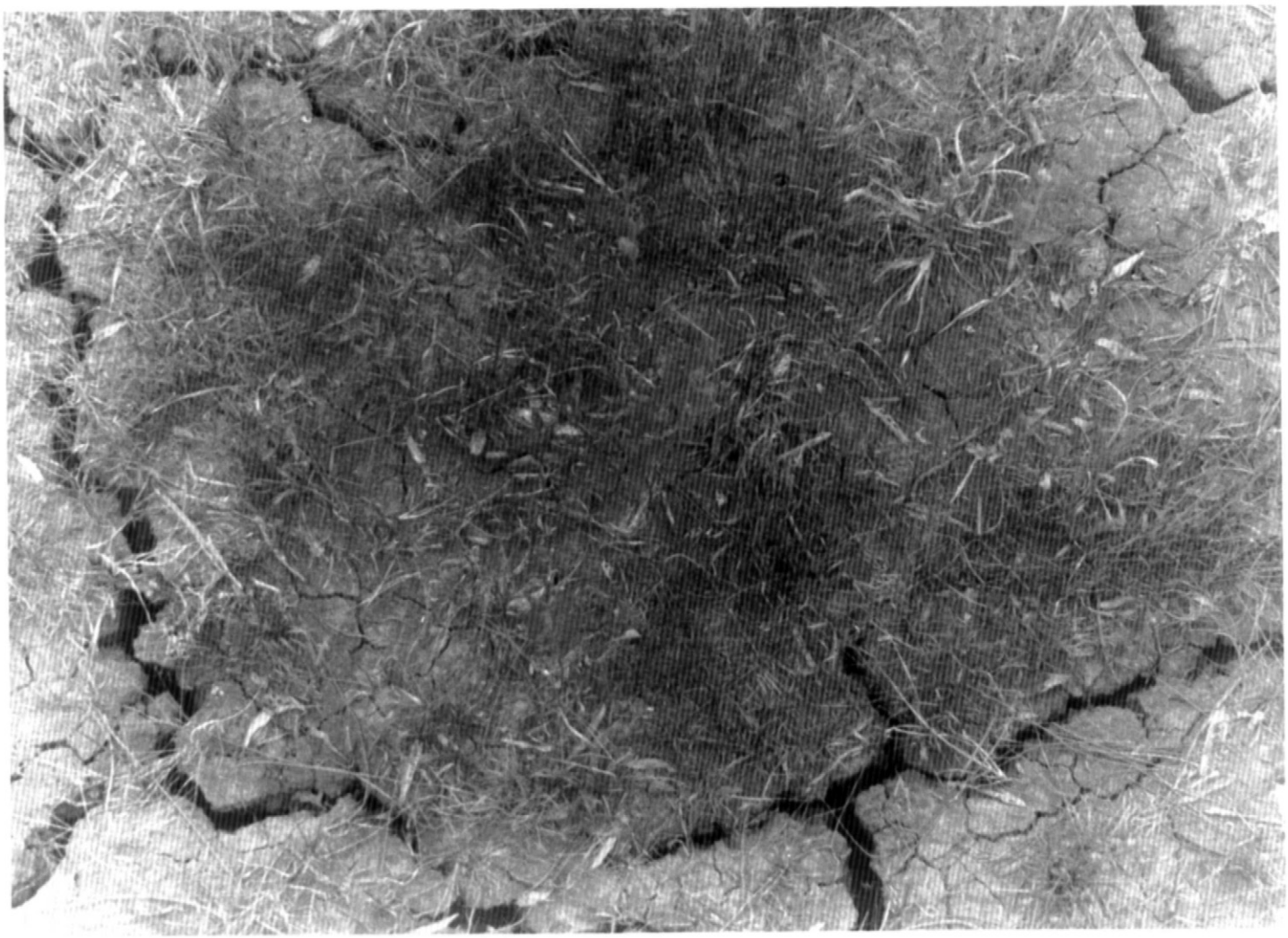


Figure 13.—When Roellen silty clay, 0 to 1 percent slopes, is dry, the soil shrinks and forms cracks 1 to 4 inches wide and several feet deep; when wet, the soil expands and the cracks close.

the included soils in this map unit that are better suited should be considered for most urban uses.

This Roellen soil is in capability subclass IVw and in woodland suitability group 9W5.

46—Roxana silt loam, 0 to 3 percent slopes. This soil is deep, well drained, and level or nearly level. It is on protected flood plains of the Arkansas River. Individual areas range from about 50 to 800 acres in size.

Typically, the surface layer is dark brown silt loam about 7 inches thick. The underlying material is stratified brown very fine sandy loam and loamy very fine sand to a depth of 72 inches or more.

This soil is high in natural fertility and low in organic matter content. It is slightly acid to mildly alkaline in the surface layer and neutral to moderately alkaline in the underlying material. Permeability is moderate, and the available water capacity is high. Crops respond well to fertilization, and tilth is easy to maintain. Although this soil is on flood plains, most of it is protected from flooding by levees that parallel the river. A small area of this soil in the city of Dardanelle is not protected by levees; however, it is high enough in elevation that the soil is not subject to flooding.

Included with this soil in mapping are a few small areas of Bruno and Dardanelle soils. Bruno soils are in slightly higher positions on the landscape than the Roxana soil, and Dardanelle soils are in slightly lower positions. Also included are a few small areas of soils that have a silty clay loam surface layer.

This Roxana soil is well suited to cultivated crops. The principal crop is soybeans (fig. 14). Other suitable crops include corn, grain sorghum, small grains, truck crops, and alfalfa. Erosion is a slight to moderate hazard. With good management that includes winter cover crops, crops that leave large amounts of residue can be safely grown year after year.

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

This soil has the capability of producing about 172 cubic feet per acre per year of eastern cottonwood commercial forest products. Suitable trees include eastern cottonwood, sweetgum, loblolly pine, and American sycamore. There are no significant limitations for woodland use or management.

This soil is well suited to most urban uses. Moderate permeability and wetness are limitations for septic tank absorption fields. These limitations can be minimized by increasing the size of the absorption field and by constructing drainageways to carry excess water away from the field. There are no significant limitations for dwellings, small commercial buildings, and local streets and roads.

This Roxana soil is in capability subclass IIe and in woodland suitability group 12A4.

47—Roxana silt loam, occasionally flooded. This soil is deep, well drained, and level or nearly level. It is on flood plains of the Arkansas River. Slopes are 0 to 3 percent. Individual areas range from about 40 to 250 acres in size.

Figure 14.—Soybeans is the principal crop on Roxana silt loam, 0 to 3 percent slopes.

Typically, the surface layer is dark brown silt loam about 7 inches thick. The underlying material is stratified brown very fine sandy loam and loamy very fine sand to a depth of 72 inches or more.

This soil is high in natural fertility and low in organic matter content. It is slightly acid to mildly alkaline in the surface layer and neutral to moderately alkaline in the underlying material. Permeability is moderate, and the available water capacity is high. Crops respond well to fertilization, and tilth is easy to maintain. This soil is flooded occasionally for brief periods during December through June. If not vegetated, fast-moving floodwaters can cause severe scouring.

Included with this soil in mapping are a few small areas of Bruno soils. Bruno soils are in slightly higher positions on the landscape than the Roxana soil. Also included are small areas of soils that are flooded for short periods at least once every two years.

This Roxana soil is well suited to cultivated crops. Suitable crops include soybeans, grain sorghum, small grains, and alfalfa. Winter small grains are damaged by flooding in some years. Erosion is a slight to moderate hazard. With good management that includes winter cover crops, crops that leave large amounts of residue can be safely grown year after year.

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

This soil has the capability of producing about 172 cubic feet per acre per year of eastern cottonwood commercial forest products. Suitable trees include eastern cottonwood, sweetgum, loblolly pine, shortleaf pine, and American sycamore. There are no significant limitations for woodland use or management.

This soil is poorly suited to most urban uses. The hazard of occasional flooding is a severe limitation to the use of this soil for septic tank absorption fields, dwellings, small commercial buildings, and local roads and streets. This limitation can be overcome only by major flood control measures.

This Roxana soil is in capability subclass IIw and in woodland suitability group 12A4.

48—Sherless fine sandy loam, 3 to 8 percent slopes. This soil is moderately deep, well drained, and gently sloping. It is on ridgetops and foot slopes. Individual areas range from about 5 to 50 acres in size.

Typically, the surface layer is dark grayish brown fine sandy loam about 3 inches thick. The subsurface layer is brown fine sandy loam to a depth of about 9 inches. The subsoil extends to a depth of about 36 inches. It is strong brown loam to a depth of about 14 inches and yellowish red sandy clay loam to a depth of about 28 inches. Below that, the subsoil is yellowish red gravelly sandy clay loam that has mottles in shades of red and brown. The underlying material to a depth of about 38 inches is soft, tilted, platy sandstone that has strong brown clay loam between plates.

This soil is low in natural fertility and organic matter content. It is medium acid or strongly acid in the surface and subsurface layers and strongly acid or very strongly acid in the subsoil. Permeability is moderate, and the available water capacity is low. Crops and grasses respond well to fertilization, and tilth is easy to maintain.

Included with this soil in mapping are a few small areas of Bismarck, Carnasaw, and Clebit soils. These soils are on ridgecrests and side slopes. Also included are a few small areas of soils that have a gravelly surface layer.

This Sherless soil is moderately suited to cultivated crops. Suitable crops include soybeans, grain sorghum, winter small grains, and truck crops. Erosion is a severe hazard. Under good management that includes adequate erosion control, crops can be grown in rotation with grasses. Terraces, contour cultivation, conservation tillage, proper management of crop residue, and cover crops reduce runoff and help to control erosion. Conservation treatment needs intensify as slope length and gradient increase.

This soil is moderately suited to use as pastureland and hayland, and this is the main use. Suitable pasture plants include bermudagrass, bahiagrass, tall fescue, and white clover. There are no significant limitations for pasture. Concerns in management include proper stocking, rotation grazing, and weed and brush control.

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

This soil is moderately suited to most urban uses. Depth to bedrock is a severe limitation for septic tank absorption fields. This limitation generally is difficult to overcome, and a specially designed or an alternative system may be needed. There are no significant limitations for dwellings or local roads and streets. Steepness of slope is a moderate limitation for small commercial buildings. Possible corrective measures include using designs that conform to the natural slope and shaping the land.

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

49—Sherless gravelly fine sandy loam, 3 to 8 percent slopes. This soil is moderately deep, well drained, and gently sloping. It is on ridgetops and foot slopes. Individual areas range from about 30 to 300 acres in size.

Typically, the surface layer is dark grayish brown gravelly fine sandy loam about 3 inches thick. The subsurface layer is brown fine sandy loam to a depth of about 9 inches. The subsoil extends to a depth of about

36 inches. It is strong brown loam to a depth of about 14 inches and yellowish red sandy clay loam to a depth of about 28 inches. Below that, the subsoil is yellowish red gravelly sandy clay loam that has mottles in shades of red and brown. The underlying material to a depth of about 38 inches is soft, tilted, platy sandstone that has strong brown clay loam between plates.

This soil is low in natural fertility and organic matter content. It is medium acid or strongly acid in the surface and subsurface layers and strongly acid or very strongly acid in the subsoil. Permeability is moderate, and the available water capacity is low. Crops and grasses respond well to fertilization, and tilth is easy to maintain.

Included with this soil in mapping are a few small areas of Bismarck, Carnasaw, and Clebit soils. These soils are on ridgecrests and side slopes. Also included are a few small areas of soils that do not have a gravelly surface layer or that have a stony surface layer.

This Sherless soil is moderately suited to cultivated crops. Suitable crops include soybeans, grain sorghum, winter small grains, and truck crops. Erosion is a severe hazard. Under good management that includes adequate erosion control, crops can be grown in rotation with grasses. Terraces, contour cultivation, conservation tillage, proper management of crop residue, and cover crops reduce runoff and help to control erosion. Conservation treatment needs intensify as slope length and gradient increase.

This soil is moderately suited to use as pastureland and hayland, and this is the main use. Suitable pasture plants include bermudagrass, bahiagrass, tall fescue, and white clover. There are no significant limitations for pasture. Concerns in management include proper stocking, rotation grazing, and weed and brush control.

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

This soil is moderately suited to most urban uses. Depth to bedrock is a severe limitation for septic tank absorption fields. This limitation generally is difficult to overcome, and a specially designed or an alternative system may be needed. There are no significant limitations for dwellings or local roads and streets. Steepness of slope is a moderate limitation for small commercial buildings. Possible corrective measures include using designs that conform to the natural slope and shaping the land.

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

50—Spadra fine sandy loam, occasionally flooded. This soil is deep, well drained, and level or nearly level. It is on low stream terraces. Slopes are 0 to 3 percent. Individual areas range from about 10 to 400 acres in size.

Typically, the surface layer is dark brown fine sandy loam about 6 inches thick. The subsoil extends to depth of about 58 inches. It is reddish brown loam to a depth of about 40 inches and brown loam to a depth of about 52 inches. Below that, the subsoil is brown loam that has mottles in shades of brown. The underlying material is brown gravelly fine sandy loam to a depth of 72 inches.

This soil is moderate in natural fertility and low in organic matter content. It ranges from medium acid to very strongly acid throughout. Permeability is moderate, and the available water capacity is high. Crops respond well to fertilization, and tilth is easy to maintain. This soil is subject to occasional flooding for very brief periods of 1 to 2 days during December through April. If the soil does not have plant cover, fast-moving floodwaters can cause severe scouring.

Included with this soil in mapping are a few small areas of Barling and Ceda soils. Barling soils are in landscape positions similar to those of the Spadra soil, but they are farther from the stream. The Ceda soils are in slightly lower positions adjacent to the stream. Also included are a few areas of soils that are rarely flooded.

This Spadra soil is well suited to cultivated crops. Suitable crops include soybeans, grain sorghum, and small grains. Occasional flooding can delay tillage operations early in spring. Runoff is slow, and the hazard of erosion is slight. Under management that includes conservation tillage and crop rotation, crops that leave large amounts of residue can be safely grown year after year.

This soil is well suited to use as pastureland or hayland. Suitable pasture plants include tall fescue, white clover, bermudagrass, and bahiagrass. Concerns in management include proper stocking, rotation grazing, and weed and brush control.

This soil has the capability of producing about 130 cubic feet per acre per year of shortleaf pine commercial forest products. Suitable trees include shortleaf pine, loblolly pine, and southern red oak. There are no significant limitations for woodland use and management.

This soil is poorly suited to most urban uses. Occasional flooding severely limits the use of this soil for septic tank absorption fields, dwellings, small commercial buildings, and local roads and streets. Major flood control structures are needed to overcome the problems caused by flooding, but installation is generally impractical.

This Spadra soil is in capability subclass IIw and in woodland suitability group 9A7.

51—Taft silt loam, 0 to 2 percent slopes. This soil is deep, somewhat poorly drained, and level or nearly level. It is on old stream terraces in broad valleys. Individual areas range from about 10 to 300 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 7 inches thick. The subsurface layer is

yellowish brown silt loam to a depth of about 14 inches. The upper part of the subsoil extends to a depth of about 23 inches. It is yellowish brown silt loam that has gray and strong brown mottles. Below that, a grayish brown silt loam layer extends to a depth of 26 inches. It has strong brown mottles. The lower part of the subsoil is silty clay loam. It extends to a depth of at least 72 inches. It is mottled gray and strong brown to a depth of about 48 inches, mottled yellowish brown and light brownish gray loam to a depth of about 60 inches, and yellowish red below that. A firm, compact and brittle fragipan is at a depth of 26 to 60 inches.

This soil is low in natural fertility, and the organic matter content is moderate. This soil is strongly acid or very strongly acid throughout. Permeability is slow, and the available water capacity is moderate. The fragipan restricts root penetration and slows the movement of water through the soil. The seasonal high water table is within 12 inches of the surface from January through April. Crops and grasses respond well to fertilization.

Included with this soil in mapping are a few small areas of Cane, Guthrie, and Leadvale soils. Cane and Leadvale soils are in higher positions on the landscape than the Taft soil, and Guthrie soils are in lower positions. Also included are a few small areas that have low mounds and a few small areas of soils that have sodium in the subsoil.

This Taft soil is moderately suited to cultivated crops if surface drainage is adequate. Suitable crops include soybeans, grain sorghum, and winter small grains. Excess surface water is a severe limitation because runoff is slow and seepage is received from adjacent slopes. Farming operations are often delayed several days after a rain. Adequate surface drainage is needed to minimize this limitation. Other good management practices include conservation tillage and crop residue management.

This soil is moderately suited to pasture, and this is the main use. Suitable pasture plants include bermudagrass, tall fescue, white clover, bahiagrass, and lespedeza. Seasonal wetness is a moderate limitation for pasture. Adequate surface drainage is needed to minimize this limitation. Other concerns in management include proper stocking, rotation grazing, and weed and brush control.

This soil has the capability of producing about 88 cubic feet per acre per year of shortleaf pine commercial forest products. Suitable trees include loblolly pine, shortleaf pine, white oak, and sweetgum. Because of wetness, equipment use limitations are moderate. These limitations can be minimized by timing operations to avoid seasonal wetness.

This soil is poorly suited to most urban uses. Wetness and slow permeability are severe limitations for septic tank absorption fields. Possible alternatives include installing a diversion to intercept water from higher places, constructing a drainage system around the absorption field, or using a specially designed alternative system. Wetness is a severe limitation for dwellings and small commercial buildings. Possible methods to minimize this limitation include constructing drainageways by footings, shaping the land so surface water moves away from the structure, and constructing on raised fill material. Low strength is a severe limitation for local roads and streets; however, suitable subgrade or base material helps minimize this limitation.

This Taft soil is in capability subclass IIIw and in woodland suitability group 6W8.

52—Udipsamments, dredged. This map unit consists mostly of sand that has been reworked in dredging the Arkansas River channel for navigation purposes. It is subject to rare to frequent flooding. Slopes range from 1 to 5 percent. The area of this map unit is east and southeast of the city of Dardanelle.

The soil of this map unit is dominantly brown and light brown sand to a depth of 72 inches or more. The sand is coarse and medium and contains from 5 to 35 percent gravel.

The soil is low in natural fertility and organic matter. It is slightly acid to moderately alkaline. Permeability is rapid, and the available water capacity is very low.

The acreage of the map unit is mostly sparsely vegetated or barren. It is very droughty and is not used for agricultural purposes. The soil is not suited to cultivated crops or to pasture. Serica lespedeza and weeping lovegrass protect the area from wind erosion.

The soil in this map unit has low potential productivity for commercial wood crops. Seedling mortality is high because of droughtiness.

The soil is not suited to most urban uses because flooding severely limits the use for septic tank absorption fields, dwellings, small commercial buildings, and local roads and streets. Other sites should be considered for most urban uses.

Udipsamments, dredged, is in capability subclass VIIs. It is not assigned a woodland suitability group.

53—Wrightsville silt loam, 0 to 1 percent slopes. This soil is deep, poorly drained, and level. It is on terraces along the Arkansas River. Individual areas range from about 20 to 200 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 4 inches thick. The subsurface layer is light brownish gray silt loam to a depth of about 18 inches. It has yellowish brown and brown mottles. The subsoil is gray silty clay to a depth of about 51 inches. It has strong brown and yellowish brown mottles. The underlying material to a depth of 72 inches or more is gray silty clay that has strong brown and yellowish brown mottles.

This soil is low in natural fertility and organic matter content. It is strongly acid or very strongly acid throughout. Permeability is very slow, and the available

water capacity is high. The seasonal high water table is within 6 inches of the surface from December through April. Crops and grasses respond well to fertilization, and tilth is easy to maintain.

Included with this soil in mapping are a few small areas of Muskogee and Taft soils. These soils are in higher positions and are better drained than the Wrightsville soil. Also included are a few small areas that have low mounds.

This Wrightsville soil is moderately suited to cultivated crops if surface drainage is adequate. Suitable crops include soybeans, grain sorghum, and winter small grains. Excess surface water is a severe limitation because runoff is slow and seepage is received from adjacent slopes. Farming operations are often delayed several days after a rain. Adequate surface drainage is needed to minimize this limitation. Other good management practices include conservation tillage and crop residue management.

This soil is moderately suited to pasture, and this is the main use. Suitable pasture plants include bermudagrass, tall fescue, white clover, bahiagrass, and sericea lespedeza. Seasonal wetness is a moderate limitation, and adequate surface drainage is needed. Other good management practices include proper stocking, rotation grazing, and weed and brush control.

This soil has the capability of producing about 110 cubic feet per acre per year of loblolly pine commercial forest products. Suitable trees include loblolly pine, shortleaf pine, water oak, willow oak, and sweetgum. Because of wetness, equipment use limitations and seedling mortality are moderate. The equipment use limitation can be minimized by timing operations to avoid seasonal wetness. Special site preparation, such as bedding or surface drainage, can reduce seedling mortality.

This soil is poorly suited to most urban uses. Very slow permeability and wetness are severe limitations for septic tank absorption fields, and a specially designed alternative system may be needed. High shrink-swell potential and wetness are severe limitations for dwellings and small commercial buildings. Possible corrective measures include using extra reinforcement in footings, backfilling with sandy material, and installing a subsurface drainage system. High shrink-swell potential, wetness, and low strength are severe limitations for local roads and streets. Construction on a raised fill of suitable subgrade material can help to minimize these limitations.

This Wrightsville soil is in capability subclass IIIw and in woodland suitability group 8W8.

Prime Farmland

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

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

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

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

Prime farmland soils usually get an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and growing season are favorable. The acidity or alkalinity level of the soils is acceptable. The soils have few or no rocks and are permeable to water and air. They are not excessively erodible or saturated with water for long periods and are not subject to frequent flooding during the growing season. The slope ranges mainly from 0 to 8 percent.

Areas of prime farmland are scattered throughout Yell County, but most are in the central and northern parts of the county. About 26,000 acres of prime farmland is used for cultivated crops, mainly soybeans, rice, grain sorghum, and wheat.

Recently, some prime farmland soils in Yell County have been converted to urban uses. The loss of prime farmland to other uses puts pressure on marginal land, which generally is wet, more erodible, droughty, or difficult to cultivate and is less productive than prime farmland.

The following map units, or soils, make up prime farmland in Yell County. The location of each map unit is shown on the detailed soil maps at the back of this publication. The extent of each unit is given in table 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.

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

1 Avilla silt loam, 1 to 3 percent slopes
2 Avilla silt loam, 3 to 8 percent slopes
3 Barling silt loam, occasionally flooded
7 Cane loam, 1 to 3 percent slopes
16 Dardanelle silt loam, 0 to 1 percent slopes
17 Dardanelle silt loam, 1 to 3 percent slopes
23 Guthrie silt loam, 0 to 1 percent slopes (where drained)
24 Guthrie silt loam, occasionally flooded (where drained)
26 Leadvale silt loam, 1 to 3 percent slopes
28 Linker fine sandy loam, 3 to 8 percent slopes
31 Moreland silty clay, 0 to 1 percent slopes (where drained)
36 Muskogee silt loam, 1 to 3 percent slopes
37 Nella gravelly fine sandy loam, 3 to 8 percent slopes
42 Pickwick silt loam, 1 to 3 percent slopes

44 Roellen silty clay, 0 to 1 percent slopes (where drained)
45 Roellen silty clay, occasionally flooded (where drained)
46 Roxana silt loam, 0 to 3 percent slopes
47 Roxana silt loam, occasionally flooded
48 Sherless fine sandy loam, 3 to 8 percent slopes
49 Sherless gravelly fine sandy loam, 3 to 8 percent slopes
50 Spadra fine sandy loam, occasionally flooded
51 Taft silt loam, 0 to 2 percent slopes (where drained)
53 Wrightsville silt loam, 0 to 1 percent slopes (where drained)

Use and Management of the Soils

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

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

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland and woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern that is in harmony with nature.

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

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

Crops and Pasture

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 176,000 acres of Yell County was used for crops and grassland in 1982, according to a National Resources Inventory by the Soil Conservation Service. Of this, 113,000 acres was used for tame grasses, 37,000 acres for native grasses, and 26,000 acres for crops, mainly soybeans.

Crops

Erosion control is needed on sloping soils. Contour cultivation, terraces, or grassed waterways, or combinations of these measures, can help control erosion. In addition, conservation tillage is needed on most soils so that residue from harvested crops is left on the surface as long as possible before planting. Tillage for weed control can be used if necessary, but it should be reduced by use of herbicides.

Annual cover crops or grasses and legumes should be grown regularly in the cropping system if erosion is a severe hazard or if the crops grown leave only small amounts of residue. Proper row arrangement and suitable surface drainage are needed for dependable growth in wet areas. Many soils that are subject to frequent flooding are not suited, or only marginally suited, to most crops commonly grown in this county.

A plowpan commonly develops in loamy soils that are improperly tilled or are tilled frequently with heavy equipment. Keeping tillage to a minimum, varying the depth of tillage, and tilling when soil moisture content is favorable can prevent formation of a plowpan. Deep-rooted grasses and legumes can help break up the plowpan.

Water ponds during periods of heavy rainfall, and many of the soils tend to pack and crust over if they are left without plant cover. The use of cover crops and proper management of crop residue help to preserve or improve tilth. Soybeans, grain sorghum, and rice are the common row crops in the county. Wheat and oats are the main small grains. Fertilizer and lime can be applied, but the kind and amount need to be determined by soil tests and by the kind of crop to be grown.

Pasture

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

Coastal bermudagrass, common bermudagrass, and Pensacola bahiagrass are the warm-season perennials most commonly grown. Tall fescue is the principal cool-season grass; however, it grows well only on soils that have favorable soil moisture content. All of these grasses respond well to fertilizer, particularly to nitrogen. White clover, crimson clover, arrowleaf clover, and annual lespedeza are the most commonly grown legumes.

Proper grazing management is essential for high quality forage, stand survival, and erosion control. Brush and weed control, fertilization, and renovation of the pasture are also important.

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, barnyard manure, and green manure crops; and harvesting that insures the smallest possible loss.

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

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

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

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

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

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode, but they have other limitations, impractical to remove, that limit their use.

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

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

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

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

There are no subclasses in class I because the soils of this class have few limitations. The soils in class V are subject to little or no erosion, but they have other

limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation. Class V contains only the subclasses indicated by *w* or *s*.

Woodland Management and Productivity

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

Forest land accounts for 412,992 acres, or 68 percent of Yell County. About 59 percent (243,665 acres) is in public ownership, 14 percent (57,819 acres) in industrial ownership, and 27 percent (111,508 acres) in private ownership.

The major forest types in Yell County include the loblolly/shortleaf pine, which comprises 244,378 acres; the oak/pine, which comprises 101,836 acres; the oak/hickory, which comprises 21,630 acres; the oak/gum, which comprises 42,799 acres; and the elm/ash/cottonwood, which comprises 2,349 acres. These forest types have 273,319 acres of sawlog stands, 87,748 acres of pole stands, and 52,925 acres of seedling and sapling stands.

Forest products contribute greatly to the local economy. Yell County ranked number 10 in pine timber harvests for Arkansas in 1983. It has 14 small sawmills, 2 large sawmills, 6 pulpwood yards, and several other speciality wood-using industries. Products include lumber, crossties, roof trusses, wood turnings, custom cabinets, and hardwood furniture stock.

The main trees in Yell County are shortleaf pine, white oak, sweetgum, blackgum, post oak, red oak, elm and hickory. Most of the soils in the county can be used as woodland. The timber can be produced for profit, wildlife habitat, recreation, material beauty, and the conservation of soil and water.

Soils vary in their ability to produce trees. Depth, fertility, texture and the available water capacity influence tree growth. Elevation, aspect, and climate determine the kinds of trees that can grow on a site. Available water capacity and the depth of the root zone are major influences of tree growth. Elevation and aspect are of particular importance in mountainous areas.

This soil survey can be used by woodland managers planning ways to increase the productivity of forest land. Some soils respond better to fertilization than others, some are more susceptible to landslides and erosion after building roads and harvesting timber, and some require special efforts to reforest. In the section "Detailed Soil Map Units," each map unit in the survey area suitable for producing timber presents information about productivity, limitations for harvesting timber, and management concerns for producing timber. The common forest understory plants are also listed. Table 10 summarizes this forestry information and rates the soils for a number of factors to be considered in management. *Slight, moderate*, and *severe* are used to indicate the degree of the major soil limitations to be considered in forest management.

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

Table 10 lists the *suitability group* for each soil. The first element in the symbol, a number, indicates the potential productivity of a soil for the indicator species in cubic meters per hectare. The larger the number, the greater the potential productivity. Potential productivity is based on the site index and the point where mean annual increment is the greatest.

The second element of the symbol, a letter, indicates the major kind of soil limitation for use and management. The letter *R* indicates a soil that has a significant limitation because of steepness of slope. The letter *X* indicates that a soil has restrictions because of stones or rocks on the surface. The letter *W* indicates a soil in which excessive water, either seasonal or year-round, causes a significant limitation. The letter *D* indicates a soil that has a limitation because of restricted rooting depth, such as a shallow soil that is underlain by hard rock, hardpan, or other layers that restrict roots. The letter *C* indicates a soil that has a limitation because of the kind or amount of clay in the upper part of the soil. The letter *S* indicates a dry, sandy soil. The letter *A* indicates a soil that has no significant restrictions or limitations for forest use and management. If a soil has more than one limitation, the priority is as follows: R, X, W, D, C, and S.

The third element in the symbol, a numeral, indicates the kind of trees to which the soil is best suited and also indicates the severity of the hazard or limitation. Only erosion hazard, equipment limitation, and seedling mortality are considered in making the following ratings. The numerals 1, 2, and 3 indicate slight, moderate, and severe limitations, respectively, and suitability for needleleaf trees. The numerals 4, 5, and 6 indicate slight, moderate, and severe limitations, respectively, and suitability for broadleaf trees. The numerals 7, 8, and 9 indicate slight, moderate, and sever limitations, respectively, and suitability for both needleleaf and broadleaf trees.

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

Ratings of *equipment limitations* indicate limits on the use of forest management equipment, year-round or seasonal, because of such soil characteristics as slope, wetness, stoniness, or susceptibility of the surface layer to compaction. As slope gradient and length increase, it becomes more difficult to use wheeled equipment. On the steeper slopes, tracked equipment must be used. On the steepest slopes, even tracked equipment cannot operate; more sophisticated systems are needed. The rating is *slight* if equipment use is restricted by soil wetness for less than 2 months and if special equipment is not needed. The rating is *moderate* if slopes are steep enough that wheeled equipment cannot be operated safely across the slope, if soil wetness restricts equipment use from 2 to 6 months per year, if stoniness restricts ground-based equipment, or if special equipment is needed to avoid or reduce soil compaction. The rating is *severe* if slopes are steep enough that tracked equipment cannot be operated safely across the slope, if soil wetness restricts equipment use for more than 6 months per year, if stoniness restricts ground-based equipment, or if special equipment is needed to avoid or reduce soil compaction. Ratings of *moderate* or *severe* indicate a need to choose the most suitable equipment and to carefully plan the timing of harvesting and other management operations.

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

Ratings of *windthrow hazard* consider the likelihood of trees being uprooted by the wind. Restricted rooting depth is the main reason for windthrow. Rooting depth can be restricted by a high water table, fragipan, or bedrock, or by a combination of such factors as soil wetness, texture, structure, and depth. The risk is *slight* if strong winds cause trees to break but do not uproot them; *moderate* if strong winds cause an occasional tree to be blown over and many trees to break; and *severe* if moderate or strong winds commonly blow trees over. Ratings of *moderate* or *severe* indicate the need for care in thinning or possibly not thinning. Specialized equipment may be needed to avoid damage to shallow root systems in partial cutting operations. A plan for periodic salvage of windthrown trees and the maintenance of a road and trail system may be needed.

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

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

The soils that are commonly used to produce timber have the yield predicted in cubic feet and cubic meters. The yield is predicted at the point where mean annual increment culminates. The productivity of the soils in this survey is usually based on shortleaf pine, but other species are used where appropriate.

The *site index* is determined by taking height measurements and determining the age of selected trees within stands of a given species. This index is the average height, in feet, that the trees attain in a specified number of years. This index applies to fully stocked, even-aged, unmanaged stands. The procedure and technique for determining site index are given in the site index tables used for the Yell County Soil Survey, *(3, 4, 5, 6, 7, 8, 11, 12)*.

The *productivity class* represents an expected volume produced by the most important trees, expressed in cubic feet per acre per year. Cubic feet per acre can be converted to cubic meters per hectare by dividing by 14.3. It can be converted to board feet by multiplying by a factor of about 5. For example, a productivity class of 114, means the soil can be expected to produce 8 cubic meters per hectare per year at the point where mean annual increment culminates, or about 570 board feet per acre per year.

Trees to plant are those that are used for reforestation or, if suitable conditions exist, natural regeneration. They are suited to the soils and will produce a commercial

wood crop. Desired product, topographic position (such as a low, wet area), and personal preference are three factors of many that can influence the choice of trees to use for reforestation.

Recreation

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

In table 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 gentle slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

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

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

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

Wildlife Habitat

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

Fish and wildlife habitats are abundant in the scenic and pleasant countryside of Yell County. About 68 percent of the county, or about 413,000 acres, is forested. Shortleaf pine, loblolly pine, and eastern redcedar are the native evergreens.

About 25 percent, or about 150,000 acres of the county, is pasture, hayland, and forage areas. Common bermudagrass and tall fescue are the major pasture grasses, and small amounts of bahiagrass, white clover, and annual lespedeza are also grown.

Plants important to wildlife in Yell County include oak, hickory, dogwood, hawthorn, shortleaf pine, loblolly pine, redcedar, blackberry, elderberry, viburnum, sumac, greenbrier, honeysuckle, wheat, bahiagrass, bluestems, fescue, clovers, annual lespedeza, panicums, partridgepea, common ragweed, tickclover, and vetches. The abundant hardwood and evergreen forests, interspersed pastures, fencerows, and numerous edges provide food and cover for white-tailed deer, wild turkey, squirrels, bobwhite quail, raccoons, coyotes, opossums, foxes, rabbits, owls, numerous non-game birds, small mammals, reptiles, and other wildlife.

The Arkansas Game and Fish Commission manages the Nimrod Wildlife Management Area, 3,634 acres near Danville, and the Petit Jean Wildlife Management Area, 14,534 acres near Ola. These wildlife areas provide habitat for deer, ducks, squirrels, quail, and other wildlife.

Part of the Ouachita National Forest (187,007 acres) and the Ozark National Forest (32,440 acres) are in Yell County. These national forests are managed cooperatively by the U.S. Forest Service and the Arkansas Game and Fish Commission to provide habitat for deer, squirrels, wild turkeys, and other wildlife.

Lowland habitats along streams, lakes, and ponds in the county support a variety of furbearers including beaver, muskrat, mink, raccoon, gray fox, striped skunk, and coyote.

Almost 3,000 ponds covering an estimated 1,500 acres are in the county. These ponds are used mainly

for stock and wildlife watering and for sport fishing for largemouth bass, bluegills, redear sunfish, and channel catfish. Part of three U.S. Army Corps of Engineers reservoirs, Blue Mountain Lake, Dardanelle Reservoir, and Nimrod Lake, cover 6,079 acres of the county. These reservoirs provide sport fishing for hybrid striped bass, largemouth bass, crappies, bluegills, redear sunfish, channel catfish, and other fish. Spring Lake, a national forest impoundment of about 82 acres, also provides sport fishing.

About 170 miles of fishable streams are in the county, including the Arkansas River, Petit Jean River, and Fourche LaFave River. These streams provide habitat for largemouth and spotted bass, crappies, bluegills, catfish, green sunfish, and other fish.

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

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

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

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

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

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

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

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, deer, 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, muskrat, mink, and beaver.

Engineering

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

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

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

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

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

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

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

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

Building Site Development

Table 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, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for

dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. Depth to a high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

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

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

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

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

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

Table 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, depth to a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

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

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

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

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

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

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

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

Construction Materials

Table 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 releases a variety of plant-available nutrients as it decomposes.

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; embankments, dikes, and levees; and aquifer-fed ponds. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

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

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

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

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

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

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

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

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

Soil Properties

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

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

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

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

Engineering Index Properties

Table 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 *(14)*. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

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

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

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

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

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

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The

estimates are based on test data from the survey area, or from nearby areas, and on field examination.

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

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They influence the soil's adsorption of cations, moisture retention, shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

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

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

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

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

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

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

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

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

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

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

In table 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 are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

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

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

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

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

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

Table 19 gives the frequency and duration of flooding and the time of year when flooding is most likely to occur.

Frequency, duration, and probable dates of occurrence are estimated. Frequency generally is expressed as *none, rare, occasional,* or *frequent. None* means that flooding is not probable. *Rare* means that flooding is unlikely but possible under unusual weather conditions (there is a near 0 to 5 percent chance of flooding in any year). *Occasional* means that flooding occurs infrequently under normal weather conditions (there is a 5 to 50 percent chance of flooding in any year). *Frequent* means that flooding occurs often under normal weather conditions (there is more than a 50 percent chance of flooding in any year). *common* is used when classification as occasional or frequent does not affect interpretations. Duration is expressed as *very brief* (less than 2 days), *brief* (2 to 7 days), *long* (7 days to 1 month), and *very long* (more than 1 month). The time of year that floods are most likely to occur is expressed in months. November-May, for example, means that flooding can occur during the period November through May. About two-thirds to three-fourths of all flooding occurs during the stated period.

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

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 19 are the depth to the seasonal high water table; the kind of water table, that is, *perched, or apparent;* and the months of the year that the water table commonly is highest. A water table that is seasonally high for less than 1 month is not indicated in table 19.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

The two numbers in the "High water table-Depth" column indicate the normal range in depth to a saturated zone. Depth is given to the nearest half foot. The first numeral in the range indicates the highest water level. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. "More than 6.0" indicates that the water table is below a depth of 6 feet or that the water table exists for less than a month.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or

fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

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

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

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

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories *(15)*. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or on laboratory measurements. Table 20 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Ultisol.

SUBORDER. Each order is divided into suborders, primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Udult (*Ud*, meaning humid, plus *ult*, from Ultisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Hapludults (*Hapl*, meaning minimal horizonation, plus *udult*, the suborder of the Ultisols that has a uduic 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. There can be some variation in the texture of the surface layer or of the substratum within a series.

Soil Series and Their Morphology

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

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the *Soil Survey Manual (14)*. Many of the technical terms used in the descriptions are defined in *Soil Taxonomy (15)*. 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."

Avilla Series

The Avilla series consists of deep, well drained, moderately permeable soils that formed in loamy alluvium. These soils are on nearly level and gently sloping stream terraces. The native vegetation was mixed hardwood and some pine. Slopes are 1 to 8 percent. Avilla soils are fine-loamy, siliceous, thermic Typic Paleudults.

Avilla soils are associated with Ceda, Kenn, and Leadvale soils. Ceda and Kenn soils are on flood plains. Ceda soils have a loamy-skeletal control section and do not have an argillic horizon. Kenn soils have a higher

base saturation than Avilla soils. Leadvale soils are on older terraces. They have a fine-silty control section and a fragipan.

Typical pedon of Avilla silt loam, 1 to 3 percent slopes; in SW1/4NW1/4NW1/4 sec. 33, T. 2 N., R. 24 W.

Ap—0 to 7 inches; dark brown (7.5YR 4/4) silt loam; weak fine granular structure; friable; many fine and medium roots; about 4 percent, by volume, rounded sandstone gravel less than 3 inches in diameter; strongly acid; clear smooth boundary.

BA—7 to 15 inches; yellowish red (5YR 4/6) silt loam; weak medium subangular blocky structure; friable; common fine roots; about 2 percent, by volume, rounded sandstone gravel less than 3 inches in diameter; strongly acid; clear smooth boundary.

Bt1—15 to 26 inches; yellowish red (5YR 4/6) clay loam; moderate medium subangular blocky structure; friable; thin continuous clay films on faces of peds; common fine roots; strongly acid; clear smooth boundary.

Bt2—26 to 34 inches; red (2.5YR 4/6) clay loam; common medium prominent yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; friable; thin continuous clay films on faces of peds; few fine roots; about 13 percent, by volume, rounded sandstone fragments dominately less than 3 inches in diameter; very strongly acid; clear smooth boundary.

Bt3—34 to 51 inches; red (2.5YR 4/6) clay loam; few medium prominent light brownish gray (10YR 6/2) and yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure friable; thin continuous clay films on faces of peds; few fine roots; very strongly acid; clear smooth boundary.

Bt4—51 to 60 inches; red (2.5YR 4/6) clay loam; common medium prominent light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; friable; thin continuous clay films on faces of peds; few fine roots; about 12 percent, by volume, rounded sandstone gravel less than 3 inches in diameter; very strongly acid; gradual smooth boundary.

BC—60 to 72 inches, red (2.5YR 4/6) very gravelly clay loam; common medium prominent light brownish gray (10YR 6/2) mottles; weak medium subangular blocky structure; friable; about 35 percent, by volume, rounded sandstone gravel dominately less than 3 inches in diameter; very strongly acid.

The solum ranges in thickness from 60 to 85 inches. Reaction is strongly acid or very strongly acid. Coarse fragment content ranges from 0 to 15 percent, by volume, in the A, BA, and upper part of the Bt horizons and from 10 to 50 percent, by volume, in the Bt4 and BC horizons.

The A horizon has hue of 10YR, value of 4, and chroma of 3 or 4; or hue of 7.5YR, value of 4, and chroma of 4.

The BA horizon has hue of 7.5YR or 5YR, value of 4 or 5, and chroma of 4 or 6. Texture is silt loam or loam.

The Bt1 horizon has hue of 5YR, value of 5, and chroma of 4, 6, or 8, or value of 4 and chroma of 4 or 6. Texture is loam or clay loam. The Bt2, Bt3, and Bt4 horizons have hue of 2.5YR, value of 4 or 5, and chroma of 4, 6, or 8; or hue of 5YR, value of 4 or 5, and chroma of 4 or 6. Texture is loam, clay loam, or sandy clay loam. Mottles are in shades of brown above a depth of 30 inches and in shades of brown or gray below that.

The BC horizon has colors similar to those of the Bt2 horizon. Texture is gravelly loam, gravelly clay loam, gravelly sandy clay loam, or the very gravelly analogs.

Barling Series

The Barling series consists of deep, moderately well drained, moderately permeable soils that formed in silty alluvium. These soils are on level and nearly level flood plains of local streams. Flooding occurs occasionally for very brief periods from December through April (fig. 15). A seasonal high water table is within 12 inches of the surface from December through April. The native vegetation was mixed hardwood. Slopes are 0 to 2 percent. Barling soils are coarse-silty, mixed, thermic Fluvaquentic Dystrochrepts.

Barling soils are associated with Guthrie and Spadra soils. Guthrie soils are on level stream terraces and have a fine-silty control section and a fragipan. Spadra soils, which are on similar landscapes as the Barling soils, have a fine-loamy control section and an argillic horizon.

Typical pedon of Barling silt loam, occasionally flooded; in a field SE1/4NW1/4SW1/4 sec. 28, T. 5 N., R. 23 W.

Ap—0 to 6 inches; dark brown (10YR 4/3) silt loam; weak fine granular structure; friable; many fine roots; few fine pores; medium acid; abrupt smooth boundary.

A—6 to 12 inches; dark brown (10YR 4/3) silt loam; weak fine subangular blocky structure; friable; common fine roots; few fine pores; medium acid; clear smooth boundary.

BA—12 to 18 inches; dark yellowish brown (10YR 4/4) silt loam; weak medium subangular blocky structure; friable; common fine roots; few fine pores; strongly acid; clear smooth boundary.

Bw1—18 to 26 inches; dark yellowish brown (10YR 4/4) silt loam; common medium distinct grayish brown (10YR 5/2) mottles; weak medium subangular blocky structure; friable; few fine roots; few fine pores; very strongly acid; gradual smooth boundary.

Bw2—26 to 55 inches; mottled light brownish gray (10YR 6/2) and dark yellowish brown (10YR 4/4)

Figure 15.—Flooding can delay farming operations on Barling silt loam, occasionally flooded, but this soil is well suited to use as pasture or for crops.

silt loam; weak medium subangular blocky structure; friable; few fine roots; common fine pores; very strongly acid; gradual smooth boundary.

Bw3—55 to 72 inches; gray (10YR 6/1) silt loam; many medium distinct dark yellowish brown (10YR 4/4) mottles; weak medium subangular blocky structure; friable; few fine roots; common fine pores; very strongly acid.

The solum ranges in thickness from 60 to 80 inches or more. Depth to horizons that have mottles in chroma of 2 or grayer colors ranges from 6 to 24 inches. Reaction ranges from slightly acid to strongly acid in the A and BA horizons and from slightly acid to very strongly acid in the Bw horizons.

The A horizon has hue of 10YR, value of 4, and chroma of 2 or 3, or value of 5 and chroma of 3.

The BA and Bw1 horizons have hue of 10YR, value of 4 or 5, and chroma of 3 or 4. Mottles are in shades of gray or brown. The Bw2 horizon has hue of 10YR, value of 4 or 5, and chroma of 4, or it is mottled in shades of gray and brown. The Bw3 horizon is mottled in shades of gray and brown, or it has hue of 10YR, value of 5 or 6, and chroma of 1 or 2, and has mottles in shades of brown. Texture of the BA and Bw horizons is silt loam or very fine sandy loam.

Bismarck Series

The Bismarck series consists of shallow, somewhat excessively drained, moderately permeable soils that formed in residuum from shale. These soils are on gently sloping ridgecrests and side slopes of mountains. The native vegetation was hardwood and pine. Slopes are 3 to 8 percent. Bismarck soils are loamy-skeletal, mixed, thermic, shallow Typic Dystrochrepts.

Bismarck soils are associated with the Carnasaw, Clebit, and Sherless soils. Carnasaw and Clebit soils are on similar landscapes as the Bismarck soils. Carnasaw soils have a clayey control section and are deeper to soft shale bedrock. Clebit soils formed in residuum from tilted sandstone and are well drained. Sherless soils are on ridgetops and side slopes. They have a fine-loamy

control section and are deeper to soft sandstone bedrock.

Typical pedon of Bismarck shaly silt loam, 3 to 8 percent slopes; in a wooded area in NE1/4SE1/4NE1/4 sec. 34, T. 3 N., R. 22 W.

A—0 to 3 inches; dark brown (10YR 3/3) shaly silt loam; moderate fine granular structure; friable; many fine and medium roots; about 30 percent, by volume, shale fragments less than 3 inches in diameter; strongly acid; clear smooth boundary.

E—3 to 7 inches; brown (10YR 5/3) very shaly silt loam; weak fine subangular blocky structure; friable; common fine and medium roots; about 35 percent, by volume, shale fragments less than 3 inches in diameter; very strongly acid; clear smooth boundary.

Bw—7 to 14 inches; yellowish brown (10YR 5/4) very shaly silt loam; weak fine subangular blocky structure; friable; few fine and medium roots; about 60 percent, by volume, shale fragments less than 3 inches in diameter; very strongly acid; clear wavy boundary.

Cr—14 to 18 inches; gray, red, and brown soft shale, fractured and tilted about 35 degrees from the horizontal.

The solum thickness and depth to shale range from 10 to 20 inches. Reaction is strongly acid or very strongly acid.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2, 3, or 4. Shale and sandstone fragment content ranges from 15 to 35 percent, by volume. Fragments more than 3 inches in diameter are less than 5 percent of the volume.

The E horizon has hue of 10YR, value of 5 or 6, and chroma of 3 or 4. Texture is shaly silt loam, shaly loam, or the very shaly analogs. Shale and sandstone fragment content ranges from 15 to 60 percent, by volume. Fragments more than 3 inches in diameter are less than 5 percent of the volume.

The Bw horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 or 6. Texture is very shaly silt loam, very shaly loam, or the extremely shaly analogs. Shale and sandstone fragment content ranges from 35 to 85 percent, by volume. Fragments more than 3 inches in diameter are less than 10 percent of the volume.

The Cr horizon is gray, brown, and red, soft, weakly cemented, acid shale that has few thin strata of interbedded sandstone and siltstone. Beds are fractured, and dip ranges from 35 degrees to near vertical.

Bruno Series

The Bruno series consists of deep, excessively drained, rapidly permeable soils that formed in stratified, sandy alluvium. These soils are on level and nearly level flood plains along the Arkansas River. Some areas of these soils are flooded occasionally for brief periods from December through June. The native vegetation was pecan, cottonwood, and willow. Slopes are 0 to 3 percent. Bruno soils are sandy, mixed, thermic Typic Udifluvents.

Bruno soils are associated with Dardanelle and Roxana soils. Dardanelle and Roxana soils are on natural levees. Dardanelle soils have a fine-silty control section and an argillic horizon. Roxana soils have a coarse-silty control section and are well drained.

Typical pedon of Bruno loamy fine sand, 0 to 3 percent slopes; in a soybean field in NE1/4SE1/4NE1/4 sec. 21, T. 6 N., R. 20 W.

Ap—0 to 7 inches; dark brown (10YR 4/3) loamy fine sand; single grained; loose; slightly acid; clear smooth boundary.

C1—7 to 13 inches; brown (10YR 5/3) loamy fine sand; single grained; loose; common bedding planes; slightly acid; gradual smooth boundary.

C2—13 to 18 inches; brown (10YR 5/3) very fine sandy loam; weak fine subangular blocky structure; friable; common bedding planes; slightly acid; gradual smooth boundary.

C3—18 to 40 inches; brown (10YR 5/3) loamy sand; single grained; loose; common bedding planes; slightly acid; clear smooth boundary.

C4—40 to 63 inches; brown (10YR 5/3) fine sandy loam; massive; very friable; common bedding planes; neutral; clear smooth boundary.

C5—63 to 72 inches; dark grayish brown (10YR 4/2) silt loam; common medium distinct reddish brown (5YR 4/4) mottles; massive; firm; neutral.

The sandy and loamy sediment ranges from 60 to more than 80 inches in thickness. Reaction is medium acid to mildly alkaline throughout.

The A horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4.

The C horizon is stratified and has hue of 10YR, value of 4, 5, or 6, and chroma of 3, or value of 4 and chroma of 2. The 10- to 40-inch control section is dominantly loamy sand, but it contains thin strata of loamy fine sand or finer textures. The weighted average texture of the 10- to 40-inch control section is sandy.

Cane Series

The Cane series consists of deep, moderately well drained, slowly permeable soils that formed in loamy material from weathered sandstone and shale. These soils are on nearly level to gently sloping colluvial foot slopes and old terraces in broad valleys. A seasonal high water table is within 2 feet of the soil surface from December through March. The native vegetation was mixed hardwood and some pine. Slopes are 1 to 8 percent. Cane soils are fine-loamy, siliceous, thermic Typic Fragiudults.

Cane soils are associated with Enders, Leadvale, Nella, Pickwick, and Taft soils. Enders soils, which are in higher positions than the Cane soils, have a clayey control section and do not have a fragipan. Leadvale soils are on similar landscapes and have a fine-silty control section. Nella soils, which are in higher positions, are well drained and do not have a fragipan. Pickwick soils, which are in similar positions, have a fine-silty control section and do not have a fragipan. Taft soils, which are in lower positions, have a fine-silty control section and do not have an argillic horizon above the fragipan.

Typical pedon of Cane loam, 3 to 8 percent slopes; in a field in NE1/4NW1/4SW1/4 sec. 12, T. 5 N., R. 24 W.

Ap—0 to 4 inches; dark brown (7.5YR 4/4) loam; weak fine granular structure; friable; many fine roots; few fine pores; medium acid; clear smooth boundary.

A—4 to 9 inches; dark brown (7.5YR 4/4) loam; weak medium subangular blocky structure; friable; common fine roots; few fine pores; strongly acid; clear smooth boundary.

Bt—9 to 26 inches; red (2.5YR 4/6) silty clay loam; moderate medium subangular blocky structure; friable; thin patchy clay films on faces of peds; common fine roots; common fine pores; few fine iron-manganese concretions; few black stains; strongly acid; clear smooth boundary.

Btx1—26 to 42 inches; mottled red (2.5YR 4/6), yellowish brown (10YR 5/6), and grayish brown (10YR 5/2) silty clay loam; weak coarse prismatic structure parting to moderate medium subangular blocky; firm, compact and brittle; thick patchy clay films on faces of peds and in pores; few fine roots in vertical gray streaks; many fine pores; few fine iron-manganese concretions; common vertical gray streaks 0.25 to 1 inch wide and 6 to 18 inches apart; common black stains; very strongly acid; gradual wavy boundary.

Btx2—42 to 60 inches; mottled yellowish red (5YR 4/6), yellowish brown (10YR 5/6), and gray (10YR 6/1) silty clay loam; weak coarse prismatic structure parting to moderate medium subangular blocky; firm, compact and brittle; thick patchy clay films on faces of peds and in pores; few fine roots in vertical gray streaks; many fine pores; few concretions; common vertical gray streaks 0.25 to 1 inch wide and 6 to 18 inches apart; common black stains; very strongly acid; gradual wavy boundary.

BC—60 to 72 inches; mottled yellowish red (5YR 4/6), yellowish brown (10YR 5/6), and gray (10YR 6/1) silty clay loam; friable; about 5 percent, by volume, fine gravel; common fine pores; few fine iron-manganese concretions; very strongly acid.

Solum thickness and depth to bedrock are 60 to 80 inches or more. Reaction is medium acid or strongly acid in the A horizon and strongly acid or very strongly acid in the B horizon. Depth to the fragipan ranges from 20 to 35 inches. Coarse fragment content ranges from 0 to 15 percent, by volume, throughout.

The A 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.

The Bt horizon has hue of 2.5YR, value of 4 or 5, and chroma of 4, 6, or 8; or hue of 5YR, value of 4, and chroma of 4 or 6, or value of 5 and chroma of 4, 6, or 8. Texture is loam, clay loam, or sitly clay loam.

The Btx and BC horizons have hue of 10YR or 7.5YR, value of 5, and chroma of 6 or 8; hue of 5YR, value of 5, and chroma of 6 or 8, or value of 4 and chroma of 6; or hue of 2.5YR, value of 4 or 5, and chroma of 6 or 8. They have mottles in shades of gray or brown. Some pedons do not have a dominant matrix color and are mottled with these colors. Texture is loam, clay loam, or silty clay loam.

Carnasaw Series

The Canasaw series consists of deep, well drained, slowly permeable soils that formed in clayey residuum of shale or interbedded sandstone and shale. These soils are on gently sloping to moderately steep ridgetops and gently sloping to very steep side slopes of mountains. The native vegetation was mixed hardwood and pine. Slopes are 3 to 60 percent. Carnasaw soils are clayey, mixed, thermic Typic Hapludults.

Carnasaw soils are associated with the Bismarck, Ceda, Clebit, Kenn, and Sherless soils. Bismarck and Clebit soils, which are on similar landscapes as the Carnasaw soils, have a loamy-skeletal control section and are less than 20 inches deep to sandstone bedrock. Ceda and Kenn soils are on flood plains. Ceda soils have a loamy-skeletal control section and do not have an argillic horizon. Kenn soils have a fine-loamy control section. Sherless soils, which are on similar landscapes as the Carnasaw soils, have a fine-loamy control section and are less than 40 inches to sandstone or shale bedrock.

Typical pedon of Carnasaw stony silt loam, in a wooded area of Carnasaw-Sherless-Clebit complex, 20 to 40 percent slopes; in SE1/4SW1/4SE1/4 sec. 4, T. 1 N., R. 25 W.

A—0 to 3 inches; very dark grayish brown (10YR 3/2) stony silt loam; weak fine granular structure; very friable; many fine and medium roots; about 30 percent, by volume, sandstone fragments up to 24 inches in diameter, medium acid; clear smooth boundary.

E—3 to 6 inches; yellowish brown (10YR 5/4) gravelly silt loam; weak fine subangular blocky structure; friable; many fine roots; few fine pores; about 15 percent, by volume, shale and sandstone fragments

0.25 inch to 3 inches in diameter; strongly acid, clear smooth boundary.

Bt1—6 to 11 inches; yellowish red (5YR 5/6) silty clay loam; moderate medium subangular blocky structure; friable; thin patchy clay films on faces of peds; few fine roots and pores; about 5 percent, by volume, shale and sandstone fragments 0.25 inch to 3 inches in diameter; very strongly acid; gradual smooth boundary.

Bt2—11 to 27 inches; red (2.5YR 4/8) silty clay; strong medium subangular blocky structure; firm; thick continuous clay films on faces of peds; few fine roots and pores; about 5 percent, by volume, shale and sandstone fragments 0.25 inch to 3 inches in diameter; very strongly acid; gradual smooth boundary.

Bt3—27 to 48 inches; red (2.5YR 4/6) silty clay; common medium prominent yellowish brown (10YR 5/6) mottles; strong medium subangular blocky structure; firm; thick continuous clay films on faces of peds; few fine roots and pores; about 5 percent, by volume, shale and sandstone fragments 0.25 inch to 3 inches in diameter; very strongly acid; gradual smooth boundary.

BC—48 to 54 inches; mottled red (2.5YR 4/6), yellowish brown (10YR 5/6), and gray (10YR 7/1) silty clay; moderate fine subangular blocky structure; firm; few thin patchy clay films on faces of peds; few fine roots and pores; about 5 percent, by volume, shale fragments less than 3 inches in diameter; very strongly acid; clear irregular boundary.

Cr—54 to 59 inches; fractured soft shale bedrock laminated with sandstone, tilted about 30 degrees from the horizontal.

Solum thickness and depth to shale bedrock range from 40 to 60 inches but are extremely variable within short distances because of the irregular boundary between the Bt horizon and the underlying tilted bedrock. Reaction is medium acid or strongly acid in the A and E horizons and in the B horizon. Gray mottles in the lower part of the Bt horizon are attributed to the parent material and are not believed to indicate wetness.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. Texture is gravelly silt loam or stony silt loam. Coarse fragment content ranges from 15 to 35 percent, by volume.

The E horizon has hue of 10YR, value of 5 or 6, and chroma of 3 or 4; or it has hue of 7.5YR, value of 5, and chroma of 4. Texture is loam, silt loam, or their gravelly analogs. Coarse fragment content ranges from 8 to 25 percent, by volume.

The Bt1 horizon has hue of 5YR, value of 4, and chroma of 6, or value of 5, and chroma of 6 or 8; or it has hue of 7.5YR, value of 5, and chroma of 6 or 8. Texture is silty clay loam, clay loam, or silty clay. Coarse fragments of shale and sandstone range from 2 to 10 percent, by volume. The Bt2 and Bt3 horizons have hue of 2.5YR, value of 4 or 5, and chroma of 6 or 8; or they have hue of 5YR, value of 4, and chroma of 6, or value of 5, and chroma of 6 or 8. Texture is silty clay or clay. Mottles in shades of red or brown are in some pedons. Coarse fragment content is similar to that of the Bt1 horizon.

The BC horizon has hue of 5YR or 7.5YR, value of 5, and chroma of 6 or 8; hue of 2.5YR, value of 4 or 5, and chroma of 6 or 8; or it is coarsely mottled in shades of red, brown, and gray. Texture is silty clay, clay, or the gravelly or shaly analogs. Coarse fragments of sandstone and shale range from 5 to 25 percent, by volume.

The Cr horizon is interbedded, soft sandstone and shale tilted 20 to 40 degrees from the horizontal.

Ceda Series

The Ceda series consists of deep, well drained, rapidly permeable soils that formed in gravelly and loamy alluvium. These soils are on level and nearly level flood plains. They are occasionally to frequently flooded for very brief periods from January through May. The native vegetation was mixed hardwood trees and some pines. Slopes are 0 to 3 percent. Ceda soils are loamy-skeletal, siliceous, nonacid, thermic Typic Udifluvents.

Ceda soils are associated with Avilla, Carnasaw, Enders, Kenn, Nella, and Spadra soils. Carnasaw and Enders soils are on adjacent side slopes. These soils have a clayey control section and an argillic horizon. Avilla, Kenn, Nella, and Spadra soils have a fine-loamy control section and an argillic horizon. Avilla soils are on adjacent terraces. Kenn soils are in a complex with Ceda soils. Nella soils are on adjacent mountainsides, benches, and foot slopes, and Spadra soils are on terraces.

Typical pedon of Ceda gravelly fine sandy loam, in a wooded area of Kenn-Ceda complex, occasionally flooded; in NE1/4NW1/4NW1/4 sec. 11, T. 1 N., R. 25 W.

A—0 to 7 inches; dark grayish brown (10YR 4/2) gravelly fine sandy loam; weak fine granular structure; friable; about 30 percent, by volume, rounded sandstone fragments; medium acid; clear wavy boundary.

C1—7 to 24 inches; dark brown (10YR 4/3) very gravelly loam; massive; friable; about 60 percent, by volume, rounded sandstone fragments; medium acid; diffuse wavy boundary.

C2—24 to 44 inches; strong brown (7.5YR 5/6) very gravelly loam; massive; friable; about 60 percent, by volume, rounded sandstone fragments; medium acid; diffuse wavy boundary.

C3—44 to 72 inches; yellowish brown (10YR 5/6) very gravelly loam; massive; friable; about 60 percent, by

volume, rounded sandstone fragments; medium acid.

The gravelly and loamy sediments are more than 80 inches deep. Reaction is slightly acid or medium acid throughout.

The A horizon has hue of 10YR, value of 3, 4, or 5, and chroma of 2 or 3. Coarse fragment content less than 3 inches in diameter ranges from 15 to 35 percent, by volume, and fragments more than 3 inches in diameter range from 0 to 5 percent, by volume. Total coarse fragments content in the A horizon is 15 to 35 percent, by volume.

The C horizon has hue of 10YR, value of 4 or 5, and chroma of 4 or 6; or it has hue of 7.5YR, value of 4 or 5, and chroma of 3, 4, or 6. Texture is very gravelly loam, very gravelly fine sandy loam, very gravelly clay loam, or the extremely gravelly analogs. Coarse fragments less than 3 inches in diameter range from 35 to 75 percent, by volume, and fragments more than 3 inches in diameter range from 0 to 20 percent, by volume. Total fragment content ranges from 35 to 85 percent, by volume.

Clebit Series

The Clebit series consists of shallow, well drained, moderately rapidly permeable soils that formed in residuum of sandstone. These soils are on strongly sloping to very steep ridgetops and side slopes of mountains. The native vegetation was hardwood and pine. Slopes are 8 to 60 percent. Clebit soils are loamy-skeletal, siliceous, thermic Lithic Dystrochrepts.

Clebit soils are associated with Bismarck, Carnasaw, and Sherless soils. Bismarck soils formed in residuum of tilted shale and are somewhat excessively drained. Carnasaw soils have a clayey control section and are deeper than 40 inches to shale bedrock. Sherless soils have a fine-loamy control section and are deeper than 20 inches to bedrock.

Typical pedon of Clebit very stony fine sandy loam, in an area of Clebit-Carnasaw-Sherless complex, 40 to 60 percent slopes; in SW1/4NE1/4NW1/4 sec. 10, T. 1 N., R. 23 W.

O—1 to 0 inch; forest litter.

A—0 to 3 inches; dark brown (10YR 3/3) very stony fine sandy loam; moderate fine granular structure; friable; many fine and medium roots; about 40 percent, by volume, sandstone fragments dominantly more than 10 inches in diameter; strongly acid; clear smooth boundary.

Bw1—3 to 6 inches; yellowish brown (10YR 5/4) very gravelly fine sandy loam; weak fine subangular blocky structure; friable; common fine and medium roots; about 35 percent, by volume, sandstone fragments dominantly less than 3 inches in diameter; very strongly acid; clear smooth boundary.

Bw2—6 to 14 inches; strong brown (7.5YR 5/6) very gravelly loam; weak fine subangular blocky structure; friable; common fine and medium roots; about 40 percent, by volume, sandstone fragments dominantly less than 3 inches in diameter; very strongly acid; clear wavy boundary.

R—14 to 18 inches; hard, gray, yellow, and brown sandstone, fractured and tilted about 35 degrees from horizontal.

Solum thickness and depth to bedrock range from 10 to 20 inches. Reaction is medium acid or strongly acid in the A horizon and strongly acid or very strongly acid in the Bw horizon.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. Coarse fragments of sandstone range from 35 to 50 percent, by volume.

The Bw horizon has hue of 10YR, value of 4 or 5, and chroma of 4 or 6; or hue of 7.5YR, value of 5, and chroma of 4 or 6. Texture is very gravelly fine sandy loam or very gravelly loam. Coarse fragments of sandstone range from 35 to 60 percent, by volume.

The R horizon is hard, yellow, gray, brown, and red sandstone that has lenses of shale, tilted and fractured.

Dardanelle Series

The Dardanelle series consists of deep, well drained, moderately permeable soils that formed in loamy alluvium. These soils are on level and nearly level, old natural levees along the Arkansas River. The native vegetation was hardwood forest. Slopes are 0 to 3 percent. Dardanelle soils are fine-silty, mixed, thermic Typic Argiudolls.

Dardanelle soils are associated with Bruno, Moreland, Roellen, and Roxana soils. Bruno soils, which are on flood plains and young natural levees, have a sandy control section and do not have an argillic horizon. Moreland and Roellen soils are in slack water areas and have a fine control section. Moreland soils are somewhat poorly drained, and Roellen soils are poorly drained. Roxana soils, which are on young natural levees, have a coarse-silty control section and do not have an argillic horizon.

Typical pedon of Dardanelle silt loam, 0 to 1 percent slopes; in a field in SE1/4SE1/4NE1/4 sec. 33, T. 6 N., R. 19 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam; weak fine granular structure; friable; many fine roots; slightly acid; abrupt smooth boundary.

A—8 to 29 inches; very dark brown (10YR 2/2) silt loam; weak fine subangular blocky structure; friable; common fine roots; common fine tubular pores; common worm channels; slightly acid; gradual smooth boundary.

Bt1—29 to 39 inches; dark brown (7.5YR 3/2) silt loam; moderate medium subangular blocky structure; friable; thin patchy clay films on faces of peds; common fine roots; common fine tubular pores; medium acid; gradual smooth boundary.
Bt2—39 to 68 inches; reddish brown (5YR 4/4) silt loam; moderate medium subangular blocky structure; friable; thin patchy clay films on faces of peds; few fine roots; common fine tubular pores; medium acid; clear smooth boundary.
C—68 to 84 inches; reddish brown (5YR 4/4) silt loam; massive; few fine roots; few fine tubular pores; medium acid.

The solum ranges in thickness from about 45 to 70 inches. Thickness of the mollic epipedon ranges from 20 to 40 inches. Reaction is medium acid to neutral in the A and B horizons and medium acid to mildly alkaline in the C horizon.

The A horizon is 18 to 30 inches thick. It has hue of 10YR, value of 3, and chroma of 2 or 3, or value of 2 and chroma of 2; or hue of 7.5YR, value of 3, and chroma of 2.

The Bt1 horizon has hue of 10YR or 7.5YR, value of 3, and chroma of 2; or hue of 5YR, value of 3, and chroma of 3. The Bt2 horizon has hue of 10YR, value of 4, and chroma of 3 or 4; hue of 7.5YR, value of 4, and chroma of 2 or 4; or hue of 5YR, value of 3 or 4, and chroma of 3 or 4. Texture of the Bt horizon is silt loam or silty clay loam.

The C horizon has hue of 5YR, value of 4 or 5, and chroma of 4 or 6; or hue of 7.5YR, value of 5, and chroma of 4 or 6, or value of 4 and chroma of 4. Texture is very fine sandy loam, silt loam, or loam.

Enders Series

The Enders series consists of deep, well drained, very slowly permeable soils that formed in a thin layer of loamy colluvium over clayey residuum of acid shale. These soils are on gently sloping to very steep upland ridgecrests, hillsides, and mountainsides. The native vegetation was hardwood or mixed pine and hardwood forest. Slopes are 3 to 65 percent. Enders soils are clayey, mixed, thermic Typic Hapludults.

Enders soils are associated with Cane, Ceda, Kenn, Leadvale, Linker, Mountainburg, and Nella soils. Cane and Leadvale soils are on colluvial foot slopes and old stream terraces in broad valleys. Cane soils have a fine-loamy control section and a fragipan. Leadvale soils have a fine-silty control section and a fragipan. Ceda and Kenn soils are on flood plains. Ceda soils have a loamy-skeletal control section and do not have an argillic horizon. Kenn soils have a fine-loamy control section. Linker and Mountainburg soils are on mountaintops, mountainsides, and benches. These soils are shallower to bedrock than the Enders soils. Linker soils have a fine-loamy control section, and Mountainburg soils have a loamy-skeletal control section. Nella soils are on mountainsides, benches, and foot slopes. These soils have a fine-loamy control section.

Typical pedon of Enders gravelly fine sandy loam, in a wooded area of Nella-Enders gravelly fine sandy loams, 8 to 20 percent slopes; SE1/4NW1/4NE1/4 sec. 31, T. 5 N., R. 24 W.

A—0 to 3 inches; dark grayish brown (10YR 4/2) gravelly fine sandy loam; weak medium granular structure; very friable; many fine and medium roots; about 25 percent, by volume, sandstone fragments, about 5 percent more than 3 inches in diameter; strongly acid; clear smooth boundary.
E—3 to 7 inches; yellowish brown (10YR 5/4) gravelly fine sandy loam; weak medium subangular blocky structure; friable; many fine and medium roots; about 20 percent, by volume, sandstone fragments, about 5 percent more than 3 inches in diameter; very strongly acid; clear smooth boundary.
Bt1—7 to 11 inches; yellowish red (5YR 5/6) silty clay loam; moderate medium subangular blocky structure; firm; thin patchy clay films on faces of peds; common fine roots; few fine pores; about 5 percent, by volume, sandstone fragments less than 3 inches in diameter; very strongly acid; clear smooth boundary.
Bt2—11 to 31 inches; red (2.5YR 4/6) silty clay; moderate medium subangular blocky structure; firm; thick continuous clay films on faces of peds; common fine roots; few fine pores; very strongly acid; gradual wavy boundary.
Bt3—31 to 41 inches; red (2.5YR 4/6) silty clay; common medium distinct pale brown (10YR 6/3) and yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; thick continuous clay films on faces of peds; few fine roots; few fine pores; very strongly acid; gradual wavy boundary.
Bt4—41 to 53 inches; red (2.5YR 4/6) silty clay; common medium prominent gray (10YR 6/1) mottles; moderate medium subangular blocky structure; firm; thick continuous clay films on faces of peds; few fine roots; few fine pores; very strongly acid; gradual wavy boundary.
BC—53 to 59 inches; gray (10YR 6/1) silty clay; common medium prominent red (2.5YR 4/6) mottles and common medium distinct strong brown (7.5YR 5/6) mottles; weak fine angular blocky structure; firm; few fine pores; 5 percent, by volume, gray shale fragments; very strongly acid; clear wavy boundary.
Cr—59 to 66 inches; soft, weathered, level-bedded shale bedrock that has gray clay between plates.

The solum ranges in thickness from 40 to 59 inches. Depth to bedrock ranges from 40 to more than 62

inches. Reaction is strongly acid or very strongly acid. Gray mottles in the Bt horizon are attributed to the parent material and are not believed to indicate wetness. Coarse fragment content ranges from 15 to 35 percent, by volume, in the A and E horizons; 0 to 15 percent, by volume, in the BE and Bt horizons; and 5 to 25 percent, by volume, in the BC horizon.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. In the cultivated areas, the Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. An A horizon that has value of 3 is less than 6 inches thick. Texture is gravelly fine sandy loam or stony fine sandy loam.

The E horizon has hue of 10YR, value of 5, and chroma of 3 or 4. Texture is gravelly fine sandy loam or stony fine sandy loam.

Some pedons have a BE horizon that has hue of 7.5YR, value of 5, and chroma of 6 or 8. Texture is loam or silt loam.

The Bt horizon has hue of 5YR, value of 4, and chroma of 6, or value of 5 and chroma of 6 or 8; or hue of 2.5YR, value of 4 or 5, and chroma of 6 or 8. The lower part of the Bt horizon has common mottles in shades of red, brown, and gray. Texture of the upper part of the Bt horizon is silty clay loam, clay loam, or silty clay. Texture of the middle and lower parts of the Bt horizon is silty clay or clay.

The BC horizon has hue of 10YR, value of 5 or 6, and chroma of 1, and has mottles in shades of red or brown; or it is coarsely mottled in shades of red, brown, and gray. Texture is silty clay, clay, or the shaly analogs.

The Cr horizon is soft, weathered, level-bedded shale bedrock.

Guthrie Series

The Guthrie series consists of deep, poorly drained, slowly permeable soils that developed from loamy sediment from sandstone and shale uplands. These soils are on level old stream terraces in broad valleys. A seasonal high water table is within 6 inches of the soil surface from December through April. Some areas of these soils are flooded occasionally for very brief periods from January through April. The native vegetation was hardwoods and tall grasses. Slopes are 0 to 1 percent. Guthrie soils are fine-silty, siliceous, thermic Typic Fragiaquults.

Guthrie soils are associated with Barling, Leadvale, and Taft soils. The Barling soils are on flood plains. These soils have a coarse-silty control section and do not have a fragipan. The Leadvale soils, which are on higher landscapes than the Guthrie soils, have an argillic horizon above the fragipan and are moderately well drained. The Taft soils are on slightly higher landscapes and are somewhat poorly drained.

Typical pedon of Guthrie silt loam, 0 to 1 percent slopes; in a pasture in NE1/4SE1/4SW1/4 sec. 13, T. 6 N., R. 22 W.

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) silt loam; many fine distinct dark yellowish brown (10YR 4/6) mottles; weak fine granular structure; friable; many fine roots; few fine pores; strongly acid; clear smooth boundary.

Eg—5 to 10 inches; gray (10YR 5/1) silt loam; many fine and medium distinct strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; friable; common fine roots; common fine pores; very strongly acid; clear smooth boundary.

Bg—10 to 22 inches; gray (10YR 6/1) silt loam; many medium and coarse distinct strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; friable; few fine roots; few fine pores; common medium iron-manganese concretions; very strongly acid; clear smooth boundary.

Btx1—22 to 40 inches; gray (10YR 6/1) silty clay loam; many coarse distinct strong brown (7.5YR 5/6) and yellowish red (5YR 4/6) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm, compact and brittle; thin patchy clay films on faces of peds; few fine pores; common medium iron-manganese concretions; very strongly acid; gradual smooth boundary.

Btx2—40 to 55 inches; mottled gray (10YR 6/1), light yellowish brown (10YR 6/4), and strong brown (7.5YR 5/6) silty clay loam; weak coarse prismatic structure parting to moderate medium subangular blocky; firm, compact and brittle; thin patchy clay films on faces of peds; common medium iron-manganese concretions; very strongly acid; gradual smooth boundary.

Btx3—55 to 72 inches; mottled yellowish brown (10YR 5/4) and gray (10YR 6/1) silty clay loam; moderate medium subangular blocky structure; firm, brittle; thin patchy clay films on faces of peds; few fine pores; common medium iron-manganese concretions; very strongly acid.

The solum ranges in thickness from about 60 to 80 inches or more. Reaction is very strongly acid throughout except where lime has been added. Depth to the fragipan ranges from 20 to 40 inches.

The A horizon has hue of 10YR, value of 4 or 5, and chroma of 2. It has mottles in shades of brown.

The Eg horizon has hue of 10YR, value of 5, 6, or 7, and chroma of 1 or 2. It has mottles in shades of brown.

The Bg horizon has hue of 10YR, value of 5, 6, or 7, and chroma of 1 or 2. It has mottles in shades of brown. Texture is silt loam or silty clay loam.

The Btx horizon has hue of 10YR, value of 5 or 6, and chroma of 1 or 2. It has mottles in shades of red and brown. In some pedons, the lower part of the Btx horizon

is mottled in shades of gray, yellow, red, and brown and does not have a dominant color. Texture of the Btx horizon is silt loam or silty clay loam.

Kenn Series

The Kenn series consists of deep, well drained, moderately permeable soils that formed in loamy alluvium. These soils are on level and nearly level flood plains. They are flooded occasionally for very brief periods from January through May. The native vegetation was mixed pine and hardwood. Slopes are 0 to 3 percent. Kenn soils are fine-loamy, siliceous, thermic Ultic Hapludalfs.

Kenn soils are associated with Avilla, Carnasaw, Ceda, Enders, Nella, and Spadra soils. Avilla soils are on terraces and have lower base saturation than Kenn soils. Carnasaw and Enders soils are on adjacent mountains and have a clayey control section. Ceda soils are on similar landscapes as the Kenn soils, and they have a loamy-skeletal control section and an argillic horizon. Nella soils are on adjacent mountainsides, benches, and foot slopes. These soils have lower base saturation than Kenn soils. Spadra soils, which are downstream from the Kenn soils on large flood plains and terraces, do not have a very gravelly substratum and have lower base saturation than Kenn soils.

Typical pedon of Kenn fine sandy loam, in an area of Kenn-Ceda complex, occasionally flooded; in NE1/4NW1/4NW1/4 sec. 11, T. 1 N., R. 25 W.

A—0 to 7 inches; dark brown (10YR 4/3) fine sandy loam; weak fine granular structure; friable; about 5 percent, by volume, rounded sandstone fragments; strongly acid; clear wavy boundary.

Bt1—7 to 24 inches; yellowish red (5YR 5/6) sandy clay loam; weak fine subangular blocky structure; friable; common thin patchy clay films on faces of peds; about 5 percent, by volume, rounded sandstone fragments; very strongly acid; clear irregular boundary.

2Bt2—24 to 42 inches; mottled yellowish red (5YR 5/6) and strong brown (7.5YR 5/6) very gravelly sandy clay loam; weak fine subangular blocky structure; friable; thin patchy clay films on faces of peds; about 45 percent, by volume, rounded sandstone fragments; very strongly acid; gradual wavy boundary.

2C—42 to 72 inches; mottled strong brown (7.5YR 5/6) and yellowish brown (10YR 5/6) very gravelly sandy clay loam; massive; friable; about 45 percent, by volume, rounded sandstone fragments; strongly acid.

The solum is 40 to 60 inches thick. Depth to the gravelly 2B horizon ranges from 20 to 40 inches. Reaction ranges from strongly acid to slightly acid in the A horizon and is strongly acid or very strongly acid in the Bt, 2B, and 2C horizons.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2, 3, or 4; or has hue of 7.5YR, value of 4, and chroma of 2 or 4. Fragments of sandstone range from 5 to 15 percent, by volume.

Some pedons have a BA horizon 3 to 6 inches thick that has hue of 5YR, value of 4 or 5, and chroma of 4 or 6; or hue of 7.5YR, value of 4, and chroma of 4, or value of 5 and chroma of 4 or 6. Coarse fragment content range is similar to that of the A horizon. Texture is loam or fine sandy loam.

The Bt1 horizon has hue of 5YR, value of 4 or 5, and chroma of 4 or 6; or hue of 7.5YR, value of 4, chroma of 4, or value of 5 and chroma of 4 or 6. Texture is clay loam, sandy clay loam, or the gravelly analogs. Coarse fragment content ranges from about 5 to 30 percent, by volume.

The 2Bt2 horizon has colors similar to those of the Bt1 horizon, or it is mottled in shades of red or brown. Texture is very gravelly sandy clay loam or very gravelly clay loam. Coarse fragment content ranges from 35 to 60 percent, by volume.

The 2C horizon has hue of 10YR, value of 4 or 5, and chroma of 4 or 6; hue of 7.5YR, value of 4, and chroma of 4, or value of 5 and chroma of 4 or 6; or it is mottled in shades of brown. Texture is very gravelly sandy clay loam, very gravelly loam, or very gravelly fine sandy loam. Coarse fragment content ranges from 35 to 60 percent, by volume.

Leadvale Series

The Leadvale series consists of deep, moderately well drained, slowly permeable soils that formed in silty sediment from local uplands underlain by sandstone and shale. These soils are on nearly level and gently sloping colluvial foot slopes and old stream terraces in broad valleys. A seasonal high water table is within 24 inches of the soil surface from December through April. The native vegetation was mixed hardwood and some pine. Slopes are 1 to 8 percent. Leadvale soils are fine-silty, siliceous, thermic Typic Fragiudults.

Leadvale soils are associated with Avilla, Cane, Enders, Guthrie, Pickwick, and Taft soils. Avilla soils, which are on younger terraces than Leadvale soils, have a fine-loamy control section and do not have a fragipan. Cane soils are on similar landscapes and have a fine-loamy control section. Enders and Pickwick soils are in higher positions on the landscape and do not have a fragipan. Enders soils have a clayey control section, and Pickwick soils are well drained. Guthrie and Taft soils are on lower landscapes and do not have an argillic horizon above the fragipan. The Guthrie soils are poorly drained, and Taft soils are somewhat poorly drained.

Typical pedon of Leadvale silt loam, 1 to 3 percent slopes; in a pasture in NW1/4NW1/4NE1/4 sec. 18, T. 5 N., R. 23 W.

Ap—0 to 6 inches; dark brown (10YR 4/3) silt loam; weak fine granular structure; very friable; many fine roots; common fine pores; strongly acid; clear smooth boundary.

BA—6 to 10 inches; strong brown (7.5YR 5/6) silt loam; weak medium subangular blocky structure; friable; common fine roots; common fine pores; very strongly acid; clear smooth boundary.

Bt1—10 to 20 inches; yellowish brown (10YR 5/6) silty clay loam; moderate medium subangular blocky structure; friable; common patchy clay films on faces of peds; common fine roots; common fine pores; very strongly acid; clear smooth boundary.

Bt2—20 to 25 inches; brownish yellow (10YR 6/6) silty clay loam; common coarse distinct gray (10YR 6/1) mottles and common fine distinct strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; friable; common patchy clay films on faces of peds; common fine roots; common fine pores; very strongly acid; clear smooth boundary.

Btx—25 to 51 inches; yellowish brown (10YR 5/6) silty clay loam; common medium distinct gray (10YR 6/1) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm, compact and brittle; thick patchy clay films on peds and in pores; common fine pores; common iron-manganese stains; very strongly acid; gradual smooth boundary.

BC—51 to 72 inches; mottled yellowish brown (10YR 5/4) and light brownish gray (10YR 6/2) silty clay loam; weak medium subangular blocky structure; firm; common fine pores; common iron-manganese stains; very strongly acid.

Solum thickness and depth to bedrock range from about 60 inches to more than 80 inches. Depth to the fragipan ranges from 16 to 30 inches. Reaction is strongly acid or very strongly acid. Content of shale fragments ranges from 0 to 10 percent in each horizon.

The Ap horizon has hue of 10YR, value of 4, and chroma of 2 or 3, or value of 5 and chroma of 3.

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

The Bt horizon has hue of 10YR, value of 5 or 6, and chroma of 6 or 8; or hue of 7.5YR, value of 5, and chroma of 6 or 8. Few to common fine and medium light gray and strong brown mottles are in the lower part of the horizon in some pedons. Texture is silt loam or silty clay loam.

The Btx horizon has hue of 10YR or 7.5YR, value of 5, and chroma of 6 or 8, and it has common to many medium and coarse light gray and light brownish gray mottles. Some pedons do not have a dominant matrix color and are mottled or varigated with these colors. Texture is silt loam or silty clay loam. The BC horizon has the same color range as the Btx horizon. Texture is silty clay loam or silty clay.

Linker Series

The Linker series consists of moderately deep, well drained, moderately permeable soils that developed from residuum of acid sandstone. These soils are on nearly level and gently sloping hilltops and mountaintops. The native vegetation was mixed hardwood and pine forest. Slopes are 1 to 8 percent. Linker soils are fine-loamy, siliceous, thermic Typic Hapludults.

Linker soils are associated with Enders, Mountainburg, and Nella soils. Enders soils, which are on side slopes and ridges, have a clayey control section and are deeper to soft shale bedrock. Mountainburg soils, which are on similar landscapes as the Linker soils, have a loamy-skeletal control section and are less than 20 inches deep to sandstone bedrock. Nella soils are on mountainsides, benches, and foot slopes. These soils have sola more than 60 inches deep.

Typical pedon of Linker fine sandy loam, 3 to 8 percent slopes; in a pasture in NE1/4NE1/4NW1/4 sec. 3, T. 6 N., R. 21 W.

Ap—0 to 6 inches; dark brown (10YR 4/3) fine sandy loam; weak fine granular structure; very friable; many fine roots; common fine pores; few worm casts; about 5 percent, by volume, sandstone fragments up to 3 inches in diameter; strongly acid; clear smooth boundary.

Bt1—6 to 10 inches; strong brown (7.5YR 5/6) loam; weak medium subangular blocky structure; friable; common fine roots; many medium pores; clay coatings and bridging on sand grains and in pores; many worm casts; about 5 percent, by volume, sandstone fragments up to 3 inches in diameter; very strongly acid; clear smooth boundary.

Bt2—10 to 28 inches; yellowish red (5YR 5/6) loam; moderate medium subangular blocky structure; friable; few fine roots; common fine pores; thin patchy clay films on faces of peds and in pores; about 5 percent, by volume, sandstone fragments up to 3 inches in diameter; very strongly acid; clear smooth boundary.

BC—28 to 36 inches; yellowish red (5YR 5/6) loam; weak medium subangular blocky structure; friable; common fine pores; thin patchy clay films on faces of peds; about 10 percent, by volume, sandstone fragments up to 3 inches in diameter; very strongly acid; abrupt smooth boundary.

R—36 to 38 inches; level-bedded, hard, acid sandstone bedrock.

Solum thickness and depth to bedrock range from 20 to 40 inches. Reaction is strongly acid or very strongly acid. Coarse fragment content ranges from 0 to 15 percent, by volume, in the A and E horizons; 0 to 10 percent, by volume, in the BA and Bt horizons; and 0 to 25 percent, by volume, in the BC horizon.

The A or Ap horizon has hue of 10YR, value of 4, and chroma of 2 or 4, or value of 4 or 5 and chroma of 3; or it has hue of 7.5YR, value of 4, and chroma of 4.

Some pedons have an E horizon that has hue of 10YR, value of 5, and chroma of 3 or 4; or hue of 7.5YR, value of 5, and chroma of 4. Texture is fine sandy loam or loam.

Some pedons have a BA horizon that has hue of 7.5YR, value of 5, and chroma of 6; or hue of 5YR, value of 4, and chroma of 6, or value of 5 and chroma of 6 or 8. Texture is fine sandy loam, sandy clay loam, or loam.

The Bt horizon has hue of 2.5YR, value of 4 or 5, and chroma of 6 or 8; or hue of 5YR, value of 4, and chroma of 6, or value of 5 and chroma of 6 or 8. Texture is sandy clay loam, clay loam, or loam.

The BC horizon has colors similar to the Bt horizon. It has mottles in shades of gray, brown, or red. Texture is fine sandy loam, loam, sandy clay loam, or the gravelly analogs.

The R horizon is hard, level-bedded, sandstone bedrock.

McKamie Series

The McKamie series consists of deep, well drained, very slowly permeable soils that formed in stratified loamy and clayey old alluvium. These soils are on gently sloping high terraces along the Arkansas River. The native vegetation was mixed hardwoods and pine forest. Slopes are 3 to 8 percent. McKamie soils are fine, mixed, thermic Vertic Hapludalfs.

McKamie soils are associated with Muskogee and Wrightsville soils. Muskogee soils, which are on slightly lower landscapes than McKamie soils, are moderately well drained and have a fine-silty control section. Wrightsville soils are on lower landscapes. These soils are poorly drained and have a grayer subsoil than McKamie soils.

Typical pedon of McKamie silt loam, 3 to 8 percent slopes, eroded; in a field in SW1/4NE1/4SE1/4 sec. 10, T. 5 N., R. 20 W.

Ap—0 to 4 inches; dark brown (7.5YR 4/4) silt loam; weak fine granular structure; friable; common fine roots; strongly acid; clear smooth boundary.

Bt1—4 to 23 inches; red (2.5YR 4/6) silty clay; moderate fine angular blocky structure; firm; thin continuous clay films on faces of peds; common fine roots; common nonintersecting slickensides; strongly acid; gradual smooth boundary.

Bt2—23 to 42 inches; reddish brown (2.5YR 4/4) silty clay; moderate fine angular blocky structure; firm; thin continuous clay films on faces of peds; few fine roots; common nonintersecting slickensides; medium acid; gradual smooth boundary.

Bt3—42 to 59 inches; red (2.5YR 4/6) silty clay; moderate medium angular blocky structure; firm; thin continuous clay films on faces of peds; few fine roots; common nonintersecting slickensides; few medium calcium carbonate concretions; neutral; gradual smooth boundary.

2C—59 to 72 inches; brown (7.5YR 5/4) silty clay loam; common medium distinct dark brown (10YR 4/3) mottles; massive; firm; few fine roots; common medium iron-manganese concretions; few medium calcium carbonate concretions; neutral.

The solum ranges in thickness from 36 to 60 inches. Reaction is slightly acid to strongly acid in the A horizon and medium acid to very strongly acid in the upper part of the Bt horizon. Below a depth of 30 inches, the reaction ranges from strongly acid to moderately alkaline and is calcareous in places.

The A horizon has hue of 10YR, value of 4 or 5, and chroma of 3; or hue of 7.5YR, value of 4, and chroma of 4.

Some pedons have a BA horizon that has hue of 7.5YR, value of 5, and chroma of 6; or hue of 5YR, value of 4 or 5, and chroma of 6. Texture is silt loam or silty clay loam.

The Bt horizon has hue of 2.5YR, value of 3, and chroma of 4 or 6, or value of 4 and chroma of 4, 6, or 8; or it has hue of 5YR, value of 4, and chroma of 6, or value of 5 and chroma of 6 or 8. Texture is silty clay or clay.

The 2C horizon has hue of 2.5YR, value of 4, and chroma of 4, 6, or 8; hue of 5YR, value of 4, and chroma of 6, or value of 5 and chroma of 6 or 8; or it has hue of 7.5YR, value of 5, and chroma of 4, 6, or 8. Texture is dominantly silty clay loam, silt loam, or fine sandy loam.

Moreland Series

The Moreland series consists of deep, somewhat poorly drained, very slowly permeable soils that formed in clayey alluvium. These soils are in level slack water areas on flood plains of the Arkansas River. A seasonal high water table is within 18 inches of the soil surface from December through April. The native vegetation was pecan, cottonwood, and willow. Slopes are dominantly less than 1 percent. Moreland soils are fine, mixed, thermic Vertic Hapludolls.

Moreland soils are associated with the Dardanelle and Roellen soils. Dardanelle soils, which are on natural levees, have a fine-silty control section and are well drained. Roellen soils, which are on similar landscapes as the Moreland soils, have a grayer subsoil and are poorly drained.

Typical pedon of Moreland silty clay, 0 to 1 percent slopes; in a field in NE1/4SE1/4NE1/4 sec. 35, T. 6 N., R. 19 W.

Ap—0 to 7 inches; dark reddish brown (5YR 3/2) silty clay; weak fine granular structure; firm; many fine roots; neutral; clear smooth boundary.
Bw1—7 to 37 inches; dark reddish brown (5YR 3/3) silty clay; moderate fine subangular blocky structure; firm; common nonintersecting slickensides; common fine roots; neutral; gradual smooth boundary.
Bw2—37 to 55 inches; dark reddish brown (5YR 3/4) silty clay; moderate fine subangular blocky structure; firm; common nonintersecting slickensides; few fine roots; mildly alkaline, calcareous; gradual smooth boundary.
BC—55 to 72 inches; reddish brown (5YR 4/4) silty clay; weak fine subangular blocky; mildly alkaline, calcareous.

The solum ranges in thickness from about 40 to 72 inches or more. Reaction ranges from slightly acid to mildly alkaline in the A horizon and neutral to moderately alkaline in the B and BC horizons. Depth to calcareous layers ranges from 10 to 40 inches.

The A horizon has hue of 7.5YR, value of 3, and chroma of 2; or hue of 5YR, value of 3, and chroma of 2 or 3.

The Bw horizon has hue of 5YR, value of 3, and chroma of 2, 3, or 4, or value of 4 and chroma of 3 or 4. Texture is silty clay or clay. The BC horizon has hue of 5YR, value of 4, and chroma of 3 or 4. Texture is clay, silty clay, or silty clay loam.

The Moreland soils in Yell County are taxadjuncts to the Moreland series in that they do not have gray mottles within 30 inches of the surface and do not have hard-centered calcium carbonate concretions in the B horizon. The use, behavior, and management of these soils are similar to those of the Moreland series.

Mountainburg Series

The Mountainburg series consists of shallow, well drained, moderately rapidly permeable soils that developed in residuum of acid sandstone. These soils are on nearly level to very steep tops and sides of ridges, hills, and mountains. The native vegetation was mixed hardwoods and pines and an understory of tall grasses. Slopes are 1 to 65 percent. Mountainburg soils are loamy-skeletal, siliceous, thermic Lithic Hapludults.

Mountainburg soils are associated with Enders, Linker, and Nella soils. Enders soils are on side slopes and ridgecrests. These soils have a clayey control section and are deeper to soft, shale bedrock than Mountainburg soils. Nella soils are on mountainsides, foot slopes, and benches. These soils have a fine-loamy control section and are more than 60 inches deep to bedrock. Linker soils, which are on similar landscapes as the Mountainburg soils, have a fine-loamy control section and are more than 20 inches deep to bedrock.

Typical pedon of Mountainburg gravelly fine sandy loam, 3 to 8 percent slopes; in a native grass pasture in NW1/4SW1/4NW1/4 sec. 32, T. 5 N., R. 23 W.

A—0 to 5 inches; dark brown (10YR 4/3) gravelly fine sandy loam; moderate medium granular structure; friable; many fine and medium roots; about 20 percent, by volume, sandstone gravel less than 3 inches in diameter; strongly acid; clear smooth boundary.
E—5 to 9 inches; yellowish brown (10YR 5/4) gravelly fine sandy loam; weak medium granular structure; friable; common fine and medium roots; about 30 percent, by volume, sandstone gravel less than 3 inches in diameter; very strongly acid; clear smooth boundary.
Bt—9 to 17 inches; strong brown (7.5YR 5/6) very gravelly loam; weak medium subangular blocky structure; friable; few fine and medium roots; thin patchy clay films on faces of peds; sand grains coated and bridged; about 40 percent, by volume, sandstone gravel less than 3 inches in diameter; very strongly acid; abrupt smooth boundary.
R—17 to 20 inches; level-bedded, acid, hard sandstone bedrock.

The solum ranges in thickness from 12 to 20 inches over acid sandstone bedrock. Reaction is medium acid to very strongly acid in the A and E horizons and strongly acid or very strongly acid in the B horizon.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3, or value of 5 and chroma of 3. Some pedons have an Ap horizon that has hue of 10YR, value of 4 or 5, and chroma of 3.

The E horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. Texture of the A and E horizons is gravelly fine sandy loam or stony fine sandy loam. Sandstone fragments as much as 30 inches in diameter range from 15 to 35 percent by volume.

Some pedons have a BE horizon that has hue of 7.5YR, value of 4, and chroma of 4, or value of 5 and chroma of 4 or 6. Texture is gravelly fine sandy loam, very gravelly fine sandy loam, or cobbly fine sandy loam. Sandstone fragments as much as 12 inches in diameter range from 15 to 50 percent, by volume.

The Bt horizon has hue of 7.5YR, value of 5, and chroma of 6; or hue of 5YR, value of 4 or 5, and chroma of 6 or 8. Texture is very gravelly fine sandy loam, very gravelly loam, very gravelly sandy clay loam, or the very cobbly analogs. Coarse fragment content ranges from 35 to 60, by volume.

Muskogee Series

The Muskogee series consists of deep, moderately well drained, slowly permeable soils that developed in loamy and clayey alluvium. These soils are on nearly level, old, high terraces along the Arkansas River. A seasonal high water table is within 12 inches of the soil surface from December to April. The native vegetation was mixed hardwoods and pine forest. Slopes are 1 to 3 percent. Muskogee soils are fine-silty, mixed, thermic Aquic Paleudalfs.

Muskogee soils are associated with McKamie and Wrightsville soils. McKamie soils, which are on slightly higher landscapes than Muskogee soils, are well drained and have a fine control section. Wrightsville soils are on slightly lower landscapes. These soils are poorly drained and have a fine control section.

Typical pedon of Muskogee silt loam, 1 to 3 percent slopes; in native grass pasture in SE1/4NE1/4SW1/4 sec. 20, T. 6 N., R. 20 W.

Ap—0 to 5 inches; dark brown (10YR 4/3) silt loam; weak fine granular structure; friable; many fine roots; common fine pores; strongly acid; clear smooth boundary.

E—5 to 9 inches; yellowish brown (10YR 5/4) silt loam; weak medium subangular blocky structure; friable; many fine roots; common fine pores; strongly acid; clear smooth boundary.

Bt1—9 to 24 inches; strong brown (7.5YR 5/6) silty clay loam; moderate medium subangular blocky structure; friable; thin patchy clay films on faces of peds; few fine roots; few fine pores; few very fine concretions; strongly acid; clear smooth boundary.

Bt2—24 to 34 inches; mottled strong brown (7.5YR 5/6), gray (10YR 6/1), and yellowish brown (10YR 5/6) silty clay; moderate medium subangular blocky structure; firm, very sticky; thin continuous clay films on faces of peds; few fine roots; strongly acid; gradual smooth boundary.

Bt3—34 to 61 inches; gray (10YR 6/1) silty clay; common medium prominent red (2.5YR 4/6) mottles; moderate medium subangular blocky structure; firm, very sticky; thin continuous clay films on faces of peds; few fine roots; strongly acid; gradual smooth boundary.

Bt4—61 to 72 inches; yellowish red (5YR 4/6) silty clay; common medium prominent gray (10YR 6/1) mottles; moderate medium subangular blocky structure; firm, very sticky; thin continuous clay films on faces of peds; strongly acid.

The solum ranges in thickness from 60 to 80 inches or more. Reaction ranges from very strongly acid to medium acid in the A, E, and Bt1 horizons and from strongly acid to mildly alkaline in the Bt2 horizon and in the Bt horizons below the Bt2 horizon.

The A horizon has hue of 10YR, value of 4, and chroma of 2 or 3.

The E horizon has hue of 10YR, value of 5, and chroma of 3 or 4.

Some pedons have a BE horizon that has hue of 10YR, value of 5 or 6, and chroma of 4 or 6. Texture is silt loam or silty clay loam.

The Bt1 horizon has hue of 10YR, value of 5, and chroma of 4 or 6; or hue of 7.5YR, value of 5, and chroma of 6 or 8. Texture is silt loam or silty clay loam. Mottles that have chroma of 2 or less are within 30 inches of the soil surface. The Bt2 horizon and Bt horizons below the Bt2 horizon have hue of 10YR, value of 6 or 7, and chroma of 1 or 2; hue of 7.5YR, value of 5, and chroma of 6 or 8; hue of 5YR, value of 4 or 5, and chroma of 6; or hue of 2.5YR, value of 4, and chroma of 6. In some pedons, red colors are dominant, and mottles are in shades of gray. Others have mottled or variegated color pattern with no dominant color. Texture is silty clay or clay.

Nella Series

The Nella series consists of deep, well drained, moderately permeable soils that developed in colluvium or residuum of acid sandstone and shale. These soils are on gently sloping to very steep mountainsides, foot slopes, and benches. The native vegetation was hardwood or mixed pine and hardwood forest. Slopes range from 3 to 60 percent. Nella soils are fine-loamy, siliceous, thermic Typic Paleudults.

Nella soils are associated with Cane, Ceda, Enders, Kenn, Linker, and Mountainburg soils. Cane soils, which are in broad valleys, are moderately well drained and have a fragipan. Ceda and Kenn soils are on flood plains. Ceda soils have a loamy-skeletal control section and do not have an argillic horizon. Kenn soils have higher base saturation than Nella soils. The Enders soils, which are in similar positions on the landscape as the Nella soils, have a clayey control section. Linker soils are on mountaintops and are 20 to 40 inches deep over sandstone bedrock. Mountainburg soils are on tops and sides of hills, mountains, and ridges. They have a loamy-skeletal control section and are less than 20 inches deep over sandstone bedrock.

Typical pedon of Nella stony fine sandy loam, in a wooded area of Nella-Enders stony fine sandy loams, 20 to 40 percent slopes; in SE1/4NW1/4NE1/4 sec. 33, T. 6 N., R. 24 W.

A—0 to 3 inches; dark brown (10YR 4/3) stony fine sandy loam; weak fine granular structure; very friable; many fine and medium roots; few fine pores; about 25 percent, by volume, sandstone fragments up to 30 inches in diameter; strongly acid; abrupt smooth boundary.

E—3 to 7 inches; yellowish brown (10YR 5/4) cobbly fine sandy loam; weak fine subangular blocky structure; friable; many fine and medium roots; about 25 percent, by volume, sandstone fragments up to 20 inches in diameter; strongly acid; clear smooth boundary.

BE—7 to 14 inches; yellowish red (5YR 5/6) gravelly loam; weak medium subangular blocky structure; friable; common fine roots; few fine pores; about 20 percent, by volume, sandstone fragments 0.25 inch to 3 inches in diameter; very strongly acid; clear smooth boundary.

Bt1—14 to 24 inches; yellowish red (5YR 5/6) gravelly clay loam; moderate medium subangular blocky structure; friable; thin patchy clay films on faces of peds; common fine roots; few fine pores; about 15 percent, by volume, sandstone fragments 0.25 inch to 3 inches in diameter; very strongly acid; gradual smooth boundary.

Bt2—24 to 56 inches; red (2.5YR 4/6) gravelly clay loam; moderate medium subangular blocky structure; friable; thin patchy clay films on faces of peds; few fine roots; few fine pores; about 15 percent, by volume, sandstone fragments 0.25 inch to 3 inches in diameter; very strongly acid; gradual smooth boundary.

Bt3—56 to 72 inches; yellowish red (5YR 5/6) gravelly clay loam; few medium strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; friable; thin patchy clay films on faces of peds; few fine roots; few fine pores; about 20 percent, by volume, sandstone fragments 0.25 inch to 3 inches in diameter; very strongly acid.

The solum ranges in thickness from 60 to 80 inches or more. Reaction is strongly acid or very strongly acid throughout. Content of coarse fragments ranges from about 15 to 35 percent, by volume, in the A and E horizons and from about 10 to 35 percent, by volume, in the BE and Bt horizons.

The A horizon has hue of 10YR, value of 4, and chroma of 2 or 3. In cultivated areas, the A horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. Texture is gravelly fine sandy loam or stony fine sandy loam.

The E horizon has hue of 10YR, value of 5, and chroma of 3 or 4; or it has hue of 7.5YR, value of 5, and chroma of 4. Texture is fine sandy loam, loam, or the gravelly, cobbly, or stony analogs.

The BE horizon has hue of 7.5YR, value of 5, and chroma of 6; or it has hue of 5YR, value of 5, and chroma of 4, 6, or 8. Texture is loam, clay loam, or the gravelly or cobbly analogs.

The Bt horizon has hue of 5YR, value of 4, and chroma of 6, or value of 5, and chroma of 6 or 8; or it has hue of 2.5YR, value of 4 or 5, and chroma of 6 or 8. Mottles are in shades of brown. Texture is clay loam, sandy clay loam, or the gravelly or cobbly analogs.

Pickwick Series

The Pickwick series consists of deep, well drained, moderately permeable soils that formed in loamy sediment from sandstone and shale uplands. These soils are on nearly level to gently sloping stream terraces in broad valleys. The native vegetation was mixed hardwoods and some pines. Slopes are 1 to 8 percent. Pickwick soils are fine-silty, mixed, thermic Typic Hapludults.

Pickwick soils are associated with Cane and Leadvale soils. Cane soils, which are on similar landscapes as the Pickwick soils, have a fragipan and a fine-loamy control section. Leadvale soils are on lower landscapes. These soils are moderately well drained and have a fragipan.

Typical pedon of Pickwick silt loam, 3 to 8 percent slopes; in a pasture in NW1/4NW1/4SE1/4 sec. 18, T. 5 N., R. 22 W.

Ap—0 to 6 inches; dark brown (7.5YR 4/4) silt loam; weak medium granular structure; friable; many fine roots; medium acid; clear smooth boundary.

BA—6 to 17 inches; yellowish red (5YR 4/6) silty clay loam; weak medium subangular blocky structure; friable; many fine roots; strongly acid; clear smooth boundary.

Bt1—17 to 38 inches; red (2.5YR 4/6) silty clay loam; moderate medium subangular blocky structure; thin patchy clay films on faces of peds; common fine roots and pores; black streaks and stains on faces of peds; strongly acid; gradual smooth boundary.

Bt2—38 to 55 inches; red (2.5YR 4/6) silty clay loam; common medium distinct yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; friable; thin patchy clay films on faces of peds; few fine dark concretions; strongly acid; gradual smooth boundary.

BC—55 to 72 inches; red (2.5YR 4/6) silty clay loam; common medium distinct yellowish brown (10YR 5/4) mottles and few medium prominent gray (10YR 6/1) mottles; moderate medium subangular blocky structure; friable; thin patchy clay films on faces of peds; few fine dark concretions; strongly acid.

The solum is 72 inches or more thick. Reaction is strongly acid or very strongly acid throughout except where the surface has been limed.

The Ap horizon has hue of 10YR, value of 4, and chroma of 3 or 4; or hue of 7.5YR, value of 4, and chroma of 4.

The BA horizon has hue of 5YR, value of 4, and chroma of 4 or 6. Texture is silt loam or silty clay loam.

The Bt horizon has hue of 5YR or 2.5YR, value of 4 or 5, and chroma of 4 or 6. Texture is silty clay loam or clay loam.

The BC horizon has colors similar to those of the Bt horizon. Mottles in shades of brown, yellowish brown, light brownish gray, and light gray are common. Texture is silty clay loam or clay loam.

The Pickwick soils in Yell County are taxadjuncts to the Pickwick series in that they did not form in a thin mantle of loess. The use, behavior, and management of these soils are similar to those of the Pickwick Series.

Roellen Series

The Roellen series consists of deep, poorly drained, slowly permeable soils that formed in clayey alluvium. These soils are in level, slack water areas on the flood plain of the Arkansas River. Areas of these soils that are not protected by levees flood occasionally for brief periods from December through June. A seasonal high water table is at or near the surface from January through May. The native vegetation was pecan, cottonwood, and willow trees. Slopes are less than 1 percent. Roellen soils are fine, montmorillonitic, thermic Vertic Haplaquolls.

Roellen soils are associated with the Dardanelle and Moreland soils. Dardanelle soils are on natural levees. These soils have a fine-silty control section and are well drained. Moreland soils, which occur on similar landscapes as the Roellen soils, have a redder subsoil and are somewhat poorly drained.

Typical pedon of Roellen silty clay, 0 to 1 percent slopes; in a field in NE1/4NE1/4NE1/4 sec. 7, T. 5 N., R. 19 W.

Ap—0 to 7 inches; very dark gray (10YR 3/1) silty clay; common fine distinct brown (7.5YR 5/4) mottles; moderate medium granular structure; firm, plastic; many fine roots; few fine pores; neutral; abrupt smooth boundary.

A—7 to 20 inches; very dark gray (10YR 3/1) clay; moderate medium angular blocky structure; firm, very plastic; common nonintersecting slickensides; common fine roots; few fine pores; neutral; diffuse smooth boundary.

Bg—20 to 44 inches; dark gray (10YR 4/1) clay; common medium distinct strong brown (7.5YR 5/6) mottles; moderate medium angular blocky structure; firm, very plastic; common nonintersecting slickensides; common calcium carbonate concretions; neutral; gradual smooth boundary.

Cg—44 to 72 inches; dark gray (10YR 4/1) clay; common medium prominent reddish brown (5YR 4/4) mottles; massive; very firm, very plastic; common slickensides form wedge-shaped aggregates; neutral.

The solum ranges in thickness from about 40 to 65 inches. Reaction is medium acid to neutral in the A horizon and from slightly acid to mildly alkaline in the Bg and Cg horizons.

The A horizon is 10 to 25 inches thick. The A and Ap horizons have hue of 10YR, value of 3, and chroma of 1 or 2. Mottles are in shades of brown.

The Bg horizon has hue of 10YR, value of 4, and chroma of 1 or 2. Mottles are shades of brown. Texture is silty clay or clay.

The Cg horizon has hue of 5YR or 10YR, value of 4, and chroma of 1. Mottles are in shades of brown. Texture is silty clay or clay.

Roxana Series

The Roxana series consists of deep, well drained, moderately permeable soils that formed in loamy alluvium. These soils are on level and nearly level natural levees along the Arkansas River. Some areas of these soils are flooded occasionally for brief periods from December through June. The native vegetation was pecan, cottonwood, and willow trees. Slopes are 0 to 3 percent. Roxana soils are coarse-silty, mixed, nonacid, thermic Typic Udifluvents.

Roxana soils are associated with the Bruno and Dardanelle soils. Bruno soils are on flood plains. These soils have a sandy control section and are excessively drained. Dardanelle soils are on old natural levees. They have a fine-silty control section and an argillic horizon.

Typical pedon of Roxana silt loam, 0 to 3 percent slopes; in a cultivated field in SW1/4SE1/4SE1/4 sec. 15, T. 6 N., R. 20 W.

Ap—0 to 7 inches; dark brown (7.5YR 4/4) silt loam; weak fine granular structure; very friable; common fine roots; few fine pores; slightly acid; abrupt smooth boundary.

C1—7 to 31 inches; brown (7.5YR 4/4) very fine sandy loam; massive; very friable; few fine roots; few fine pores; common bedding planes; neutral; gradual smooth boundary.

C2—31 to 42 inches; brown (7.5YR 5/4) loamy very fine sand; massive; very friable; common bedding planes; neutral; gradual smooth boundary.

C3—42 to 54 inches; brown (7.5YR 5/4) very fine sandy loam; massive; very friable; few fine roots; few fine pores; common bedding planes; neutral; gradual smooth boundary.

C4—54 to 72 inches; brown (7.5YR 5/4) loamy very fine sand; massive; very friable; common bedding planes; neutral.

The loamy sediment is more than 80 inches thick. Reaction ranges from slightly acid to mildly alkaline in the A horizon and from neutral to moderately alkaline in the C horizon.

The A horizon has hue of 5YR, value of 3 or 4, and chroma of 4; or hue of 7.5YR, value of 4 or 5, and chroma of 4.

The C horizon has hue of 5YR, value of 4 or 5, and chroma of 3, 4, or 6; or hue of 7.5YR, value of 4 or 5, and chroma of 4 or 6. Texture is very fine sandy loam, silt loam, or loamy very fine sand and is stratified. Bedding planes are evident in the 10- to 40-inch control section.

Sherless Series

The Sherless series consists of moderately deep, well drained, moderately permeable soils that formed in residuum of interbedded sandstone and shale. These soils are on ridgetops, side slopes, and foot slopes of mountains. The native vegetation was mixed hardwoods and shortleaf pine. Slopes are 3 to 50 percent. Sherless soils are fine-loamy, mixed, thermic Typic Hapludults.

Sherless soils are associated with Bismarck, Carnasaw, Ceda, Clebit, Kenn, and Leadvale soils. Bismarck and Clebit soils are on ridgetops and upper side slopes. These soils have a loamy-skeletal control section, and the sola is less than 20 inches thick. Carnasaw soils are on uplands adjacent to the Sherless soils. They have a clayey control section and are more than 40 inches deep to shale bedrock. Ceda and Kenn soils are on flood plains. Ceda soils have a loamy-skeletal control section and do not have an argillic horizon. Kenn soils have higher base saturation than Sherless soils. Leadvale soils, which are on terraces adjacent to the Sherless soils, are moderately well drained and have a fragipan.

Typical pedon of Sherless gravelly fine sandy loam, 3 to 8 percent slopes; in NE1/4NW1/4NW1/4 sec. 18, T. 3 N., R. 22 W.

A—0 to 3 inches; dark grayish brown (10YR 4/2) gravelly fine sandy loam; moderate fine granular structure; friable; many fine and medium roots; about 20 percent, by volume, sandstone fragments up to 4 inches in diameter; strongly acid; clear smooth boundary.

E—3 to 9 inches; yellowish brown (10YR 5/4) fine sandy loam; weak fine subangular blocky structure; friable; many fine and medium roots; about 5 percent, by volume, sandstone fragments up to 3 inches in diameter; strongly acid; clear smooth boundary.

BE—9 to 14 inches; strong brown (7.5YR 5/6) loam; weak medium subangular blocky structure; friable; common fine roots; about 5 percent, by volume, sandstone fragments up to 3 inches in diameter; strongly acid; clear smooth boundary.

Bt1—14 to 28 inches; yellowish red (5YR 5/6) sandy clay loam; moderate medium subangular blocky structure; friable; continuous clay films on faces of peds and in pores; common fine roots; about 5 percent, by volume, sandstone and shale fragments up to 3 inches in diameter; strongly acid; clear wavy boundary.

Bt2—28 to 36 inches; yellowish red (5YR 5/6) gravelly sandy clay loam; common medium faint yellowish red (5YR 4/6) mottles and common medium distinct yellowish brown (10YR 5/4) mottles; weak medium subangular blocky structure; friable; thin patchy clay films on faces of peds; few fine roots; about 15 percent, by volume, sandstone and shale fragments up to 3 inches in diameter; very strongly acid; abrupt irregular boundary.

Cr—36 to 38 inches; soft, tilted, platy sandstone bedrock; strong brown (7.5YR 5/6) clay loam between plates.

The solum ranges in thickness from 20 to 40 inches. Reaction is medium acid or strongly acid in the A and E horizons and strongly acid or very strongly acid in the B horizon. Coarse fragment content ranges from 5 to 30 percent, by volume, in the A and E horizons and from 5 to 20 percent, by volume, in the BE and Bt horizons.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. Texture is fine sandy loam or the gravelly or cobbly analogs.

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

The BE horizon has hue of 10YR or 7.5YR, value of 5, and chroma of 6 or 8. Texture is loam, clay loam, or the gravelly analogs.

The Bt horizon has hue of 5YR or 7.5YR, value of 5, and chroma of 6 or 8. Texture is clay loam, sandy clay loam, or the gravelly analogs.

The Cr horizon is soft, tilted, interbedded sandstone and shale bedrock.

Spadra Series

The Spadra series consists of deep, well drained, moderately permeable soils that formed in loamy alluvium. These soils are on level and nearly level low stream terraces along the larger streams. These soils are flooded occasionally for very brief periods from December through April. The native vegetation was mixed hardwoods and pine. Slopes are 0 to 3 percent. Spadra soils are fine-loamy, siliceous, thermic Typic Hapludults.

Spadra soils are associated with the Barling, Ceda, and Kenn soils. Barling soils, which are on similar landscapes as the Spadra soils, have a coarse-silty control section and do not have an argillic horizon. Ceda soils are on flood plains. These soils have a loamy-skeletal control section and do not have an argillic horizon. Kenn soils are on flood plains, and they have a very gravelly substratum and higher base saturation than Spadra soils.

Typical pedon of Spadra fine sandy loam, occasionally flooded; in a pasture in SE1/4NW1/4NW1/4 sec. 19, T. 6 N., R. 21 W.

Ap—0 to 6 inches; dark brown (7.5YR 4/4) fine sandy loam; moderate medium granular structure; friable; many fine roots; few fine pores; strongly acid; clear smooth boundary.

Bt1—6 to 40 inches; reddish brown (5YR 4/4) loam; weak medium subangular blocky structure; friable; thin patchy clay films on faces of peds; common fine roots; few fine pores; very strongly acid; gradual smooth boundary.

Bt2—40 to 52 inches; brown (7.5YR 4/4) loam; weak medium subangular blocky structure; friable; thin patchy clay films on faces of peds; common fine roots; few fine pores; very strongly acid; gradual smooth boundary.

BC—52 to 58 inches; brown (7.5YR 4/4) loam; common medium faint yellowish brown (10YR 5/4) mottles; weak medium subangular blocky structure; friable; thin patchy clay films on faces of peds; few fine roots; few fine pores; very strongly acid; clear smooth boundary.

C—58 to 72 inches; brown (7.5YR 4/4) gravelly fine sandy loam; massive; friable; few fine roots; few fine pores; about 20 percent, by volume, rounded sandstone gravel and shale fragments; very strongly acid.

The solum ranges in thickness from 40 to 60 inches. Reaction ranges from medium acid to very strongly acid. Coarse fragment content ranges from 0 to 10 percent, by volume, in the A, Bt, and BC horizons and from 0 to 20 percent, by volume, in the C horizon.

The A horizon has hue of 10YR, value of 4, and chroma of 3 or 4; or hue of 7.5YR, value of 4, and chroma of 4.

The Bt horizon has hue of 5YR, value of 4, and chroma of 4 or 6, or value of 3 and chroma of 4; or hue of 7.5YR, value of 4, and chroma of 4. Texture is loam or sandy clay loam.

The BC and C horizons have hue of 5YR or 7.5YR, value of 4, and chroma of 4 or 6. Texture is loam, sandy loam, fine sandy loam, or the gravelly analogs.

Taft Series

The Taft series consists of deep, somewhat poorly drained, slowly permeable soils that formed in old alluvium. These soils are on level and nearly level old stream terraces in broad valleys. A seasonal high water table is within 12 inches of the soil surface from December through April. The native vegetation was mixed hardwood trees and some pines. Slopes are 0 to 2 percent. Taft soils are fine-silty, siliceous, thermic Glossaquic Fragiudults.

Taft soils are associated with Cane, Guthrie, and Leadvale soils. Cane and Leadvale soils are in slightly higher positions on the landscape than Taft soils and have an argillic horizon above the fragipan. Cane soils also have a fine-loamy control section. Guthrie soils are in lower positions and are poorly drained.

Typical pedon of Taft silt loam, 0 to 2 percent slopes; in a meadow in SW1/4NE1/4SE1/4 sec. 13, T. 6 N., R. 22 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam; weak fine granular structure; friable; many fine roots; few fine pores; strongly acid; abrupt smooth boundary.

E—7 to 14 inches; yellowish brown (10YR 5/4) silt loam; weak fine subangular blocky structure; friable; many fine roots; few fine pores; very strongly acid; clear smooth boundary.

Bw—14 to 23 inches; yellowish brown (10YR 5/4) silt loam; common medium distinct gray (10YR 5/1) and strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; friable; common fine roots; common fine pores; very strongly acid; clear smooth boundary.

E'—23 to 26 inches; grayish brown (10YR 5/2) silt loam; common medium distinct strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; friable, slightly brittle; thick silt coats on faces of peds; few fine roots; common fine pores; very strongly acid; clear irregular boundary.

Btx1—26 to 48 inches; mottled gray (10YR 6/1) and strong brown (7.5YR 5/6) silty clay loam; weak coarse platy structure parting to moderate medium subangular blocky; firm, compact and brittle; thick patchy clay films on faces of peds and in pores; few fine roots; common fine pores; many medium dark concretions; very strongly acid; gradual wavy boundary.

Btx2—48 to 60 inches; mottled yellowish brown (10YR 5/4) and light brownish gray (10YR 6/2) silty clay loam; weak coarse platy structure parting to moderate medium subangular blocky; firm, compact and brittle; thick patchy clay films on faces of peds and in pores; common pores; few fine and medium dark concretions; very strongly acid; gradual wavy boundary.

Bt—60 to 72 inches; yellowish red (5YR 5/6) silty clay; many coarse prominent light gray (10YR 6/1) mottles; medium subangular blocky structure; firm; thick continuous clay films on faces of peds and in pores; few pores; very strongly acid.

The solum ranges in thickness from 50 to 72 inches or more. Reaction is strongly acid or very strongly acid throughout. Depth to fragipan ranges from 20 to 30 inches. Depth to bedrock ranges from 60 to more than 80 inches.

The A horizon has hue of 10YR, value of 4, and chroma of 2, or value of 5 and chroma of 3.

The E horizon has hue of 10YR, value of 5 or 6, and chroma of 3 or 4. Some pedons do not have an E horizon.

The Bw horizon has hue of 10YR, value of 5 or 6, and chroma of 3 or 4. Few to common, fine and medium gray mottles are within 10 inches of the upper boundary of this horizon. Texture is silt loam or silty clay loam.

The E' horizon has hue of 10YR, value of 5 or 6, and chroma of 1 or 2. Texture is silt loam or silt. Mottles are in shades of brown.

The Btx horizon is mottled gray, yellowish brown, and brown; or it has a dominant hue of 10YR, value of 5, and chroma of 4, or hue of 2.5Y, value of 5 or 6, and chroma of 4, and has mottles in shades of brown and gray. Texture is silt loam or silty clay loam.

The Bt horizon has hue of 10YR, 7.5YR, or 5YR, value of 5, and chroma of 4 or 6. Mottles are in shades of gray, brown, or yellow. Texture is silty clay loam or silty clay.

Wrightsville Series

The Wrightsville series consists of deep, poorly drained, very slowly permeable soils that formed in silty and clayey alluvium. These soils are on old level terraces along the Arkansas River. A seasonal high water table is within 6 inches of the soil surface from December through April. The native vegetation was hardwood trees and tall grasses. Slopes are 0 to 1 percent. Wrightsville soils are fine, mixed, thermic Typic Glossaqualfs.

Wrightsville soils are associated with McKamie and Muskogee soils. McKamie soils, which are on higher landscapes than the Wrightsville soils, are well drained and have a red subsoil. Muskogee soils are on slightly higher landscapes. These soils are moderately well drained and have a fine-silty control section.

Typical pedon of Wrightsville silt loam, 0 to 1 percent slopes; in a field in SE1/4SW1/4NW1/4 sec. 12, T. 5 N., R. 20 W.

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

Eg1—4 to 11 inches; light brownish gray (10YR 6/2) silt loam; common fine distinct yellowish brown (10YR 5/6) and brown (10YR 5/3) mottles; weak medium subangular blocky structure; friable; common fine and medium roots; very strongly acid; gradual smooth boundary.

Eg2—11 to 18 inches; light brownish gray (10YR 6/2) silt loam; common fine distinct brown (10YR 5/3) mottles; weak medium roots; very strongly acid; abrupt irregular boundary.

Btg/Eg—18 to 36 inches; gray (10YR 6/1) silty clay (Btg); tongues of light gray (10YR 7/2) silt loam (Eg); common medium distinct strong brown (7.5YR 5/6) mottles; weak prismatic structure parting to moderate medium subangular blocky (Btg); firm; massive (Eg); friable; continous clay films on faces of peds and in pores of silty clay; common fine roots; common fine pores; silt coatings on prism faces; very strongly acid; gradual smooth boundary.

Btg—36 to 51 inches; gray (10YR 5/1) silty clay; common coarse distinct yellowish brown (10YR 5/4) mottles; weak prismatic structure parting to moderate medium subangular blocky; firm, plastic; few fine roots; few fine pores; continuous clay films on faces of peds and in pores; silt coatings on prism faces; very strongly acid; gradual smooth boundary.

Cg—51 to 72 inches; gray (10YR 6/1) silty clay; common medium distinct strong brown (7.5YR 5/6) and yellowish brown (10YR 5/4) mottles; massive; firm; common medium dark concretions; strongly acid.

The solum ranges in thickness from 40 to more than 72 inches. Reaction is strongly acid or very strongly acid throughout.

The A horizon has hue of 10YR, value of 3, 4, or 5, and chroma of 2.

The Eg horizon and the Eg part of the Btg/Eg horizon have hue of 10YR, value of 6 or 7, and chroma of 1 or 2. Mottles are in shades of brown. Texture is silt loam or silty clay loam.

The Btg horizon and the Btg part of the Btg/Eg horizon have hue of 10YR, value of 5 or 6, and chroma of 1 to 2. Mottles are in shades of brown. Texture is silty clay loam, silty clay, or clay. The tongues of silt loam in the Eg part of the Btg/Eg horizon are 1 to 6 inches wide.

The Cg horizon has hue of 10YR, value of 5, 6, or 7, and chroma of 1 or 2. Mottles are in shades of brown. Texture is silty clay loam, silty clay, or clay.

Formation of the Soils

In this section the factors of soil formation are described as they relate to the soils in the county. In addition, the processes of soil formation are described.

Factors of Soil Formation

Soil is formed by weathering and other processes that act upon the parent material. The characteristics of the soil at any given point depend upon climate, living organisms, parent material, relief, and time. Each factor acts on the soil and modifies the effect of the other four. When climate, living organisms, or any other one of the five factors is varied to a significant extent, a different soil may be formed.

Climate and living organisms are the active forces in soil formation. Relief modifies the effects of climate and living organisms, mainly by its influence on temperature and runoff. Because climate, vegetation, parent material, and relief interact over a period of time, the effect of time is also reflected in the soil characteristics. The interaction of the five factors of soil formation is more complex for some soils than for others *(13)*.

Climate

From an overall standpoint, climate is perhaps the most influential factor of soil formation in Yell County. To a great extent it determines the nature of the weathering that occurs. For example, temperature and precipitation directly influence the rate of chemical and physical processes. These processes, in turn, directly influence the rate of soil profile development.

The climate of Yell County is characterized by warm summers, mild winters, and fairly abundant rainfall. The present climate is probably similar to the climate that influenced soil formation in the past. For additional information about climate, refer to the section "General Nature of the County."

The warm, moist climate promotes rapid soil formation and encourages rapid chemical reactions. The large amount of water that moves through the soil is instrumental in moving dissolved or suspended material 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 minerals.

Because the soil is frozen only to a shallow depth and for a relatively short period, soil formation continues almost year round. The climate throughout the county is relatively uniform, but its effect is modified locally by elevation, slope steepness, and slope aspect. Climate alone does not account for differences in the soils of the county.

Living Organisms

Plants and animals, including insects, bacteria, and fungi, are important in the formation of soils. Among the changes they cause are gains in organic matter and nitrogen in the soil, gains or losses in plant nutrients, and changes in soil structure and porosity.

Before Yell County was settled, the native vegetation had more influence on soil formation than did animal activity. Hardwood forests covered the bottom lands. Bruno, Dardanelle, Moreland, Roellen, and Roxana soils formed in these areas. These soils differ from each other chiefly by parent material and age.

The level to gently sloping areas in the broad valleys supported a growth of tall bunch grasses and hardwood trees. Guthrie, Leadvale, Muskogee, and Taft soils formed in these areas. These soils, however, do not have the thick, dark-color surface layer commonly associated with soils formed under this type of vegetation. Apparently, their characteristics were influenced more by parent material, climate, and relief than by vegetation.

In the narrow valleys and along the streams in the sloping and hilly parts of the county, the native trees were mixed pines and hardwoods. Cane, Leadvale, Pickwick, Barling, and Spadra soils formed in these areas. These soils are deep, and they differ chiefly in age, relief, and degree of weathering.

On ridges and low hills within the broad valleys, the native vegetation was savannas of scattered hardwoods, cedars, and pines that had an understory of tall grasses. Linker and Mountainburg soils formed here. These soils are shallow, and they differ chiefly in age and degree of weathering.

The native vegetation in most of the mountainous area of the county consisted of forests of oaks, hickory, redcedar, and shortleaf pine. Only the upper few inches of the soils in these areas have a significant accumulation of organic matter and are dark color. Carnasaw, Clebit, Enders, Linker, Nella, Mountainburg, and Sherless soils formed on these uplands. These soils

differ chiefly in age and degree of weathering, in relief, and in the kind of parent material.

Differences 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 also cause minor variations. Only the major differences in the original vegetation are reflected to any extent in the characteristics of the soils.

People are important to the future rate and direction of soil formation. They clear the forests, cultivate the soils, and introduce new kinds of plants. Fertilizers, lime, and chemicals for insect, disease, and weed control are added to the soil. Constructing levees and dams for flood control, improving drainage, and grading the soil surface also effect the development of soils. Some results of these changes will not be evident for many centuries; nevertheless, the complex of living organisms affecting soil formation in this county has been drastically changed by these activities.

Parent Material and Geology

The acid sandstone and shales that underlie most of Yell County were deposited in marine waters during the Pennsylvanian and Mississippian Periods *(9, 10)*. These sedimentary rocks are of various textures. They range from rather coarse-grained sandstones to shaly sandstones to clayey shales. The geologic formations in the county are the Stanley Shale, Jackfork Sandstone, Johns Valley Shale, Atoka Formation, Hartshorne Sandstone, and McAlester Formation.

The northern half of the county is in the Arkansas Valley and Ridges Major Land Resource Area. This area is characterized by level bedded sandstone and shale bedrock. The McAlester Formation is the youngest and rests on the Hartshorne Sandstone Formation. The McAlester Formation is of minor extent. It is in the northwest part of the county. This formation is shales with sandstones. It outcrops on the sides of some hills and in some valley floors. Where this formation outcrops, Enders and Nella soils formed in its weathered material.

The Hartshorne Sandstone Formation rests on the Atoka Formation and is of minor extent. It is composed of sandstone and sandy shales. The Hartshorne Sandstone weathers into material from which Mountainburg and Linker soils are formed. The sandstone is medium grained and well cemented.

The divided Atoka Formation rests on the Johns Valley Shale Formation and is extensive throughout the county. This formation is dominantly interbedded shale, but it also has thin bedded sandstone. In the northern half of the county this shale and sandstone is level bedded and weathers into material in which Enders and Nella soils formed. Mountainburg and Linker soils formed where the sandstone caps the ridges.

The southern half of Yell County is in the Ouachita Mountain Major Land Resource Area. This area is characterized by shale and sandstone bedrock tilted about 30 degrees from horizontal. The Atoka Formation, except for the upper part, continues into this part of the county. This formation is mainly tilted interbedded acid shale and sandstone; the shale is dominant. It weathers into material from which Carnasaw, Sherless, and Clebit soils are formed.

The Johns Valley Shale Formation rests on the Jackfork Sandstone Formation and is of moderate extent. The Johns Valley Shale is mainly in the south-central and southeastern parts of the county. This formation is tilted, acid shale that has thin interbedded layers of sandstone. It weathers into material from which Carnasaw and Sherless soils are formed.

The Jackfork Sandstone Formation rests on the Stanley Shale Formation and is of moderate extent. The Jackfork Sandstone is in the southern part of the county. This formation consists of tilted interbedded sandstone and shale. The sandstone is most prominent as rock outcrops and sandstone caps on ridgetops. This formation weathers into material from which Carnasaw, Sherless, and Clebit soils are formed.

The Stanley Shale Formation is in the extreme south-central part of the county and is of minor extent. It consists mainly of soft, tilted, thin layers of interbedded sandstone and shale. This formation weathers into material from which Carnasaw, Sherless, and Bismarck soils are formed.

The Kenn, Ceda, Barling, and Spadra soils are on flood plains of upland drainageways. These soils formed in loamy sediment washed from local uplands.

The Cane, Guthrie, Leadvale, Pickwick, and Taft soils formed on the valley terraces. These soils have well developed horizons that formed in loamy local sediment.

The Nella soils are on benches along the mountainsides. They formed in friable, loamy, and silty material that washed or rolled down from uplands. These soils are deep, medium textured, acid, and well drained. In many places, the surface of these soils is stony or gravelly because of sandstone fragments that have rolled down from the caprock bluffs above.

Soils along the Arkansas River formed in the poorly graded, well sorted alluvial sediment deposited by floodwaters. The Bruno soils formed in sandy sediment deposited along or near the river as natural levees. The Roellen and Moreland soils formed in predominantly clayey sediment deposited by slack water on flats and flood bays on the flood plain farthest from the river. The Dardanelle and Roxana soils formed in the loamy sediment deposited between the areas of sandy sediment and clayey sediment.

Relief

The relief, or topography, of the land can increase or slow down the work of climatic forces. In smooth, flat areas, excess water is removed at a slower rate than on

a rolling landscape. More water reaches the soil to aid in soil profile development. The rolling topography encourages more surface runoff and some natural erosion of the surface layer. If the runoff and erosion is extensive, the formation of a deep soil can be eliminated. The role of relief in the process of soil formation is primarily one of modifying the effects of the climate and vegetative factors.

The relief in Yell County has been brought about chiefly by faulting, folding, and the subsequent entrenchment of drainage channels into the land surface. The highest recorded elevation in the county, about 2,439 feet above sea level, is in the western part of the county within the boundary of the Ouachita National Forest. The lowest elevation, about 300 feet above sea level, is in the northeastern part of the county along the Arkansas River.

Some of the greatest differences in the soils of Yell County are caused by differences in relief through its effect on drainage, runoff, erosion, and percolation of water through the soil. The landscape ranges from near vertical bluffs to broad flats.

The soils on steeper slopes and narrow ridges are generally shallow because they have lost so much soil material through geologic erosion. Examples are the Mountainburg and Clebit soils. In contrast, broad areas of the nearly level or gently sloping soils have lost little soil material, and the soils are moderately deep or deep. Examples are Linker and Leadvale soils.

Deep accumulations of material that washed or slid down from adjoining steep slopes are in coves and on foot slopes. The Nella soils are in such areas. In places where rocks have broken off and rolled downslope, these soils are stony.

The Guthrie, Taft, and Wrightsville soils are in the level to depressional areas in the broad valleys. Surface drainage is slow or ponded, and the soils are poorly drained and somewhat poorly drained. Permability is slow. The soils are gray or have gray mottles because of the reduction of iron. They also have a seasonal or perched high water table.

The flood plain of the Arkansas River is level to nearly level and was subject to frequent flooding before flood control dams and levees were built on the river. The floodwater, loaded with soil particles, moved at different speeds, depending partly on the topography. Rapidly moving water deposited the sandy sediment in which the Bruno soils formed. The less rapidly moving water deposited mixed sediment that was high in silt. The Dardanelle and Roxana soils formed in this sediment. The slack or still water trapped in flood bays and on broad flats deposited the clayey sediment in which the Moreland and Roellen soils formed.

Time

The time required for soil formation depends largely on other factors of soil formation. Less time generally is required if the climate is warm and humid and the vegetation luxuriant. If other factors are equal, less time is also required if the parent material is loamy than if it is clayey.

In terms of geological time, most of the soils of Yell County are old, regardless of whether they are on mountaintops, mountainsides, or stream terraces. The young soils are along streams and rivers.

The soils on uplands are old. They formed in material weathered from sandstone and shale of Pennsylvanian age. Most of these soils are old enough that nearly all of the bases have been leached out. The reaction is strongly acid or very strongly acid. Considerable weathering and translocation of clay has occurred, 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. Enders and Linker soils clearly show the impact of time acting with other soil-forming factors on parent material.

The Bruno and Roxana soils are examples of young soils. They formed in recent alluvium on the flood plains of the Arkansas River. No definite horizons have formed below the A horizon. Instead, these soils still have the depositional rock structure, or bedding planes, and little or no soil structure. Base saturation is high, and the reaction is slightly acid to moderately alkaline, indicating that leaching has been slight. Except for the slight changes caused by worms and roots, there is little evidence of soil-forming activity.

Processes of Soil Formation

The effects of the soil-forming factors are reflected in the soil profile. The soil profile is a succession of layers, or horizons, from the surface to the parent rock. These horizons differ in one or more properties, such as color, texture, structure, consistency, and porosity.

Most soil profiles contain three major horizons, the A, B, and C horizons. Very young soils do not have a B horizon.

The A horizon, or surface layer, is the horizon of maximum accumulation of organic matter. The horizon of maximum leaching of dissolved or suspended material is called the E horizon, or subsurface layer.

The B horizon, or subsoil, is below the A or E horizon. It is the horizon of maximum accumulation of suspended material, such as clay and iron. The B horizon commonly has blocky structure and is firmer than the horizons immediately above or below it *(16)*.

The C horizon is below the B horizon. This horizon is little affected by soil-forming processes, but it can be materially modified by weathering. In some young soils, the C horizon immediately underlies the A horizon and has been slightly modified by living organisms as well as weathering.

In Yell County, several processes have been active in the formation of soil horizons. These processes are the accumulation of organic matter, the leaching of bases, the oxidation or reduction and transfer of iron, and the formation and translocation of silicate clay minerals. In most of the soils, more than one of these processes were involved.

Physical weathering of rocks, through heating and cooling and wetting and drying, slowly breaks the rocks into small pieces that form the parent material of residual soils. The effects of weathering are most evident in Linker and Mountainburg soils.

The accumulation of organic matter in the upper part of the profile (A horizon) is readily evident in the Nella soils. These soils have a light-color subsurface layer from which organic matter, clay, and iron oxides have been removed.

Leaching of bases has occurred to some degree in nearly all of the soils of Yell County. Soil scientists generally agree that bases are leached downward in soils before silicate clay minerals begin to move. Most of the soils in the county are moderately leached. Bruno and Roxana soils are only slightly leached, and Enders, Linker, and Mountainburg soils are strongly leached.

Oxidation of iron is evident in the moderately well drained and well drained soils in the county. Red and brown colors in the B horizon of the Linker, Mountainburg, Enders and Leadvale soils indicate the oxidation of iron.

The reduction and transfer of iron is apparent in the poorly drained and somewhat poorly drained soils. In the naturally wet soils, this process is called gleying. The gray colors in the horizons below the surface layer indicate the reduction and loss of iron. Some horizons contain red or yellow mottles and concretions derived from segregated iron. Gleying is most pronounced in the Guthrie, Roellen, and Wrightsville soils.

Translocation of silicate clay minerals has contributed to horizon development in most of the soils in the county. In cultivated areas, most of the elevated E horizon has been destroyed. Where the E horizon remains distinct, it generally has weak subangular blocky structure, has less clay than the lower horizons, and is lighter in color than the rest of the soil. Clay films generally have accumulated in pores and on the surface of peds in the B horizon. The soils were probably leached of carbonates and soluble salts to a great extent before translocation of silicate clay occurred, even though the content of bases is still higher in some of the soils on lowlands.

Leaching of bases and translocation of silicate clay are among the most important processes in horizon differentiation in the soils of Yell County.

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Glossary

ABC soil. A soil having an A, a B, and a C horizon.

AC soil. A soil having only an A and a C horizon. Commonly such soil formed in recent alluvium or on steep rocky slopes.

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

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

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

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

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

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

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

Bedding planes. Fine stratifications, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediments.

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

Bench terrace. A raised, level or nearly level strip of earth constructed on or nearly on the contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Bisequum. Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

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

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

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

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

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard compacted layers to a depth below normal plow depth.

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

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

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15 to 38 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.

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

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

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

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

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

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

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.

Coprogenous earth (sedimentary peat). Fecal material deposited in water by aquatic organisms. The Lco horizon is a limnic layer that contains many fecal pellets.

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.

Deferred grazing. Postponing grazing or resting grazingland for a prescribed period.

Dense layer (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below

the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, such as fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay are in the soil. The soil is not a source of gravel or sand for construction purposes.

Fast intake (in tables). The movement of water into the soil is rapid.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, and clay.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist, 6 to 15 inches (15 to 37.5 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Fragile (in tables). The soil is easily damaged by use or disturbance.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual.* The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an O, A, or E horizon. The B horizon is, in part, a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics, such as accumulation of clay, sesquioxides, humus, or a combination of these; prismatic or blocky structure; redder or browner colors than those in the A horizon; or a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Arabic numeral 2 precedes the letter C.

R layer.—Consolidated rock (unweathered bedrock) beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material. This contrasts with percolation, which is movement of water through soil layers or material.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake in inches per hour is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.
Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.
Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.
Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.
Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.
Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.
Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Large stones (in tables). Rock fragments that are 3 inches (7.5 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Moderately coarse textured soil. Sandy loam and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Outwash plain. A landform of mainly sandy or coarse-textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it is generally low in relief.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan.*

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affects the specified use.

Permeability. The quality of the soil that enables water to move through the profile. Permeability is measured as the number of inches per hour that water moves through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Subsurface tunnels or pipelike cavities are formed by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Poor filter (in tables). Because of rapid permeability, the soil may not adequately filter effluent from a waste disposal system.

Poor outlets (in tables). In these areas, surface or subsurface drainage outlets are difficult or expensive to install.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of the acidity or alkalinity of a soil expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rippable. Rippable bedrock or hardpan can be excavated using a single-tooth ripping attachment mounted on a tractor with a 200-300 draw bar horsepower rating.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). There is a shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil adversely affects the specified use.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05

millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Sinkhole. A depression in the landscape where limestone has been dissolved.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slippage (in tables). The soil mass is susceptible to movement downslope when loaded, excavated, or wet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stone line. A concentration of coarse fragments in a soil. Generally it is indicative of an old weathered surface. In a cross section, thickness of the line can be one fragment or more. It generally overlies material that weathered in place, and it is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsurface layer. Technically, the A2 horizon. Generally refers to a leached horizon lighter in color and lower in organic matter content than the overlying surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace. An embankment, or ridge, constructed on the contour or at a slight angle to the contour across sloping soils. The terrace intercepts surface runoff, so that water soaks into the soil or flows slowly to a prepared outlet.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material is too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements. Chemical elements, such as zinc, cobalt, manganese, copper, and iron, are in soils in extremely small amounts. They are essential to plant growth.

Unstable fill (in tables). There is a risk of caving or sloughing on banks of fill material.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial melt water. In nonglaciated regions, alluvium deposited in stream valleys by heavily loaded streams.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.

Variegation. Refers to patterns of contrasting colors that are assumed to be inherited from the parent material rather than to be the result of poor drainage.

Weathering. All physical and chemical changes produced by atmospheric agents in rocks or other deposits at or near the earth's surface. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of course grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. This contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Tables

TABLE 1.--FARMLAND DATA IN SELECTED YEARS

Farmland	1982	1978	1974
Number of farms	953	978	974
Average size (in acres)	215	212	219
Total acreage	204,927	207,375	213,690
Percentage of county	34.4	34.8	35.9

TABLE 2.--LIVESTOCK AND POULTRY ON FARMS

Livestock and poultry	1982	1978	1974
Cattle and calves	40,931	39,595	51,747
Hogs and pigs	6,438	6,904	5,310
Horses and ponies	866	1,006	561
Chickens (more than 3 months old)	582,096	960,592	1,126,121

TABLE 3.--LIVESTOCK AND POULTRY SOLD FROM FARMS

Livestock and poultry	1982	1978	1974
Cattle and calves	17,748	24,205	17,527
Hogs and pigs	10,540	10,741	12,693
Chickens (broilers)	28,313,475	23,425,421	25,945,100

TABLE 4.--ACREAGE OF PRINCIPAL CROPS

Crop	1982	1978	1974
Corn	101	279	260
Sorghum for grain or seed	*	3,216	1,830
Soybeans	17,520	18,067	14,198
Wheat	9,460	1,305	2,139
Rice	3,263	2,580	*
Hay crops	27,326	25,723	23,198

* Withheld to avoid disclosing data for individual farms.

TABLE 5.--TEMPERATURE AND PRECIPITATION

[Data recorded in the period 1951-79 at Dardanelle, Arkansas]

Month	Temperature						Precipitation				
				2 years in 10 will have--				2 years in 10 will have--			
	Average daily maximum	Average daily minimum	Average daily	Maximum temperature higher than--	Minimum temperature lower than--	Average number of growing degree days*	Average	Less than--	More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	50.0	28.2	39.1	75	5	33	2.88	1.27	4.25	5	1.8
February---	55.5	32.2	43.9	77	10	51	3.15	1.61	4.49	6	1.2
March------	63.8	39.8	51.8	86	19	175	5.24	2.62	7.51	8	0.5
April------	74.9	50.0	62.5	89	28	375	4.36	2.18	6.25	7	0.0
May--------	82.0	58.4	70.2	94	40	626	5.12	2.37	7.48	7	0.0
June-------	88.8	65.9	77.4	100	51	822	4.24	1.45	6.58	7	0.0
July-------	92.9	70.0	81.5	103	56	977	3.33	1.48	4.90	6	0.0
August-----	92.1	68.0	80.1	102	55	933	3.34	1.71	4.75	5	0.0
September--	86.1	61.7	73.9	100	43	717	3.62	1.57	5.35	5	0.0
October----	76.7	49.2	63.0	93	30	403	3.31	1.00	5.21	4	0.0
November---	62.7	38.7	50.7	83	17	107	4.49	2.01	6.61	5	0.4
December---	53.2	31.5	42.4	75	11	20	3.81	1.94	5.43	6	0.7
Yearly:											
Average--	73.2	49.5	61.4	---	---	---	---	---	---	---	---
Extreme--	---	---	---	105	2	---	---	---	---	---	---
Total----	---	---	---	---	---	5,239	46.89	38.54	54.88	71	4.6

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50 °F).

TABLE 6.--FREEZE DATES IN SPRING AND FALL

[Data recorded in the period 1951-79 at Dardanelle, 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 22	April 1	April 16
2 years in 10 later than--	March 15	March 27	April 11
5 years in 10 later than--	March 2	March 18	April 3
First freezing temperature in fall:			
1 year in 10 earlier than--	November 2	October 29	October 21
2 years in 10 earlier than--	November 8	November 1	October 25
5 years in 10 earlier than--	November 21	November 8	November 1

TABLE 7.--GROWING SEASON

[Data recorded in the period 1951-79 at Dardanelle, Arkansas]

Probability	Daily minimum temperature during growing season		
	Higher than 24 °F	Higher than 28 °F	Higher than 32 °F
	Days	Days	Days
9 years in 10	238	216	196
8 years in 10	247	222	201
5 years in 10	264	234	212
2 years in 10	280	246	222
1 year in 10	289	252	227

TABLE 8.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
1	Avilla silt loam, 1 to 3 percent slopes	3,335	0.5
2	Avilla silt loam, 3 to 8 percent slopes	4,335	0.7
3	Barling silt loam, occasionally flooded	21,460	3.5
4	Bismarck shaly silt loam, 3 to 8 percent slopes	965	0.2
5	Bruno loamy fine sand, 0 to 3 percent slopes	725	0.1
6	Bruno loamy fine sand, occasionally flooded	2,005	0.3
7	Cane loam, 1 to 3 percent slopes	2,200	0.4
8	Cane loam, 3 to 8 percent slopes	25,180	4.1
9	Carnasaw gravelly silt loam, 3 to 8 percent slopes	4,955	0.8
10	Carnasaw gravelly silt loam, 8 to 12 percent slopes	3,070	0.5
11	Carnasaw-Sherless complex, 3 to 8 percent slopes	19,780	3.3
12	Carnasaw-Sherless-Clebit complex, 8 to 20 percent slopes	80,935	13.3
13	Carnasaw-Sherless-Clebit complex, 20 to 40 percent slopes	106,170	17.5
14	Ceda gravelly fine sandy loam, frequently flooded	1,885	0.3
15	Clebit-Carnasaw-Sherless complex, 40 to 60 percent slopes	3,480	0.6
16	Dardanelle silt loam, 0 to 1 percent slopes	3,095	0.5
17	Dardanelle silt loam, 1 to 3 percent slopes	2,000	0.3
18	Enders gravelly fine sandy loam, 3 to 8 percent slopes	2,180	0.4
19	Enders gravelly fine sandy loam, 8 to 12 percent slopes	3,065	0.5
20	Enders stony fine sandy loam, 12 to 20 percent slopes	1,975	0.3
21	Enders-Mountainburg stony fine sandy loams, 8 to 20 percent slopes	9,370	1.5
22	Enders-Mountainburg stony fine sandy loams, 20 to 40 percent slopes	9,520	1.6
23	Guthrie silt loam, 0 to 1 percent slopes	9,630	1.6
24	Guthrie silt loam, occasionally flooded	21,730	3.6
25	Kenn-Ceda complex, occasionally flooded	7,560	1.2
26	Leadvale silt loam, 1 to 3 percent slopes	46,320	7.6
27	Leadvale silt loam, 3 to 8 percent slopes	6,980	1.1
28	Linker fine sandy loam, 3 to 8 percent slopes	18,715	3.1
29	Linker-Mountainburg complex, 1 to 8 percent slopes	10,870	1.8
30	McKamie silt loam, 3 to 8 percent slopes, eroded	3,270	0.5
31	Moreland silty clay, 0 to 1 percent slopes	1,215	0.2
32	Mountainburg gravelly fine sandy loam, 3 to 8 percent slopes	8,510	1.4
33	Mountainburg gravelly fine sandy loam, 8 to 12 percent slopes	2,755	0.5
34	Mountainburg stony fine sandy loam, 1 to 12 percent slopes	3,345	0.6
35	Mountainburg stony fine sandy loam, 12 to 40 percent slopes	3,065	0.5
36	Muskogee silt loam, 1 to 3 percent slopes	2,755	0.5
37	Nella gravelly fine sandy loam, 3 to 8 percent slopes	9,065	1.5
38	Nella gravelly fine sandy loam, 8 to 12 percent slopes	2,500	0.4
39	Nella-Enders gravelly fine sandy loams, 8 to 12 percent slopes	21,985	3.6
40	Nella-Enders stony fine sandy loams, 20 to 40 percent slopes	17,610	2.9
41	Nella-Enders-Mountainburg stony fine sandy loams, 40 to 65 percent slopes	4,205	0.7
42	Pickwick silt loam, 1 to 3 percent slopes	4,440	0.7
43	Pickwick silt loam, 3 to 8 percent slopes	8,865	1.5
44	Roellen silty clay, 0 to 1 percent slopes	6,105	1.0
45	Roellen silty clay, occasionally flooded	4,265	0.8
46	Roxana silt loam, 0 to 3 percent slopes	10,455	1.7
47	Roxana silt loam, occasionally flooded	2,660	0.4
48	Sherless fine sandy loam, 3 to 8 percent slopes	600	0.1
49	Sherless gravelly fine sandy loam, 3 to 8 percent slopes	6,135	1.0
50	Spadra fine sandy loam, occasionally flooded	14,720	2.4
51	Taft silt loam, 0 to 2 percent slopes	21,220	3.5
52	Udipsamments, dredged	530	0.1
53	Wrightsville silt loam, 0 to 1 percent slopes	1,612	0.3
	Water (in bodies of more than 40 acres)	12,367	2.0
	Total	607,744	100.0

TABLE 9.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Map symbol and soil name	Land capability	Rice	Soybeans	Grain sorghum	Wheat	Tall fescue	Improved bermudagrass	Common bermudagrass
		Bu	Bu	Bu	Bu	AUM*	AUM*	AUM*
1--Avilla	IIe	---	25	60	35	6.5	9.0	7.0
2--Avilla	IIIe	---	---	---	30	6.0	8.5	6.5
3--Barling	IIw	110	35	75	40	8.5	11.0	8.0
4--Bismarck	VIe	---	---	---	---	4.0	---	4.0
5--Bruno	IIIs	---	15	40	25	---	6.0	5.0
6--Bruno	IIIs	---	15	40	25	---	6.0	5.0
7--Cane	IIe	---	25	60	30	7.0	9.0	7.0
8--Cane	IIIe	---	---	---	25	6.5	8.5	6.5
9--Carnasaw	IVe	---	---	---	25	5.0	---	4.5
10--Carnasaw	VIe	---	---	---	---	4.5	---	4.0
11--Carnasaw-Sherless	IVe	---	---	---	25	5.0	---	5.0
12--Carnasaw-Sherless-Clebit	VIs	---	---	---	---	4.5	---	4.5
13--Carnasaw-Sherless-Clebit	VIIs	---	---	---	---	---	---	---
14--Ceda	VIIs	---	---	---	---	5.5	6.5	4.5
15--Clebit-Carnasaw-Sherless	VIIs	---	---	---	---	---	---	---
16--Dardanelle	I	120	40	90	50	8.0	11.0	8.0
17--Dardanelle	IIe	---	40	90	50	8.0	11.0	8.0
18--Enders	IVe	---	---	---	---	4.0	4.0	5.0

See footnote at end of table.

TABLE 9.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Map symbol and soil name	Land capability	Rice	Soybeans	Grain sorghum	Wheat	Tall fescue	Improved bermudagrass	Common bermudagrass
		Bu	Bu	Bu	Bu	AUM*	AUM*	AUM*
19--Enders	VIe	---	---	---	---	3.5	4.5	8.5
20--Enders	VIIs	---	---	---	---	---	---	---
21--Enders	VIs	---	---	---	---	---	---	---
22--Mountainburg	VIIs	---	---	---	---	---	---	---
23--Guthrie	IIIw	110	25	60	30	6.0	7.5	6.0
24--Guthrie	IVw	110	20	50	25	5.5	7.0	5.5
25--Kenn-Ceda	IVe	---	---	---	---	6.0	7.0	5.0
26--Leadvale	IIe	---	25	60	35	7.0	9.0	7.0
27--Leadvale	IIIe	---	---	---	30	6.5	8.5	6.5
28--Linker	IIIe	---	---	---	25	5.0	7.0	5.5
29--Linker-Mountainburg	IVe	---	---	---	20	5.0	7.0	5.0
30--McKamie	VIe	---	---	---	25	5.5	6.5	5.0
31--Moreland	IIIw	130	35	75	25	8.5	10.0	6.0
32--Mountainburg	IVe	---	---	---	---	4.0	5.0	4.0
33--Mountainburg	VIe	---	---	---	---	3.0	---	3.5
34--Mountainburg	VIs	---	---	---	---	---	---	---
35--Mountainburg	VIIs	---	---	---	---	---	---	---
36--Muskogee	IIe	---	30	---	35	7.5	10.0	7.0
37--Nella	IIIe	---	---	---	30	6.5	8.0	7.0
38--Nella	IVe	---	---	---	---	6.0	7.5	6.5

See footnote at end of table.

TABLE 9.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Map symbol and soil name	Land capability	Rice	Soybeans	Grain sorghum	Wheat	Tall fescue	Improved bermudagrass	Common bermudagrass
		Bu	Bu	Bu	Bu	AUM*	AUM*	AUM*
39--- Nella-Enders	VIe	---	---	---	---	5.0	---	5.0
40--- Nella-Enders	VIIs	---	---	---	---	---	---	---
41--- Nella-Enders-Mountainburg	VIIs	---	---	---	---	---	---	---
42--- Pickwick	IIe	---	25	60	35	7.0	10.0	7.0
43--- Pickwick	IIIe	---	---	---	30	6.5	9.5	6.5
44--- Roellen	IIIw	120	35	75	25	7.0	---	6.0
45--- Roellen	IVw	130	35	75	25	7.0	---	6.0
46--- Roxana	IIe	---	35	75	45	7.5	11.0	8.5
47--- Roxana	IIw	---	35	75	45	7.5	11.0	8.5
48, 49--- Sherless	IIIe	---	---	---	25	5.0	8.0	5.5
50--- Spadra	IIw	---	30	65	35	8.0	10.0	8.0
51--- Taft	IIIw	---	25	50	25	6.0	7.5	6.0
52--- Udipsamments	VIIs	---	---	---	---	---	---	---
53--- Wrightsville	IIIw	110	25	50	25	7.5	8.5	7.0

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

TABLE 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	Windthrow hazard	Plant competition	Common trees	Site index	Productivity*	
									Ft^3/ac/yr	
1, 2---------- Avilla	8A7	Slight	Slight	Slight	Slight	Moderate	Shortleaf pine------ Southern red oak---- Loblolly pine------- Cherrybark oak------ Sweetgum------------	70 65 80 --- 75	110 --- --- --- ---	Loblolly pine, shortleaf pine, cherrybark oak.
3---------- Barling	9A7	Slight	Slight	Slight	Slight	Moderate	Shortleaf pine------ Southern red oak---- Sweetgum------------ Eastern cottonwood--	80 80 90 95	130 --- --- ---	Loblolly pine, shortleaf pine, cherrybark oak.
4---------- Bismarck	4D8	Slight	Slight	Moderate	Severe	Slight	Shortleaf pine------ Loblolly pine------- Eastern redcedar---- Post oak------------	45 50 30 ---	57 --- --- ---	Loblolly pine, shortleaf pine, eastern redcedar.
5, 6---------- Bruno	9S8	Slight	Moderate	Moderate	Slight	Moderate	Eastern cottonwood-- Water oak---------- Sweetgum------------ American sycamore---	100 95 90 90	128 --- --- ---	Eastern cottonwood, loblolly pine, shortleaf pine.
7, 8---------- Cane	8A7	Slight	Slight	Slight	Moderate	Moderate	Shortleaf pine------ Yellow-poplar------- Sweetgum------------ Loblolly pine-------	70 90 80 80	110 --- --- ---	Loblolly pine, shortleaf pine, cherrybark oak.
9, 10---------- Carnasaw	8A7	Slight	Slight	Slight	Slight	Moderate	Shortleaf pine------ Loblolly pine------- White oak----------	70 80 ---	110 --- ---	Loblolly pine, shortleaf pine.
11: Carnasaw----------	8A7	Slight	Slight	Slight	Slight	Moderate	Shortleaf pine------ Loblolly pine------- White oak----------	70 80 ---	110 --- ---	Loblolly pine, shortleaf pine.
Sherless----------	8A7	Slight	Slight	Slight	Slight	Moderate	Shortleaf pine------ White oak---------- Southern red oak---- Sweetgum------------	70 --- --- ---	110 --- --- ---	Loblolly pine, shortleaf pine.

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	Windthrow hazard	Plant competition	Common trees	Site index	Productivity*	
									$Ft^3/ac/yr$	
12: Carnasaw	8X8	Slight	Moderate	Slight	Slight	Moderate	Shortleaf pine	70	110	Loblolly pine, shortleaf pine.
							Loblolly pine	80	---	
							White oak	---	---	
Sherless	8A7	Slight	Slight	Slight	Slight	Moderate	Shortleaf pine	70	110	Loblolly pine, shortleaf pine.
							White oak	---	---	
							Southern red oak	---	---	
							Sweetgum	---	---	
Clebit	3X8	Slight	Moderate	Moderate	Moderate	Moderate	Shortleaf pine	40	47	Shortleaf pine, southern red oak.
							Eastern redcedar	30	---	
							Post oak	35	---	
13: Carnasaw	8R8	Moderate	Moderate	Slight	Slight	Moderate	Shortleaf pine	70	110	Loblolly pine, shortleaf pine.
							Loblolly pine	80	---	
							White oak	---	---	
Sherless	7R8	Moderate	Moderate	Slight	Slight	Moderate	Shortleaf pine	65	99	Loblolly pine, shortleaf pine.
							White oak	60	---	
							Southern red oak	60	---	
							Sweetgum	65	---	
Clebit	3R8	Moderate	Moderate	Moderate	Severe	Severe	Shortleaf pine	40	47	Shortleaf pine, eastern redcedar.
							Eastern redcedar	30	---	
							Post oak	35	---	
14- Ceda	7W8	Slight	Slight	Moderate	Slight	Moderate	Shortleaf pine	65	99	Loblolly pine, shortleaf pine.
							Southern red oak	65	---	
							White oak	60	---	
							Sweetgum	75	---	
							American sycamore	80	---	
15: Clebit	3R9	Severe	Severe	Severe	Severe	Severe	Shortleaf pine	40	47	Shortleaf pine, eastern redcedar.
							Eastern redcedar	30	---	
							Post oak	35	---	
Carnasaw	7R9	Severe	Severe	Slight	Slight	Moderate	Shortleaf pine	65	99	Loblolly pine, shortleaf pine.
							Loblolly pine	70	---	
							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	Windthrow hazard	Plant competition	Common trees	Site index	Productivity*	
									Ft^3/ac/yr	
15:										
Sherless	7R9	Severe	Severe	Slight	Slight	Slight	Shortleaf pine	65	100	Loblolly pine, shortleaf pine.
							White oak	60	---	
							Southern red oak	60	---	
							Sweetgum	60	---	
16, 17 Dardanelle	10A4	Slight	Slight	Slight	---	---	Eastern cottonwood	105	141	Loblolly pine, shortleaf pine, cottonwood, cherrybark oak, black walnut.
							Cherrybark oak	100	---	
							Sweetgum	100	---	
							American sycamore	---	---	
18, 19 Enders	7A7	Slight	Slight	Slight	Slight	Moderate	Shortleaf pine	65	100	Loblolly pine, shortleaf pine.
							Southern red oak	60	---	
							White oak	55	---	
20:										
Enders	6X8	Slight	Moderate	Slight	Slight	Slight	Shortleaf pine	60	88	Loblolly pine, shortleaf pine.
							Southern red oak	60	---	
21:										
Enders	6X8	Slight	Moderate	Slight	Slight	Slight	Shortleaf pine	60	88	Loblolly pine, shortleaf pine.
							Southern red oak	60	---	
Mountainburg	5X2	Slight	Moderate	Moderate	Severe	Slight	Shortleaf pine	50	68	Loblolly pine, shortleaf pine, eastern redcedar.
							Eastern redcedar	30	---	
							Southern red oak	---	---	
22:										
Enders	6R8	Moderate	Moderate	Slight	Moderate	Moderate	Shortleaf pine	60	88	Loblolly pine, shortleaf pine.
							White oak	56	---	
							Eastern redcedar	40	---	
Mountainburg	5R2	Moderate	Moderate	Moderate	Severe	Slight	Shortleaf pine	50	68	Loblolly pine, shortleaf pine, eastern redcedar.
							Eastern redcedar	---	---	
							Southern red oak	---	---	
23, 24 Guthrie	8W8	Slight	Moderate	Moderate	Moderate	Severe	Shortleaf pine	70	110	Loblolly pine, shortleaf pine, sweetgum.
							Southern red oak	---	---	
							Loblolly pine	80	---	
							Willow oak	---	---	
							Sweetgum	---	---	

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	Windthrow hazard	Plant competition	Common trees	Site index	Productivity*	
									Ft^3/ac/yr	
25:										
Kenn	8W8	Slight	Slight	Moderate	Slight	Moderate	Shortleaf pine	70	110	Loblolly pine, shortleaf pine.
							Southern red oak	70	---	
							Sweetgum	80	---	
							Post oak	---	---	
Ceda	7W8	Slight	Slight	Moderate	Slight	Moderate	Shortleaf pine	65	99	Loblolly pine, shortleaf pine.
							Southern red oak	65	---	
							White oak	60	---	
							Sweetgum	75	---	
							American sycamore	80	---	
26, 27 Leadvale	8A7	Slight	Slight	Slight	Slight	Moderate	Shortleaf pine	70	110	Loblolly pine, shortleaf pine, white oak.
							White oak	70	---	
							Loblolly pine	80	---	
							Southern red oak	---	---	
28 Linker	6A1	Slight	Slight	Slight	Moderate	Slight	Shortleaf pine	60	88	Loblolly pine, shortleaf pine, southern red oak.
							Southern red oak	50	---	
							White oak	50	---	
							Eastern redcedar	40	---	
							Loblolly pine	70	---	
29:										
Linker	6A1	Slight	Slight	Slight	Moderate	Slight	Shortleaf pine	60	88	Loblolly pine, shortleaf pine, southern red oak.
							Southern red oak	50	---	
							White oak	50	---	
							Eastern redcedar	40	---	
							Loblolly pine	70	---	
Mountainburg	5D2	Slight	Slight	Moderate	Severe	Slight	Shortleaf pine	50	68	Loblolly pine, shortleaf pine, eastern redcedar.
							Eastern redcedar	30	---	
							Loblolly pine	60	---	
							Southern red oak	---	---	
30 McKamie	8C2	Slight	Moderate	Slight	Slight	Severe	Shortleaf pine	70	110	Loblolly pine, shortleaf pine.
							Loblolly pine	80	---	

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	Windthrow hazard	Plant competition	Common trees	Site index	Productivity*	
									Ft^3/ac/yr	
31---------- Moreland	9W5	Slight	Moderate	Moderate	Slight	Slight	Eastern cottonwood--	100	128	Cherrybark oak, eastern cottonwood.
							Sweetgum----------	90	---	
							American sycamore---	---	---	
							Water oak----------	90	---	
							Cherrybark oak------	90	---	
32, 33---------- Mountainburg	5D2	Slight	Slight	Moderate	Severe	Slight	Shortleaf pine------	50	68	Loblolly pine, shortleaf pine, eastern redcedar.
							Eastern redcedar----	30	---	
							Loblolly pine-------	---	---	
							Southern red oak----	---	---	
34---------- Mountainburg	5X2	Slight	Moderate	Moderate	Severe	Slight	Shortleaf pine------	50	68	Loblolly pine, shortleaf pine, eastern redcedar.
							Eastern redcedar----	30	---	
							Southern red oak----	---	---	
35---------- Mountainburg	5R2	Slight	Moderate	Moderate	Severe	Slight	Shortleaf pine------	50	68	Loblolly pine, shortleaf pine, eastern redcedar.
							Eastern redcedar----	30	---	
							Southern red oak----	---	---	
36---------- Muskogee	8A7	Slight	Slight	Slight	Slight	Moderate	Shortleaf pine------	70	110	Loblolly pine, shortleaf pine, sweetgum.
							Sweetgum----------	80	---	
							Loblolly pine-------	---	---	
							Water oak----------	---	---	
							Southern red oak----	---	---	
37, 38---------- Nella	8A7	Slight	Slight	Slight	Slight	Moderate	Shortleaf pine------	70	110	Loblolly pine, shortleaf pine, northern red oak.
							Southern red oak----	---	---	
							Eastern redcedar----	---	---	
39:										
Nella----------	8A7	Slight	Slight	Slight	Slight	Moderate	Shortleaf pine------	70	110	Loblolly pine, shortleaf pine, northern red oak.
							Southern red oak----	---	---	
							Eastern redcedar----	---	---	
Enders----------	6A7	Slight	Slight	Slight	Slight	Moderate	Shortleaf pine------	60	88	Loblolly pine, shortleaf pine.
							Southern red oak----	60	---	
							White oak----------	65	---	
							Loblolly pine-------	70	---	
40:										
Nella----------	8R8	Slight	Moderate	Slight	Slight	Moderate	Shortleaf pine------	70	110	Loblolly pine, shortleaf pine, northern red oak.
							Southern red oak----	70	---	
							Eastern redcedar----	50	---	

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	Windthrow hazard	Plant competition	Common trees	Site index	Productivity*	
									$Ft^3/ac/yr$	
40: Enders	6R8	Moderate	Moderate	Slight	Slight	Slight	Shortleaf pine White oak Eastern redcedar	60 56 40	88 --- ---	Loblolly pine, shortleaf pine.
41: Nella	8R9	Moderate	Severe	Slight	Slight	Moderate	Shortleaf pine Southern red oak Eastern redcedar	70 70 50	110 --- ---	Loblolly pine, shortleaf pine, northern red oak.
Enders	6R9	Severe	Severe	Slight	Slight	Slight	Shortleaf pine White oak Eastern redcedar	60 56 40	88 --- ---	Loblolly pine, shortleaf pine.
Mountainburg	5R3	Moderate	Severe	Moderate	Severe	Slight	Shortleaf pine Eastern redcedar Southern red oak	50 30 ---	68 --- ---	Loblolly pine, shortleaf pine, eastern redcedar.
42, 43 Pickwick	8A7	Slight	Slight	Slight	Slight	Moderate	Shortleaf pine White oak Loblolly pine	70 73 80	110 --- ---	Loblolly pine, shortleaf pine, white oak.
44, 45 Roellen	9W5	Slight	Moderate	Moderate	Slight	Severe	Eastern cottonwood Sweetgum Water oak Cherrybark oak	100 90 90 90	128 --- --- ---	Eastern cottonwood, sweetgum.
46, 47 Roxana	12A4	Slight	Slight	Slight	Slight	Severe	Eastern cottonwood Sweetgum Pecan American sycamore Water oak Cherrybark oak	115 100 --- --- --- ---	172 --- --- --- --- ---	Eastern cottonwood, loblolly pine, shortleaf pine, cherrybark oak.
48, 49 Sherless	8A7	Slight	Slight	Slight	Slight	Moderate	Shortleaf pine White oak Southern red oak Sweetgum	70 --- --- ---	110 --- --- ---	Loblolly pine, shortleaf pine.
50 Spadra	9A7	Slight	Slight	Slight	Slight	Severe	Shortleaf pine Southern red oak Eastern redcedar	80 80 60	130 --- ---	Loblolly pine, shortleaf pine, southern red oak.

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	Windthrow hazard	Plant competition	Common trees	Site index	Productivity*	
									$Ft^3/ac/yr$	
51---------- Taft	6W8	Slight	Moderate	Slight	Slight	Moderate	Shortleaf pine------ White oak---------- Loblolly pine------- Sweetgum----------	60 60 85 80	88 --- --- ---	Loblolly pine, shortleaf pine, white oak.
53---------- Wrightsville	8W8	Slight	Moderate	Moderate	Slight	Severe	Loblolly pine------- Sweetgum---------- Water oak----------	80 80 80	110 --- ---	Loblolly pine, shortleaf pine, water oak.

* Productivity class is the yield in cubic feet per acre per year calculated at the age of culmination of mean annual increment for fully stocked natural stands.

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, 2---------- Avilla	Slight----------	Slight----------	Moderate: slope.	Slight.
3---------- Barling	Severe: flooding.	Moderate: wetness.	Moderate: wetness, flooding.	Slight.
4---------- Bismarck	Severe: depth to rock.	Severe: depth to rock.	Severe: small stones, depth to rock.	Slight.
5---------- Bruno	Slight----------	Slight----------	Slight----------	Slight.
6---------- Bruno	Severe: flooding.	Slight----------	Moderate: flooding.	Slight.
7, 8---------- Cane	Moderate: wetness.	Moderate: wetness.	Moderate: slope, small stones, wetness.	Slight.
9---------- Carnasaw	Moderate: small stones, percs slowly.	Moderate: small stones, percs slowly.	Severe: small stones.	Slight.
10---------- Carnasaw	Moderate: slope, small stones, percs slowly.	Moderate: slope, small stones, percs slowly.	Severe: slope, small stones.	Slight.
11: Carnasaw----------	Moderate: small stones, percs slowly.	Moderate: small stones, percs slowly.	Severe: small stones.	Slight.
Sherless----------	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight.
12: Carnasaw----------	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Moderate: large stones.
Sherless----------	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: large stones, slope, small stones.	Moderate: large stones.
Clebit----------	Severe: small stones, depth to rock.	Severe: small stones, depth to rock.	Severe: slope, small stones, large stones.	Moderate: large stones.
13: Carnasaw----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

TABLE 11.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails
13: Sherless	Severe: slope.	Severe: slope.	Severe: large stones, slope, small stones.	Severe: slope.
Clebit	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, large stones.	Severe: slope.
14--- Ceda	Severe: flooding, small stones.	Severe: small stones.	Severe: flooding, small stones.	Moderate: flooding.
15: Clebit	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, large stones.	Severe: slope.
Carnasaw	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Sherless	Severe: slope.	Severe: slope.	Severe: large stones, slope, small stones.	Severe: slope.
16, 17--- Dardanelle	Slight	Slight	Slight	Slight.
18--- Enders	Severe: small stones, percs slowly.	Severe: small stones, percs slowly.	Severe: small stones, percs slowly.	Slight.
19--- Enders	Severe: small stones, percs slowly.	Severe: small stones, percs slowly.	Severe: slope, small stones, percs slowly.	Slight.
20--- Enders	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: slope, small stones.	Moderate: large stones, slope.
21: Enders	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, small stones.	Moderate: large stones.
Mountainburg	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, small stones.	Moderate: large stones.
22: Enders	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: slope, small stones.	Severe: slope.

TABLE 11.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails
22: Mountainburg	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones.	Severe: slope.
23--- Guthrie	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
24--- Guthrie	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
25: Kenn	Severe: flooding.	Slight	Moderate: small stones, flooding.	Slight.
Ceda	Severe: flooding, small stones.	Severe: small stones.	Severe: small stones.	Slight.
26, 27--- Leadvale	Moderate: wetness.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Moderate: wetness.
28--- Linker	Slight	Slight	Moderate: slope, small stones.	Slight.
29: Linker	Slight	Slight	Moderate: slope, small stones.	Slight.
Mountainburg	Severe: depth to rock.	Severe: depth to rock.	Severe: small stones.	Slight.
30--- McKamie	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Severe: erodes easily.
31--- Moreland	Severe: wetness, percs slowly.	Severe: wetness, too clayey, percs slowly.	Severe: too clayey, wetness.	Severe: wetness, too clayey.
32--- Mountainburg	Severe: depth to rock.	Severe: depth to rock.	Severe: small stones.	Slight.
33--- Mountainburg	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, small stones.	Slight.
34--- Mountainburg	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, small stones.	Moderate: large stones.
35--- Mountainburg	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones.	Severe: slope.

TABLE 11.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails
36--- Muskogee	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Slight.
37--- Nella	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight.
38--- Nella	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight.
39:				
Nella---	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight.
Enders---	Severe: small stones, percs slowly.	Severe: small stones, percs slowly.	Severe: slope, small stones, percs slowly.	Slight.
40:				
Nella---	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Enders---	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: slope, small stones.	Severe: slope.
41:				
Nella---	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Enders---	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: slope, small stones.	Severe: slope.
Mountainburg---	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones.	Severe: slope.
42, 43--- Pickwick	Slight---	Slight---	Moderate: slope.	Slight.
44--- Roellen	Severe: wetness, too clayey.	Severe: wetness, too clayey.	Severe: wetness, too clayey.	Severe: wetness, too clayey.
45--- Roellen	Severe: flooding, wetness, too clayey.	Severe: wetness, too clayey.	Severe: too clayey, wetness.	Severe: wetness, too clayey.
46--- Roxana	Slight---	Slight---	Slight---	Severe: erodes easily.
47--- Roxana	Severe: flooding.	Slight---	Moderate: flooding.	Severe: erodes easily.
48--- Sherless	Moderate: small stones.	Moderate: small stones.	Moderate: small stones, slope, depth to rock.	Moderate: large stones.

TABLE 11.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails
49--- Sherless	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Moderate: large stones.
50--- Spadra	Severe: flooding.	Slight---	Moderate: small stones, flooding.	Slight.
51--- Taft	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.
52. Udipsamments, dredged				
53--- Wrightsville	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, erodes easily.

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, 2---------- Avilla	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
3---------- Barling	Fair	Good	Good	Good	Poor	Poor	Poor	Good	Good	Poor.
4---------- Bismarck	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
5, 6---------- Bruno	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
7, 8---------- Cane	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Fair	Very poor.
9, 10---------- Carnasaw	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
11:										
Carnasaw----------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Sherless----------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
12:										
Carnasaw----------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Sherless----------	Poor	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Clebit----------	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
13:										
Carnasaw----------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Sherless----------	Very poor.	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Clebit----------	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
14---------- Ceda	Poor	Fair	Fair	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.
15:										
Clebit----------	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Carnasaw----------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Sherless----------	Very poor.	Poor	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.

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
16, 17---------- Dardanelle	Good	Good	Good	Good	---	Poor	Fair	Good	Good	Poor.
18, 19---------- Enders	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
20---------- Enders	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
21:										
Enders----------	Poor	Fair	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.
22:										
Enders----------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Mountainburg------	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Poor	Very poor.
23, 24---------- Guthrie	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
25:										
Kenn----------	Fair	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
Ceda----------	Poor	Fair	Fair	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.
26---------- Leadvale	Fair	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
27---------- Leadvale	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
28---------- Linker	Fair	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
29:										
Linker----------	Fair	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
Mountainburg------	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Very poor.	Poor	Very poor.	Very poor.
30---------- McKamie	Fair	Good	Good	---	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
31---------- Moreland	Fair	Fair	Fair	Good	---	Good	Good	Fair	Good	Good.
32---------- Mountainburg	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Very poor.	Poor	Very poor.	Very poor.
33---------- Mountainburg	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.

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
34, 35---------- Mountainburg	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Poor	Very poor.
36---------- Muskogee	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
37, 38---------- Nella	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
39: Nella----------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Enders----------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
40: 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.
41: Nella----------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Enders----------	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Very poor.	Good	Very poor.
Mountainburg------	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Poor	Very poor.
42---------- Pickwick	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
43---------- Pickwick	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
44---------- Roellen	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
45---------- Roellen	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
46---------- Roxana	Good	Good	Good	Good	---	Poor	Very poor.	Good	Good	Very poor.
47---------- Roxana	Good	Good	Good	Good	---	Poor	Very poor.	Good	Good	Very poor.
48, 49---------- Sherless	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
50---------- Spadra	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.

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
51---------- Taft	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
52. Udipsamments, dredged										
53---------- Wrightsville	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.

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; it does not eliminate the need for onsite investigation]

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
1---------- Avilla	Slight----------	Slight----------	Slight----------	Slight----------	Slight.
2---------- Avilla	Slight----------	Slight----------	Slight----------	Moderate: slope.	Slight.
3---------- Barling	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding.
4---------- Bismarck	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: slope, depth to rock.	Moderate: depth to rock.
5---------- Bruno	Severe: cutbanks cave.	Slight----------	Slight----------	Slight----------	Slight.
6---------- Bruno	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
7---------- Cane	Moderate: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
8---------- Cane	Moderate: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness, slope.	Moderate: wetness.
9---------- Carnasaw	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
10---------- Carnasaw	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.
11: Carnasaw---------	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
Sherless---------	Moderate: depth to rock.	Slight----------	Moderate: depth to rock.	Moderate: slope.	Slight.
12: Carnasaw---------	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength.
Sherless---------	Moderate: depth to rock, slope.	Moderate: slope.	Moderate: depth to rock, slope.	Severe: slope.	Moderate: slope.
Clebit----------	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.

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
13: Carnasaw	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell, low strength.
Sherless	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Clebit	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.
14 Ceda	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
15: Clebit	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.
Carnasaw	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell, low strength.
Sherless	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
16, 17 Dardanelle	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.
18 Enders	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
19 Enders	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.
20 Enders	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.
21: Enders	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.
Mountainburg	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.
22: Enders	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.

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, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.
23--- Guthrie	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, wetness.
24--- Guthrie	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.
25: Kenn	Moderate: flooding, large stones.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
Ceda	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
26--- Leadvale	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: low strength, wetness.
27--- Leadvale	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness, slope.	Moderate: low strength, wetness.
28--- Linker	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: slope, depth to rock.	Moderate: depth to rock.
29: Linker	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: slope, depth to rock.	Moderate: depth to rock.
Mountainburg	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
30--- McKamie	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
31--- Moreland	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness.
32--- Mountainburg	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
33--- Mountainburg	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.
34--- Mountainburg	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.

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
35--- Mountainburg	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.
36--- Muskogee	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, shrink-swell.
37--- Nella	Slight---	Slight---	Slight---	Moderate: slope.	Slight.
38--- Nella	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
39: 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.
40: 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.
41: 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.
Mountainburg---	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.
42--- Pickwick	Slight---	Slight---	Moderate: shrink-swell.	Slight---	Severe: low strength.
43--- Pickwick	Slight---	Slight---	Moderate: shrink-swell.	Moderate: slope.	Severe: low strength.
44--- Roellen	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.

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---------- Roellen	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: low strength, wetness, flooding.
46---------- Roxana	Severe: cutbanks cave.	Slight----------	Slight----------	Slight----------	Slight.
47---------- Roxana	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
48, 49---------- Sherless	Moderate: depth to rock.	Slight----------	Moderate: depth to rock.	Moderate: slope.	Slight.
50---------- Spadra	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
51---------- Taft	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength.
52. Udipsamments, dredged					
53---------- Wrightsville	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.

TABLE 14.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "good," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition; it does not eliminate the need for onsite investigation]

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1, 2---------- Avilla	Moderate: percs slowly.	Severe: seepage.	Severe: seepage.	Slight----------	Fair: too clayey.
3---------- Barling	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding.	Fair: wetness.
4---------- Bismarck	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, small stones.
5---------- Bruno	Severe: poor filter.	Severe: seepage, flooding.	Severe: seepage.	Severe: seepage.	Poor: seepage, too sandy.
6---------- Bruno	Severe: flooding, poor filter.	Severe: seepage, flooding.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage.	Poor: seepage, too sandy.
7, 8---------- Cane	Severe: wetness, percs slowly.	Moderate: slope.	Moderate: wetness.	Moderate: wetness.	Fair: wetness.
9---------- Carnasaw	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---------- Carnasaw	Severe: percs slowly.	Severe: slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock, slope.	Poor: too clayey, hard to pack.
11: Carnasaw----------	Severe: percs slowly.	Moderate: depth to rock, slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock.	Poor: too clayey, hard to pack.
Sherless----------	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, thin layer.
12: Carnasaw----------	Severe: percs slowly.	Severe: slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock, slope.	Poor: too clayey, hard to pack.
Sherless----------	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, thin layer.
Clebit----------	Severe: depth to rock.	Severe: depth to rock, slope, seepage.	Severe: depth to rock, seepage, large stones.	Severe: depth to rock, seepage.	Poor: area reclaim, small stones, thin layer.

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
13: Carnasaw	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
Sherless	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope, thin layer.
Clebit	Severe: depth to rock, slope.	Severe: depth to rock, slope, seepage.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: area reclaim, small stones, slope.
14--- Ceda	Severe: flooding, poor filter.	Severe: seepage, flooding.	Severe: flooding, seepage.	Severe: flooding, seepage.	Poor: small stones, seepage.
15: Clebit	Severe: depth to rock, slope.	Severe: depth to rock, slope, seepage.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: area reclaim, small stones, slope.
Carnasaw	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
Sherless	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope, thin layer.
16, 17--- Dardanelle	Moderate: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
18--- 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.
19--- Enders	Severe: percs slowly.	Severe: slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock, slope.	Poor: too clayey, hard to pack.
20--- Enders	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
21: Enders	Severe: percs slowly.	Severe: slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock, slope.	Poor: too clayey, hard to pack.
Mountainburg	Severe: depth to rock.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Poor: depth to rock, small stones, thin layer.

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
22: Enders	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
Mountainburg	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: depth to rock, small stones, slope.
23--- Guthrie	Severe: wetness, percs slowly.	Slight	Severe: wetness.	Severe: wetness.	Poor: wetness.
24--- Guthrie	Severe: flooding, wetness, percs slowly.	Slight	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
25: Kenn	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Poor: small stones.
Ceda	Severe: flooding, poor filter.	Severe: seepage, flooding.	Severe: flooding, seepage.	Severe: flooding, seepage.	Poor: small stones, seepage.
26, 27--- Leadvale	Severe: wetness, percs slowly.	Severe: wetness.	Severe: depth to rock.	Moderate: depth to rock, wetness.	Fair: area reclaim, too clayey.
28--- Linker	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, thin layer.
29: 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: depth to rock, seepage.	Severe: depth to rock, seepage.	Severe: seepage, depth to rock.	Poor: area reclaim, seepage, small stones.
30--- McKamie	Severe: percs slowly.	Moderate: seepage, slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
31--- Moreland	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
32--- Mountainburg	Severe: depth to rock.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Severe: seepage, depth to rock.	Poor: area reclaim, seepage, small stones.

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
33--Mountainburg	Severe: depth to rock.	Severe: slope, depth to rock, seepage.	Severe: depth to rock, seepage.	Severe: seepage, depth to rock.	Poor: area reclaim, seepage, small stones.
34--Mountainburg	Severe: depth to rock.	Severe: seepage, depth to rock.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Poor: depth to rock, small stones, thin layer.
35--Mountainburg	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: depth to rock, small stones, slope.
36--Muskogee	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
37--Nella	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey, large stones.	Slight	Poor: small stones.
38--Nella	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey, large stones.	Moderate: slope.	Poor: small stones.
39:					
Nella	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey, large stones.	Moderate: slope.	Poor: small stones.
Enders	Severe: percs slowly.	Severe: slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock, slope.	Poor: too clayey, hard to pack.
40:					
Nella	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: small stones, slope.
Enders	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
41:					
Nella	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: small stones, slope.
Enders	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.

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
41: Mountainburg	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: depth to rock, small stones, slope.
42, 43--- Pickwick	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
44--- Roellen	Severe: wetness, percs slowly.	Slight	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
45--- Roellen	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
46--- Roxana	Moderate: percs slowly.	Moderate: seepage.	Slight	Slight	Fair: thin layer.
47--- Roxana	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Fair: thin layer.
48, 49--- Sherless	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, thin layer.
50--- Spadra	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Good.
51--- Taft	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
52. Udipsamments, dredged					
53--- Wrightsville	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.

TABLE 15.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition; it does not eliminate the need for onsite investigation]

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
1, 2---------- Avilla	Good----------	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.
3---------- Barling	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
4---------- Bismarck	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
5, 6---------- Bruno	Good----------	Probable----------	Improbable: too sandy.	Poor: thin layer.
7, 8---------- Cane	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, thin layer.
9, 10---------- Carnasaw	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
11: Carnasaw----------	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
Sherless----------	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
12: Carnasaw----------	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
Sherless----------	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Clebit----------	Poor: area reclaim, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, large stones.
13: Carnasaw----------	Poor: shrink-swell, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones, area reclaim.
Sherless----------	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.

TABLE 15.--CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
13: Clebit	Poor: area reclaim, slope, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
14 Ceda	Good	Improbable: small stones.	Probable	Poor: small stones, area reclaim.
15: Clebit	Poor: area reclaim, slope, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
Carnasaw	Poor: shrink-swell, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones, area reclaim.
Sherless	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
16, 17 Dardanelle	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
18, 19 Enders	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, thin layer.
20 Enders	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, thin layer, slope.
21: Enders	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, thin layer.
Mountainburg	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones.
22: Enders	Poor: low strength, slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, thin layer, slope.
Mountainburg	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
23, 24 Guthrie	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.

TABLE 15.--CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
25: Kenn	Fair: shrink-swell.	Improbable: small stones.	Probable	Poor: small stones, area reclaim.
Ceda	Good	Improbable: small stones.	Probable	Poor: small stones, area reclaim.
26, 27--- Leadvale	Fair: area reclaim, low strength, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Good.
28--- Linker	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
29: Linker	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Mountainburg	Poor: thin layer, area reclaim.	Improbable: thin layer.	Improbable: thin layer.	Poor: small stones, area reclaim.
30--- McKamie	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
31--- Moreland	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
32, 33--- Mountainburg	Poor: thin layer, area reclaim.	Improbable: thin layer.	Improbable: thin layer.	Poor: small stones, area reclaim.
34--- Mountainburg	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones.
35--- Mountainburg	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
36--- Muskogee	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
37, 38--- Nella	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
39: Nella	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.

TABLE 15.--CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
39: Enders	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, thin layer.
40: Nella	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Enders	Poor: low strength, slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, thin layer, slope.
41: Nella	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Enders	Poor: low strength, slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, thin layer, slope.
Mountainburg	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
42, 43 Pickwick	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
44, 45 Roellen	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
46, 47 Roxana	Fair: thin layer.	Improbable: excess fines.	Improbable: excess fines.	Good.
48, 49 Sherless	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
50 Spadra	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
51 Taft	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
52. Udipsamments, dredged				
53 Wrightsville	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.

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; it does not eliminate the need for onsite investigation]

Map symbol and soil name	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
1---------- Avilla	Moderate: seepage.	Severe: piping.	Deep to water	Favorable------	Favorable------	Favorable.
2---------- Avilla	Moderate: seepage.	Severe: piping.	Deep to water	Slope----------	Favorable------	Favorable.
3---------- Barling	Moderate: seepage.	Severe: piping.	Flooding-------	Wetness, erodes easily, flooding.	Erodes easily, wetness.	Erodes easily.
4---------- Bismarck	Severe: depth to rock.	Severe: thin layer.	Deep to water	Droughty, depth to rock, slope.	Depth to rock	Droughty, depth to rock.
5, 6---------- Bruno	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake.	Too sandy------	Droughty.
7---------- Cane	Slight---------	Severe: piping.	Percs slowly---	Wetness, percs slowly, rooting depth.	Erodes easily, wetness, rooting depth.	Erodes easily, rooting depth.
8---------- Cane	Slight---------	Severe: piping.	Percs slowly, slope.	Wetness, percs slowly, rooting depth.	Erodes easily, wetness, rooting depth.	Erodes easily, rooting depth.
9---------- Carnasaw	Moderate: depth to rock.	Moderate: thin layer, hard to pack.	Deep to water	Percs slowly, slope.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
10---------- Carnasaw	Moderate: depth to rock.	Moderate: thin layer, hard to pack.	Deep to water	Percs slowly, slope.	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
11:						
Carnasaw---------	Moderate: depth to rock.	Moderate: thin layer, hard to pack.	Deep to water	Percs slowly, slope.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
Sherless---------	Moderate: seepage, depth to rock.	Moderate: thin layer, piping.	Deep to water	Depth to rock, slope.	Large stones, depth to rock.	Large stones, depth to rock.
12:						
Carnasaw---------	Moderate: depth to rock.	Moderate: large stones, thin layer, hard to pack.	Deep to water	Percs slowly, slope.	Slope, large stones, erodes easily.	Slope, large stones, erodes easily.
Sherless---------	Moderate: seepage, depth to rock.	Moderate: thin layer, piping.	Deep to water	Depth to rock, slope.	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.

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
12: Clebit	Severe: depth to rock, seepage.	Severe: thin layer, large stones.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
13: Carnasaw	Severe: slope.	Moderate: large stones, thin layer, hard to pack.	Deep to water	Percs slowly, slope.	Slope, large stones, erodes easily.	Slope, large stones, erodes easily.
Sherless	Severe: slope.	Moderate: thin layer, piping.	Deep to water	Depth to rock, slope.	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
Clebit	Severe: depth to rock, slope, seepage.	Severe: thin layer, large stones.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
14 Ceda	Severe: seepage.	Severe: seepage.	Deep to water	Flooding, droughty.	Large stones	Droughty, large stones.
15: Clebit	Severe: depth to rock, slope, seepage.	Severe: thin layer, large stones.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Carnasaw	Severe: slope.	Moderate: large stones, thin layer, hard to pack.	Deep to water	Percs slowly, slope.	Slope, large stones, erodes easily.	Slope, large stones, erodes easily.
Sherless	Severe: slope.	Moderate: thin layer, piping.	Deep to water	Depth to rock, slope.	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
16, 17 Dardanelle	Moderate: seepage.	Severe: piping.	Deep to water	Erodes easily	Erodes easily	Erodes easily.
18 Enders	Moderate: depth to rock.	Severe: hard to pack.	Deep to water	Percs slowly, slope.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
19 Enders	Moderate: depth to rock.	Severe: hard to pack.	Deep to water	Percs slowly, slope.	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
20 Enders	Moderate: depth to rock.	Moderate: thin layer, hard to pack.	Deep to water	Percs slowly, slope.	Slope, percs slowly.	Slope, percs slowly.
21: Enders	Moderate: depth to rock.	Moderate: thin layer, hard to pack.	Deep to water	Percs slowly, slope.	Slope, percs slowly.	Slope, percs slowly.
Mountainburg	Severe: depth to rock.	Severe: large stones.	Deep to water	Slope, large stones, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.

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
22:						
Enders	Severe: slope.	Moderate: thin layer, hard to pack.	Deep to water	Percs slowly, slope.	Slope, percs slowly.	Slope, percs slowly.
Mountainburg	Severe: depth to rock, slope.	Severe: large stones.	Deep to water	Slope, large stones, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
23--- Guthrie	Slight	Severe: piping, wetness.	Percs slowly	Wetness, percs slowly, rooting depth.	Erodes easily, wetness, rooting depth.	Wetness, erodes easily, rooting depth.
24--- Guthrie	Slight	Severe: piping, wetness.	Percs slowly, flooding.	Wetness, percs slowly, rooting depth.	Erodes easily, wetness, rooting depth.	Wetness, erodes easily, rooting depth.
25:						
Kenn	Moderate: seepage.	Moderate: piping, large stones.	Deep to water	Droughty, flooding.	Large stones	Large stones, droughty.
Ceda	Severe: seepage.	Severe: seepage.	Deep to water	Flooding, droughty.	Large stones	Droughty, large stones.
26--- Leadvale	Moderate: seepage, depth to rock.	Severe: piping.	Percs slowly	Wetness, percs slowly, rooting depth.	Erodes easily, wetness.	Erodes easily, rooting depth.
27--- Leadvale	Moderate: seepage, depth to rock, slope.	Severe: piping.	Percs slowly, slope.	Wetness, percs slowly, rooting depth.	Erodes easily, wetness.	Erodes easily, rooting depth.
28--- Linker	Moderate: seepage, depth to rock.	Severe: piping.	Deep to water	Depth to rock, slope.	Depth to rock	Depth to rock.
29:						
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: thin layer, seepage.	Deep to water	Droughty, depth to rock, slope.	Large stones, depth to rock.	Large stones, droughty, depth to rock.
30--- McKamie	Moderate: seepage.	Moderate: thin layer, hard to pack.	Deep to water	Percs slowly, rooting depth, slope.	Erodes easily, percs slowly.	Erodes easily, rooting depth.
31--- Moreland	Slight	Severe: hard to pack, wetness.	Percs slowly	Wetness, slow intake, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.
32--- Mountainburg	Severe: depth to rock, seepage.	Severe: thin layer, seepage.	Deep to water	Droughty, depth to rock, slope.	Large stones, depth to rock.	Large stones, droughty, depth to rock.
33--- Mountainburg	Severe: depth to rock, seepage.	Severe: thin layer, seepage.	Deep to water	Droughty, depth to rock, slope.	Large stones, depth to rock, slope.	Large stones, slope, droughty.

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
34---------- Mountainburg	Severe: depth to rock.	Severe: large stones.	Deep to water	Slope, large stones, depth to rock.	Large stones, depth to rock.	Large stones, droughty, depth to rock.
35---------- Mountainburg	Severe: depth to rock, slope.	Severe: large stones.	Deep to water	Slope, large stones, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
36---------- Muskogee	Slight---------	Moderate: hard to pack, wetness.	Percs slowly---	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
37---------- Nella	Moderate: seepage.	Moderate: piping.	Deep to water	Slope----------	Large stones---	Favorable.
38---------- Nella	Moderate: seepage.	Moderate: piping.	Deep to water	Slope----------	Slope, large stones.	Slope.
39: Nella----------	Moderate: seepage.	Moderate: piping.	Deep to water	Slope----------	Slope, large stones.	Slope.
Enders----------	Moderate: depth to rock.	Severe: hard to pack.	Deep to water	Percs slowly, slope.	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
40: Nella----------	Severe: slope.	Moderate: piping.	Deep to water	Large stones, slope.	Slope, large stones.	Slope.
Enders----------	Severe: slope.	Moderate: thin layer, hard to pack.	Deep to water	Percs slowly, slope.	Slope, percs slowly.	Slope, percs slowly.
41: Nella----------	Severe: slope.	Moderate: piping.	Deep to water	Large stones, droughty, slope.	Slope, large stones.	Slope.
Enders----------	Severe: slope.	Moderate: thin layer, hard to pack.	Deep to water	Percs slowly, slope.	Slope, percs slowly.	Slope, percs slowly.
Mountainburg-----	Severe: depth to rock, slope.	Severe: large stones.	Deep to water	Slope, large stones, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
42---------- Pickwick	Moderate: seepage.	Severe: hard to pack.	Deep to water	Erodes easily	Erodes easily	Erodes easily.
43---------- Pickwick	Moderate: seepage.	Severe: hard to pack.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
44---------- Roellen	Slight---------	Severe: hard to pack, wetness.	Percs slowly---	Wetness, slow intake, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
45---------- Roellen	Slight---------	Severe: hard to pack, wetness.	Percs slowly, flooding.	Wetness, slow intake, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
46, 47---------- Roxana	Moderate: seepage.	Severe: piping.	Deep to water	Erodes easily	Erodes easily	Erodes easily.

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
48, 49---------- Sherless	Moderate: seepage, depth to rock.	Moderate: thin layer, piping.	Deep to water	Depth to rock, slope.	Large stones, depth to rock.	Large stones, depth to rock.
50---------- Spadra	Moderate: seepage.	Severe: piping.	Deep to water	Erodes easily, flooding.	Erodes easily	Erodes easily.
51---------- Taft	Moderate: seepage.	Severe: piping.	Percs slowly---	Wetness, percs slowly, rooting depth.	Erodes easily, wetness, rooting depth.	Wetness, erodes easily, rooting depth.
52. Udipsamments, dredged						
53---------- Wrightsville	Slight---------	Severe: wetness.	Percs slowly---	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.

TABLE 17.--ENGINEERING INDEX PROPERTIES

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated. Some soils may have Unified classifications and USDA textures in addition to those shown. In general, the dominant classifications and textures are shown]

Map symbol and soil name	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
1, 2---------- Avilla	0-7	Silt loam--------	ML, CL-ML, CL	A-4	0	100	85-100	80-90	60-80	<23	NP-10
	7-15	Silt loam, loam	ML, CL, CL-ML	A-4	0	100	85-100	80-90	60-80	<23	NP-10
	15-26	Loam, clay loam	CL, SC, CL-ML	A-4, A-6	0	100	85-100	80-90	45-80	23-38	7-15
	26-60	Loam, clay loam, sandy clay loam.	CL, SC, CL-ML	A-6, A-4	0	100	85-100	80-90	45-80	23-38	7-15
	60-72	Gravelly loam, gravelly clay loam, gravelly sandy clay loam.	SC, GC, GP-GC, SP-SC	A-2, A-4, A-6	0-10	40-90	20-85	15-60	12-50	23-38	7-15
3---------- Barling	0-12	Silt loam--------	ML	A-4	0	100	100	90-100	70-90	<20	NP-3
	12-72	Silt loam, very fine sandy loam.	ML, CL-ML	A-4	0	100	100	90-100	70-90	<25	NP-6
4---------- Bismarck	0-3	Shaly silt loam	SM, SM-SC, ML, CL-ML	A-4	0-5	55-80	50-75	45-65	40-60	<30	NP-10
	3-7	Very shaly silt loam, shaly loam, shaly silt loam.	SM, SM-SC, GC, GC-GM	A-1, A-2, A-4	0-5	35-80	25-75	20-65	20-60	<30	NP-10
	7-14	Extremely shaly silt loam, extremely shaly loam, very shaly silt loam.	GM, GM-GC, SM-SC, SM	A-1, A-2	0-10	25-70	15-50	15-40	12-35	<30	NP-10
	14-18	Weathered bedrock	---	---	---	---	---	---	---	---	---
5, 6---------- Bruno	0-7	Loamy fine sand	SM	A-2	0	100	100	50-75	15-30	---	NP
	7-72	Loamy sand, loamy fine sand.	SP-SM, SM	A-2	0	100	100	60-80	10-30	---	NP
7, 8---------- Cane	0-9	Loam----------	ML, SM, CL-ML, SM-SC	A-4	0-2	80-100	75-100	65-95	40-75	<30	NP-7
	9-26	Silty clay loam, loam, clay loam.	ML, CL-ML, CL	A-4, A-6	0-2	90-100	80-100	75-100	60-85	17-32	3-12
	26-72	Silty clay loam, loam, clay loam.	ML, CL-ML, CL	A-4, A-6	0-2	90-100	80-100	75-100	55-85	18-37	3-15
9, 10---------- Carnasaw	0-3	Gravelly silt loam.	CL, SC, GC	A-4, A-6	0-25	55-75	55-75	45-75	35-75	30-37	8-14
	3-6	Gravelly silt loam, silt loam, loam.	CL, SC, GC	A-4, A-6	0-15	65-95	60-95	45-95	35-95	30-37	8-14
	6-11	Silty clay loam	CL, CH	A-6, A-7	0-10	85-95	85-95	75-95	70-95	37-65	18-35
	11-27	Clay, silty clay	CL, CH	A-7	0-10	85-95	85-95	80-95	70-95	41-65	18-35
	27-54	Gravelly silty clay, gravelly clay, silty clay.	CL, CH	A-7	0-10	60-90	60-90	55-90	50-90	41-65	18-35
	54-59	Weathered bedrock	---	---	---	---	---	---	---	---	---

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	
11:											
Carnasaw--------	0-3	Gravelly silt loam.	CL, SC, GC	A-4, A-6	0-25	55-75	55-75	45-75	35-75	30-37	8-14
	3-6	Gravelly silt loam, silt loam, loam.	CL, SC, GC	A-4, A-6	0-15	65-95	60-95	45-95	35-95	30-37	8-14
	6-11	Silty clay loam	CL, CH	A-6, A-7	0-10	85-95	85-95	75-95	70-95	37-65	18-35
	11-27	Clay, silty clay	CL, CH	A-7	0-10	85-95	85-95	80-95	70-95	41-65	18-35
	27-54	Gravelly silty clay, gravelly clay, silty clay.	CL, CH	A-7	0-10	60-90	60-90	55-90	50-90	41-65	18-35
	54-59	Weathered bedrock	---	---	---	---	---	---	---	---	---
Sherless--------	0-3	Gravelly fine sandy loam.	SM, SC, CL, ML	A-2, A-4	0-20	70-80	70-80	45-80	25-55	<26	NP-8
	3-9	Gravelly fine sandy loam, fine sandy loam.	SM, SC, CL, ML	A-2, A-4	0-20	70-90	70-80	45-80	25-55	<26	NP-8
	9-14	Loam, clay loam, gravelly clay loam.	CL, SC	A-2, A-4, A-6	0-10	70-90	70-90	45-80	25-80	25-40	7-18
	14-36	Clay loam, sandy clay loam, gravelly clay loam.	CL, SC	A-2, A-4, A-6	0-10	70-90	70-90	45-85	25-80	25-40	7-18
	36-38	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
12, 13:											
Carnasaw--------	0-3	Stony silt loam	CL, SC, SM, ML	A-4, A-6	25-40	85-95	85-95	75-90	40-75	26-37	3-14
	3-6	Gravelly silt loam, silt loam, loam.	CL, SC, GC	A-4, A-6	0-15	65-95	60-95	45-95	35-95	30-37	8-14
	6-11	Silty clay loam	CL, CH	A-6, A-7	0-10	85-95	85-95	75-95	70-95	37-65	18-35
	11-27	Clay, silty clay	CL, CH	A-7	0-10	85-95	85-95	80-95	70-95	41-65	18-35
	27-54	Gravelly silty clay, gravelly clay, silty clay.	CL, CH	A-7	0-10	60-90	60-90	55-90	50-90	41-65	18-35
	54-59	Weathered bedrock	---	---	---	---	---	---	---	---	---
Sherless--------	0-3	Cobbly fine sandy loam.	SM, SC, CL, ML	A-2, A-4	0-20	70-90	70-90	45-80	25-55	<26	NP-8
	3-9	Gravelly fine sandy loam, fine sandy loam.	SM, SC, CL, ML	A-2, A-4	0-20	70-90	70-80	45-80	25-55	<26	NP-8
	9-14	Loam, clay loam, gravelly clay loam.	CL, SC	A-2, A-4, A-6	0-10	70-90	70-90	45-85	25-80	25-40	7-18
	14-36	Clay loam, sandy clay loam, gravelly clay loam.	CL, SC	A-2, A-4, A-6	0-10	70-90	70-90	45-85	25-80	25-40	7-18
	36-38	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

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	
12, 13:											
Clebit----------	0-3	Very stoney fine sandy loam.	GM, GM-GC	A-1, A-2	15-40	50-80	50-80	30-50	13-30	<26	NP-7
	3-14	Very gravelly loam, very gravelly fine sandy loam.	GM, GC, GM-GC	A-1, A-2, A-4, A-6	0-15	35-50	35-50	30-50	13-45	<35	NP-13
	14-18	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
14---------- Ceda	0-7	Gravelly fine sandy loam.	SM, GM, SM-SC, GM-GC	A-1, A-2, A-4	0-10	50-80	50-80	40-50	13-45	<26	NP-7
	7-72	Very gravelly loam, very gravelly fine sandy loam, extremely gravelly clay loam.	GM, GP-GM, GM-GC	A-1, A-2, A-4, A-6	0-30	15-15	15-50	10-50	5-45	<40	NP-18
15:											
Clebit----------	0-3	Very stony fine sandy loam.	GM, GM-GC	A-1, A-2	15-40	50-80	50-80	30-50	13-30	<26	NP-7
	3-14	Very gravelly loam, very gravelly fine sandy loam.	GM, GC, GM-GC	A-1, A-2, A-4, A-6	0-15	35-50	35-50	30-50	13-45	<35	NP-13
	14-18	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Carnasaw---------	0-3	Stony silt loam	CL, SC, SM, ML	A-4, A-6	25-40	85-95	85-95	75-90	40-75	26-37	3-14
	3-6	Gravelly silt loam, silt loam.	CL, SC, GC	A-4, A-6	0-15	65-95	60-95	45-95	35-95	30-37	8-14
	6-11	Silty clay loam	CL, CH	A-6, A-7	0-10	85-95	85-95	75-95	70-95	37-65	18-35
	11-27	Clay, silty clay	CL, CH	A-7	0-10	85-95	85-95	80-95	70-95	41-65	18-35
	27-54	Gravelly silty clay, gravelly clay, silty clay.	CL, CH	A-7	0-10	60-90	60-90	55-90	50-90	41-65	18-35
	54-59	Weathered bedrock	---	---	---	---	---	---	---	---	---
Sherless---------	0-3	Cobbly fine sandy loam.	SM, SC, CL, ML	A-2, A-4	0-20	70-90	70-90	45-80	25-55	<26	NP-8
	3-9	Gravelly fine sandy loam, fine sandy loam.	SM, SC, CL, ML	A-2, A-4	0-20	70-90	70-80	45-80	25-55	<26	NP-8
	9-14	Loam, clay loam, gravelly clay loam.	CL, SC	A-2, A-4, A-6	0-10	70-90	70-90	45-85	25-80	25-40	7-18
	14-36	Clay loam, sandy clay loam, gravelly clay loam.	CL, SC	A-2, A-4, A-6	0-10	70-90	70-90	45-85	25-80	25-40	7-18
	36-38	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

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	
16, 17---------- Dardanelle	0-29	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	100	100	85-100	16-30	3-11
	29-68	Silt loam, silty clay loam.	CL-ML, CL	A-4, A-6	0	100	100	100	80-100	23-38	6-15
	68-84	Silt loam, very fine sandy loam, loam.	ML, CL, CL-ML	A-4, A-6	0	100	100	100	80-100	16-38	3-15
18, 19---------- Enders	0-7	Gravelly fine sandy loam.	ML, SM, SM-SC, GM	A-2, A-4	0-15	50-95	50-75	30-70	30-60	20-35	2-10
	7-11	Clay loam, silty clay loam, silty clay.	CL	A-6	0	80-100	75-100	70-100	65-95	30-40	11-17
	11-53	Silty clay, clay	CH	A-7	0	95-100	75-100	70-100	70-95	65-80	35-45
	53-59	Silty clay, shaly silty clay, clay.	CH	A-7	0	95-100	60-100	60-100	55-95	65-80	35-45
	59-66	Weathered bedrock, unweathered bedrock.	---	---	---	---	---	---	---	---	---
20---------- Enders	0-3	Stony fine sandy loam.	SM, ML, SM-SC, CL-ML	A-2, A-4	15-40	80-90	80-90	65-75	30-60	20-35	2-10
	3-7	Stony fine sandy loam, gravelly fine sandy loam.	SM, ML, SM-SC, CL-ML	A-2, A-4	15-40	80-90	70-80	65-75	30-60	20-35	2-10
	7-11	Clay loam, silty clay loam, silty clay.	CL	A-6	0	85-100	75-100	65-85	60-80	30-40	11-17
	11-53	Silty clay, clay	CH	A-7	0	85-100	75-100	75-100	70-90	50-65	30-40
	53-59	Silty clay, shaly silty clay, shaly clay.	CH	A-7	0	65-100	60-100	30-100	25-90	50-65	30-40
	59-66	Weathered bedrock, unweathered bedrock.	---	---	---	---	---	---	---	---	---
21, 22: Enders----------	0-3	Stony fine sandy loam.	SM, ML, SM-SC, CL-ML	A-2, A-4	15-40	80-90	80-90	65-75	30-60	20-35	2-10
	3-7	Stony fine sandy loam, gravelly fine sany loam.	SM, ML, SM-SC, CL-ML	A-2, A-4	15-40	80-90	70-80	65-75	30-60	20-35	2-10
	7-11	Clay loam, silty clay loam, silty clay.	CL	A-6	0	85-100	75-100	65-85	60-80	30-40	11-17
	11-53	Silty clay, clay	CH	A-7	0	85-100	75-100	75-100	70-90	50-65	30-40
	53-59	Silty clay, shaly silty clay, shaly clay.	CH	A-7	0	65-100	60-100	30-100	25-90	50-65	30-40
	59-66	Weathered bedrock, unweathered bedrock.	---	---	---	---	---	---	---	---	---

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	
21, 22: Mountainburg----	0-9	Stony fine sandy loam.	SM	A-2	15-35	80-90	75-90	40-60	25-35	<20	NP
	9-17	Very gravelly sandy clay loam, very gravelly loam, very cobbly fine sandy loam.	GM, GC, GM-GC	A-1, A-2	5-50	40-60	35-55	25-50	20-30	<30	NP-10
	17-20	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
23, 24---------- Guthrie	0-10	Silt loam--------	ML, CL-ML	A-4	0	100	100	90-100	85-95	18-28	2-7
	10-22	Silt loam, silty clay loam.	CL-ML, CL	A-4, A-6	0	100	100	90-100	85-95	23-39	5-15
	22-72	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6, A-7	0	90-100	85-100	80-100	70-95	20-42	5-20
25: Kenn----------	0-7	Fine sandy loam	ML, SM, CL-ML, SM-SC	A-2, A-4	0	75-90	75-90	65-90	25-55	<26	NP-7
	7-24	Clay loam, sandy clay loam, gravelly clay loam.	CL, SC	A-2, A-4, A-6	0-15	50-90	50-90	35-90	15-80	25-40	8-18
	24-42	Very gravelly sandy clay loam, very gravelly clay loam.	GC, GP-GC	A-2, A-4, A-6	0-15	25-50	25-50	20-50	10-45	25-40	8-18
	42-72	Very gravelly loam, very gravelly fine sandy loam, very gravelly sandy clay loam.	GC, GM, GP-GC, GP-GM	A-1, A-2, A-4	15-40	15-50	25-50	10-50	5-45	<31	NP-10
Ceda----------	0-7	Gravelly fine sandy loam.	SM, GM, SM-SC, GM-GC	A-1, A-2, A-4	0-10	50-75	50-75	40-50	13-45	<26	NP-7
	7-72	Very gravelly loam, very gravelly fine sandy loam, extremely gravelly clay loam.	GM, GP-GM, GM-GC	A-1, A-2, A-4, A-6	0-30	15-50	15-50	10-50	5-45	<40	NP-18
26, 27---------- Leadvale	0-6	Silt loam--------	ML, CL-ML, CL	A-4	0	100	85-100	85-95	65-85	18-32	2-10
	6-25	Silt loam, silty clay loam.	CL-ML, CL, ML	A-4, A-6	0	100	85-100	90-98	75-90	22-36	3-14
	25-51	Silt loam, silty clay loam.	CL-ML, CL	A-4, A-6, A-7	0	100	85-100	80-98	70-90	23-42	3-18
	51-72	Silty clay loam, silty clay.	CL, MH, CH	A-6, A-7	0-5	90-100	85-100	85-95	70-90	32-58	12-26

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	
28---------- Linker	0-6	Fine sandy loam	SM, ML, SM-SC, CL-ML	A-4	0	85-100	80-100	70-100	40-70	<30	NP-7
	6-28	Clay loam, sandy clay loam, loam.	CL, SC, SM, ML	A-4, A-6	0-10	90-100	85-100	70-100	40-80	<40	NP-18
	28-36	Gravelly sandy clay loam, gravelly fine sandy loam, loam.	CL, SC, GC, ML	A-4, A-6	0-10	70-100	65-100	35-100	30-80	<40	NP-18
	36-38	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
29: Linker----------	0-6	Fine sandy loam	SM, ML SM-SC, CL-ML	A-4	0	85-100	80-100	70-100	40-70	<30	NP-7
	6-28	Clay loam, sandy clay loam, loam.	CL, SC, SM, ML	A-4, A-6	0-10	90-100	85-100	70-100	40-80	<40	NP-18
	28-36	Gravelly sandy clay loam, gravelly fine sandy loam, loam.	CL, SC, GC, ML	A-4, A-6	0-10	70-100	65-100	35-100	30-80	<40	NP-18
	36-38	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Mountainburg----	0-9	Gravelly fine sandy loam.	GM, SM	A-1, A-2	0-15	60-80	50-75	20-40	15-30	---	NP
	9-17	Very gravelly sandy clay loam, very gravelly fine sandy loam, very gravelly loam.	GM, GC, GP-GM, GM-GC	A-1, A-2	0-15	40-60	30-50	25-50	10-25	<30	NP-10
	17-19	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
30---------- McKamie	0-4	Silt loam--------	CL, CL-ML	A-6, A-4	0	100	100	95-100	80-100	20-40	5-22
	4-59	Clay, silty clay	CH, CL	A-7	0	100	100	95-100	80-100	45-70	22-40
	59-72	Silty clay loam, silt loam, fine sandy loam.	CL, CL-ML	A-4, A-6	0	100	94-100	88-100	50-95	20-40	5-22
31---------- Moreland	0-7	Silty clay-------	CH	A-7	0	100	95-100	90-100	90-100	51-74	25-45
	7-55	Clay, silty clay	CH	A-7	0	100	95-100	90-100	90-100	51-74	25-45
	55-72	Clay, silty clay loam, silty clay.	CH, CL	A-7, A-6	0	100	100	100	90-100	35-74	25-45
32, 33---------- Mountainburg	0-9	Gravelly fine sandy loam.	GM, SM	A-1, A-2	0-15	60-80	50-75	20-40	15-30	---	NP
	9-17	Very gravelly sandy clay loam, very gravelly fine sandy loam, very gravelly loam.	GM, GC, GP-GM, GM-GC	A-1, A-2	0-15	40-60	30-50	25-50	10-25	<30	NP-10
	17-19	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

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	
34, 35---------- Mountainburg	0-9	Stony fine sandy loam.	SM	A-2	15-35	80-90	75-90	40-60	25-35	<20	NP
	9-17	Very gravelly sandy clay loam, very gravelly loam, very cobbly fine sandy loam.	GM, GC, GM-GC	A-1, A-2	5-50	40-60	35-55	25-50	20-30	<30	NP-10
	17-19	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
36---------- Muskogee	0-9	Silt loam--------	ML, CL, CL-ML	A-4	0	100	100	95-100	85-100	18-30	1-10
	9-24	Silty clay loam, silt loam.	CL, CH	A-6, A-7	0	100	100	95-100	90-100	35-55	15-30
	24-72	Silty clay, clay	CH	A-7	0	100	100	95-100	90-100	55-70	30-40
37, 38---------- Nella	0-3	Gravelly fine sandy loam.	ML, CL, GM, SM	A-4, A-2	0-10	65-90	60-80	55-65	30-55	<30	NP-8
	3-7	Gravelly fine sandy loam, loam, cobbly fine sandy loam.	ML, CL, GM, SM	A-2, A-4	0-25	65-90	60-80	55-65	30-55	<30	NP-8
	7-14	Cobbly clay loam, clay loam, gravelly loam.	CL, SC, CL-ML, SM-SC	A-4, A-6, A-2	0-30	75-95	60-90	45-70	30-60	25-40	6-20
	14-72	Cobbly clay loam, gravelly clay loam, sandy clay loam.	SC, CL, GC	A-4, A-6, A-7	0-25	85-95	65-90	65-80	40-65	30-55	8-27
39: Nella----------	0-3	Gravelly fine sandy loam.	ML, CL, GM, SM	A-4, A-2	0-10	65-90	60-80	55-65	30-55	<30	NP-8
	3-7	Gravelly fine sandy loam, loam, cobbly fine sandy loam.	ML, CL, GM, SM	A-2, A-4	0-25	65-90	60-80	55-65	30-55	<30	NP-8
	7-14	Cobbly clay loam, clay loam, gravelly loam.	CL, SC, CL-ML, SM-SC	A-4, A-6, A-2	0-30	75-95	60-90	45-70	30-60	25-40	6-20
	14-72	Cobbly clay loam, gravelly sandy clay loam, sandy clay loam.	SC, CL, GC	A-4, A-6, A-7	0-25	85-95	65-90	65-80	40-65	30-55	8-27
Enders----------	0-7	Gravelly fine sandy loam.	ML, SM, SM-SC, GM	A-2, A-4	0-15	50-95	50-75	30-70	30-60	20-35	2-10
	7-11	Clay loam, silty clay loam, silty clay.	CL	A-6	0	80-100	75-100	70-100	65-95	30-40	11-17
	11-53	Silty clay, clay	CH	A-7	0	95-100	75-100	70-100	70-95	65-80	35-45
	53-59	Silty clay, shaly silty clay, clay.	CH	A-7	0	95-100	70-100	70-100	55-95	65-80	35-45
	59-66	Weathered bedrock, unweathered bedrock.	---	---	---	---	---	---	---	---	---

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	
40:											
Nella	0-3	Stony fine sandy loam.	ML, CL, SM, SC	A-4	10-30	90-100	85-90	65-75	36-55	<30	NP-8
	3-7	Cobbly fine sandy loam, loam, gravelly fine sandy loam.	ML, CL, GM, SM	A-2, A-4	0-25	65-90	60-80	55-65	30-55	<30	NP-8
	7-14	Gravelly loam, cobbly loam, clay loam.	CL, SC, CL-ML, SM-SC	A-4, A-6, A-2	0-30	75-95	60-90	45-70	30-60	25-40	6-20
	14-72	Gravelly clay loam, gravelly sandy clay loam, clay loam.	SC, CL, GC	A-4, A-6, A-7	0-25	85-95	65-90	65-80	40-65	30-55	8-27
Enders	0-3	Stony fine sandy loam.	SM, ML, SM-SC, CL-ML	A-2, A-4	15-40	80-90	50-90	50-75	30-60	20-35	2-10
	3-7	Stony fine sandy loam, gravelly fine sandy loam.	SM, ML, SM-SC, CL-ML	A-2, A-4	15-40	80-90	70-80	65-75	30-60	20-35	2-10
	7-11	Stony silty clay loam, silty clay loam, silty clay.	CL	A-6	0	85-100	75-100	65-85	60-80	30-40	11-17
	11-53	Silty clay, clay	CH	A-7	0	85-100	75-100	75-100	70-90	50-65	30-40
	53-59	Silty clay, shaly silty clay, shaly clay.	CH	A-7	0	65-100	60-100	30-100	25-90	50-65	30-40
	59-66	Weathered bedrock, unweathered bedrock.	---	---	---	---	---	---	---	---	---
41:											
Nella	0-3	Stony fine sandy loam.	ML, CL, SM, SC	A-4	10-30	90-100	85-90	65-75	36-55	<30	NP-8
	3-7	Cobbly fine sandy loam, loam, gravelly fine sandy loam.	ML, CL, GM, SM	A-2, A-4	0-25	65-90	60-80	55-65	30-55	<30	NP-8
	7-14	Gravelly loam, cobbly loam, clay loam.	CL, SC, CL-ML, SM-SC	A-4, A-6, A-2	0-30	75-95	60-90	45-70	30-60	25-40	6-20
	14-72	Gravelly clay loam, gravelly sandy clay loam, clay loam.	SC, CL, GC	A-4, A-6, A-7	0-25	85-95	65-90	65-80	40-65	30-55	8-27

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	
41:											
Enders	0-3	Stony fine sandy loam.	SM, ML, SM-SC, CL-ML	A-2, A-4	15-40	80-90	80-90	65-75	30-60	20-35	2-10
	3-7	Stony fine sandy loam, gravelly loam, fine sandy loam.	SM, ML, SM-SC, CL-ML	A-2, A-4	15-40	80-90	70-80	65-75	30-60	20-35	2-10
	7-11	Stony silty clay loam, silty clay loam, silty clay.	CL	A-6	0	85-100	75-100	65-85	60-80	30-40	11-17
	11-53	Silty clay, clay	CH	A-7	0	85-100	75-100	75-100	70-90	50-65	30-40
	53-59	Silty clay, shaly silty clay, shaly clay.	CH	A-7	0	65-100	60-100	30-100	25-90	50-65	30-40
	59-66	Weathered bedrock, unweathered bedrock.	---	---	---	---	---	---	---	---	---
Mountainburg	0-9	Stony fine sandy loam.	SM	A-2	15-35	70-90	65-90	40-60	25-35	<20	NP
	9-17	Very gravelly sandy clay loam, very gravelly loam, very cobbly fine sandy loam.	GM, GC, GM-GC	A-1, A-2	5-50	40-60	25-55	25-50	20-30	<30	NP-10
	17-19	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
42, 43 Pickwick	0-6	Silt loam	ML, CL-ML, CL	A-4, A-6	0	100	95-100	90-100	70-95	18-32	2-11
	6-38	Silty clay loam, silt loam.	CL	A-6, A-7	0	95-100	95-100	90-100	75-95	30-42	11-17
	38-72	Silty clay loam, clay loam.	CL	A-6, A-7	0-5	80-100	75-100	65-95	55-80	33-49	12-22
44, 45 Roellen	0-7	Silty clay	CL, CH	A-7	0	100	100	95-100	90-100	45-65	20-40
	7-20	Silty clay, clay	CL, CH	A-7	0	100	100	95-100	90-100	45-65	20-40
	20-44	Clay, silty clay	CH	A-7	0	100	100	95-100	90-100	55-80	30-50
	44-72	Clay, silty clay	CH, CL	A-7, A-6	0	100	95-100	80-100	60-95	30-80	10-50
46, 47 Roxana	0-7	Silt loam	ML, CL-ML	A-4	0	100	100	85-100	50-75	<27	NP-7
	7-72	Silt loam, very fine sandy loam, loamy very fine sand.	ML, CL-ML	A-4	0	100	100	85-100	50-85	<27	NP-7
48 Sherless	0-3	Fine sandy loam	SM, SC, CL, ML	A-2, A-4	0-20	70-90	70-90	45-80	25-55	<26	NP-8
	3-9	Gravelly fine sandy loam, fine sandy loam.	SM, SC, CL, ML	A-2, A-4	0-20	70-90	70-90	45-85	25-80	25-40	7-18
	9-14	Loam, clay loam, gravelly clay loam.	CL, SC	A-2, A-4, A-6	0-10	70-90	70-90	45-85	25-80	25-40	7-18
	14-36	Clay loam, sandy clay loam, gravelly clay loam.	CL, SC	A-2, A-4, A-6	0-10	70-90	70-90	45-85	25-80	25-40	7-18
	36-38	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

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	
49---------- Sherless	0-3	Gravelly fine sandy loam.	SM, SC, CL, ML	A-2, A-4	0-20	70-80	70-80	45-80	25-55	<26	NP-8
	3-9	Gravelly fine sandy loam, fine sandy loam.	SM, SC, CL, ML	A-2, A-4	0-20	70-90	70-90	45-85	25-80	25-40	7-18
	9-14	Loam, clay loam, gravelly clay loam.	CL, SC	A-2, A-4, A-6	0-10	70-90	70-90	45-85	25-80	25-40	7-18
	14-36	Clay loam, sandy clay loam, gravelly clay loam.	CL, SC	A-2, A-4, A-6	0-10	70-90	70-90	45-85	25-80	25-40	7-18
	36-38	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
50---------- Spadra	0-6	Fine sandy loam	ML, SM	A-2, A-4	0	85-100	85-100	65-100	30-75	<20	NP-3
	6-52	Loam, sandy clay loam.	CL, CL-ML, ML	A-4, A-6	0	90-100	85-100	80-95	55-75	25-40	NP-15
	52-72	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
51---------- Taft	0-14	Silt loam--------	CL-ML, ML, CL	A-4	0	100	95-100	90-100	75-95	18-30	2-10
	14-23	Silt loam, silty clay loam.	CL-ML, CL	A-4, A-6	0	100	95-100	95-100	85-95	23-38	5-16
	23-26	Silt loam, silt	CL-ML, ML, CL	A-4	0	100	95-100	90-100	75-95	18-30	2-10
	26-60	Silt loam, silty clay loam.	CL-ML, CL	A-4, A-6, A-7	0	95-100	90-100	85-100	80-95	23-42	5-20
	60-72	Silty clay loam, silty clay.	ML, GC, CL	A-6, A-7	0	95-100	90-100	80-90	70-85	35-48	12-22
52. Udipsamments, dredged											
53---------- Wrightsville	0-4	Silt loam--------	ML, CL, CL-ML	A-4	0	100	95-100	90-100	75-100	<31	NP-10
	4-18	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	95-100	95-100	85-100	23-38	5-16
	18-72	Silty clay, clay, silty clay loam.	CH, CL	A-7	0	100	100	95-100	90-100	41-65	22-40

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/cc	In/hr	In/in	pH				Pct
1, 2----------	0-15	18-27	1.30-1.50	0.6-2.0	0.10-0.24	4.5-6.5	Low----------	0.24	4	.5-1
Avilla	15-60	20-35	1.25-1.50	0.6-2.0	0.12-0.20	4.5-5.5	Low----------	0.28		
	60-72	25-40	1.25-1.45	0.6-6.0	0.04-0.15	4.5-5.5	Low----------	0.24		
3----------	0-18	8-17	1.25-1.60	0.6-2.0	0.13-0.24	5.1-6.5	Low----------	0.37	5	1-3
Barling	18-72	10-17	1.25-1.55	0.6-2.0	0.13-0.24	4.5-6.5	Low----------	0.37		
4----------	0-3	10-18	1.30-1.50	0.6-2.0	0.11-0.17	4.5-6.0	Low----------	0.32	1	.5-2
Bismarck	3-14	12-20	1.30-1.50	0.6-2.0	0.03-0.13	4.5-6.0	Low----------	0.28		
	14-18	---	---	---	---	---	----------	----		
5, 6----------	0-7	4-8	1.40-1.60	6.0-20	0.05-0.10	5.1-8.4	Low----------	0.17	5	.5-2
Bruno	7-72	2-8	1.40-1.60	6.0-20	0.05-0.10	5.1-8.4	Low----------	0.17		
7, 8----------	0-9	7-18	1.45-1.65	0.6-2.0	0.10-0.18	5.1-6.5	Low----------	0.28	3	.5-1
Cane	9-26	18-35	1.55-1.75	0.6-2.0	0.14-0.19	4.5-6.0	Low----------	0.37		
	26-72	18-35	1.60-1.80	0.06-0.2	0.05-0.08	4.5-6.0	Low----------	0.37		
9, 10----------	0-6	15-26	1.30-1.60	0.6-2.0	0.08-0.20	4.5-6.0	Low----------	0.32	4	.5-2
Carnasaw	6-11	35-40	1.45-1.70	0.2-0.6	0.12-0.20	4.5-5.5	High---------	0.37		
	11-27	40-65	1.35-1.60	0.06-0.2	0.12-0.18	4.5-5.5	High---------	0.32		
	27-54	40-65	1.35-1.60	0.06-0.2	0.07-0.15	4.5-5.5	High---------	0.32		
	54-59	---	---	---	---	---	----------	----		
11:										
Carnasaw---------	0-6	15-26	1.30-1.60	0.6-2.0	0.08-0.20	4.5-6.0	Low----------	0.32	4	.5-2
	6-11	35-40	1.45-1.70	0.2-0.6	0.12-0.20	4.5-5.5	High---------	0.37		
	11-27	40-65	1.35-1.60	0.06-0.2	0.12-0.18	4.5-5.5	High---------	0.32		
	27-54	40-65	1.35-1.60	0.06-0.2	0.07-0.15	4.5-5.5	High---------	0.32		
	54-59	---	---	---	---	---	----------	----		
Sherless---------	0-9	5-18	1.30-1.60	2.0-6.0	0.07-0.11	4.5-7.3	Low----------	0.24	3	.5-1
	9-36	20-35	1.45-1.70	0.6-2.0	0.09-0.18	4.5-5.5	Low----------	0.28		
	36-38	---	---	---	---	---	----------	----		
12, 13:										
Carnasaw---------	0-6	15-26	1.30-1.60	0.6-2.0	0.10-0.20	4.5-6.0	Low----------	0.24	4	.5-2
	6-11	35-40	1.45-1.70	0.2-0.6	0.12-0.20	4.5-5.5	High---------	0.37		
	11-27	40-60	1.35-1.60	0.06-0.2	0.12-0.18	4.5-5.5	High---------	0.32		
	27-54	40-60	1.35-1.60	0.06-0.2	0.07-0.15	4.5-5.5	High---------	0.32		
	54-59	---	---	---	---	---	----------	----		
Sherless---------	0-9	5-18	1.30-1.60	2.0-6.0	0.07-0.11	4.5-7.3	Low----------	0.24	3	.5-1
	9-36	20-35	1.45-1.70	0.6-2.0	0.09-0.18	4.5-5.5	Low----------	0.28		
	36-38	---	---	---	---	---	----------	----		
Clebit----------	0-3	10-20	1.30-1.60	2.0-6.0	0.04-0.08	4.5-6.5	Low----------	0.17	1	.5-1
	3-14	10-20	1.30-1.60	2.0-6.0	0.04-0.10	4.5-6.5	Low----------	0.28		
	14-18	---	---	---	---	---	----------	----		
14----------	0-7	10-18	1.30-1.60	6.0-20	0.05-0.12	5.6-6.5	Low----------	0.17	5	.5-1
Ceda	7-72	15-32	1.40-1.70	6.0-20	0.02-0.16	5.6-6.5	Low----------	0.28		

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/cc	In/hr	In/in	pH				Pct
15:										
Clebit----------	0-3	10-20	1.30-1.60	2.0-6.0	0.04-0.08	4.5-6.5	Low----------	0.17	1	.5-1
	3-14	10-20	1.30-1.60	2.0-6.0	0.04-0.10	4.5-6.5	Low----------	0.28		
	14-18	---	---	---	---	---	----------	----		
Carnasaw--------	0-6	15-26	1.30-1.60	0.6-2.0	0.10-0.20	4.5-6.0	Low----------	0.24	4	.5-2
	6-11	35-40	1.45-1.70	0.2-0.6	0.12-0.20	4.5-5.5	High---------	0.37		
	11-27	40-60	1.35-1.60	0.06-0.2	0.12-0.18	4.5-5.5	High---------	0.32		
	27-54	40-60	1.35-1.60	0.06-0.2	0.07-0.15	4.5-5.5	High---------	0.32		
	54-59	---	---	---	---	---	----------	----		
Sherless--------	0-9	5-18	1.30-1.60	2.0-6.0	0.07-0.11	4.5-7.3	Low----------	0.24	3	.5-1
	9-36	20-35	1.45-1.70	0.6-2.0	0.09-0.18	4.5-5.5	Low----------	0.28		
	36-38	---	---	---	---	---	----------	----		
16, 17----------	0-29	10-25	1.25-1.50	0.6-2.0	0.13-0.24	5.6-7.3	Low----------	0.37	5	2-4
Dardanelle	29-68	20-35	1.25-1.60	0.6-2.0	0.15-0.24	5.1-7.3	Moderate-----	0.32		
	68-84	10-25	1.25-1.60	0.6-2.0	0.13-0.24	5.6-8.4	Low----------	0.32		
18, 19----------	0-7	10-20	1.25-1.60	0.6-2.0	0.07-0.15	3.6-5.5	Low----------	0.32	3	.5-2
Enders	7-11	15-45	1.25-1.60	0.2-0.6	0.15-0.22	3.6-5.5	Low----------	0.43		
	11-53	40-60	1.15-1.45	<0.06	0.12-0.18	3.6-5.5	High---------	0.37		
	53-59	40-60	1.20-1.45	<0.06	0.08-0.10	3.6-5.5	Moderate-----	0.37		
	59-66	---	---	---	---	---	----------	----		
20----------	0-3	10-20	1.25-1.60	0.6-2.0	0.07-0.15	3.6-5.5	Low----------	0.32	3	.5-2
Enders	3-7	10-20	1.25-1.60	0.6-2.0	0.07-0.15	3.6-5.5	Low----------	0.32		
	7-11	15-45	1.25-1.45	0.2-0.6	0.15-0.20	3.6-5.5	Low----------	0.28		
	11-53	40-60	1.25-1.45	<0.06	0.12-0.18	3.6-5.5	High---------	0.24		
	53-59	40-60	1.25-1.45	<0.06	0.11-0.13	3.6-5.5	Moderate-----	0.24		
	59-66	---	---	---	---	---	----------	----		
21, 22:										
Enders----------	0-3	10-20	1.25-1.60	0.6-2.0	0.07-0.15	3.6-5.5	Low----------	0.32	3	.5-2
	3-7	10-20	1.25-1.60	0.6-2.0	0.07-0.15	3.6-5.5	Low----------	0.32		
	7-11	15-45	1.25-1.45	0.2-0.6	0.15-0.20	3.6-5.5	Low----------	0.28		
	11-53	40-60	1.25-1.45	<0.06	0.12-0.18	3.6-5.5	High---------	0.24		
	53-59	40-60	1.25-1.45	<0.06	0.11-0.13	3.6-5.5	Moderate-----	0.24		
	59-66	---	---	---	---	---	----------	----		
Mountainburg----	0-9	5-15	1.30-1.60	2.0-6.0	0.05-0.10	4.5-6.0	Low----------	0.17	1	1-3
	9-17	10-30	1.30-1.55	2.0-6.0	0.05-0.10	4.5-5.5	Low----------	0.24		
	17-20	---	---	---	---	---	----------	----		
23, 24----------	0-10	10-25	1.35-1.55	0.6-2.0	0.20-0.22	3.6-5.0	Low----------	0.43	3	1-4
Guthrie	10-22	18-30	1.40-1.60	0.6-2.0	0.18-0.20	3.6-5.0	Low----------	0.43		
	22-72	18-32	1.60-1.75	0.06-0.2	0.03-0.05	3.6-5.0	Low----------	0.43		
25:										
Kenn----------	0-7	10-20	1.30-1.60	0.6-2.0	0.10-0.18	5.1-6.5	Low----------	0.24	5	.5-2
	7-24	20-30	1.45-1.70	0.6-2.0	0.06-0.18	4.5-5.5	Moderate-----	0.28		
	24-42	20-30	1.45-1.70	0.6-2.0	0.02-0.10	4.5-5.5	Moderate-----	0.28		
	42-72	10-25	1.40-1.70	0.6-2.0	0.02-0.05	4.5-5.5	Low----------	0.32		
Ceda----------	0-7	10-18	1.30-1.60	6.0-20	0.05-0.12	5.6-6.5	Low----------	0.17	5	.5-1
	7-72	15-32	1.40-1.70	6.0-20	0.02-0.16	5.6-6.5	Low----------	0.28		

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/cc	In/hr	In/in	pH				Pct
26, 27----------	0-6	12-22	1.30-1.40	0.6-2.0	0.17-0.22	4.5-5.5	Low----------	0.43	3	1-4
Leadvale	6-25	20-32	1.30-1.50	0.6-2.0	0.17-0.20	4.5-5.5	Low----------	0.43		
	25-51	20-35	1.55-1.70	0.06-0.6	0.06-0.11	4.5-5.5	Low----------	0.43		
	51-72	30-45	1.40-1.60	0.06-0.6	0.06-0.11	4.5-5.5	Low----------	0.24		
28----------	0-6	5-20	1.30-1.60	0.6-2.0	0.11-0.20	3.6-5.5	Low----------	0.28	3	.5-3
Linker	6-28	18-35	1.30-1.60	0.6-2.0	0.11-0.20	3.6-5.5	Low----------	0.32		
	28-36	18-35	1.30-1.60	0.6-2.0	0.08-0.20	3.6-5.5	Low----------	0.28		
	36-38	---	---	---	---	---	----------	----		
29:										
Linker----------	0-6	5-20	1.30-1.60	0.6-2.0	0.11-0.20	3.6-5.5	Low----------	0.28	3	.5-3
	6-28	18-35	1.30-1.60	0.6-2.0	0.11-0.20	3.6-5.5	Low----------	0.32		
	28-36	18-35	1.30-1.60	0.6-2.0	0.08-0.20	3.6-5.5	Low----------	0.28		
	36-38	---	---	---	---	---	----------	----		
Mountainburg----	0-9	3-10	1.40-1.60	2.0-6.0	0.05-0.10	5.1-6.0	Low----------	0.20	1	.5-1
	9-17	15-25	1.50-1.70	2.0-6.0	0.05-0.10	4.5-5.5	Low----------	0.17		
	17-19	---	---	---	---	---	----------	----		
30----------	0-4	18-27	1.42-1.76	0.6-2.0	0.16-0.22	5.1-6.5	Moderate-----	0.37	5	.5-2
McKamie	4-59	40-60	1.20-1.45	<0.06	0.18-0.20	4.5-6.0	High---------	0.32		
	59-72	14-35	1.40-1.76	0.2-2.0	0.14-0.22	4.5-8.4	Moderate-----	0.37		
31----------	0-7	40-50	1.20-1.50	<0.06	0.18-0.20	6.1-7.8	Very high----	0.32	5	2-4
Moreland	7-55	40-60	1.20-1.45	<0.06	0.18-0.20	6.6-8.4	High---------	0.32		
	55-72	35-60	1.20-1.75	<0.2	0.18-0.21	6.6-8.4	Very high----	0.32		
32, 33----------	0-9	3-10	1.40-1.60	2.0-6.0	0.05-0.10	5.1-6.0	Low----------	0.20	1	.5-1
Mountainburg	9-17	15-25	1.50-1.70	2.0-6.0	0.05-0.10	4.5-5.5	Low----------	0.17		
	17-19	---	---	---	---	---	----------	----		
34, 35----------	0-9	5-15	1.30-1.60	2.0-6.0	0.05-0.10	4.5-6.0	Low----------	0.17	1	1-3
Mountainburg	9-17	10-30	1.30-1.55	2.0-6.0	0.05-0.10	4.5-5.5	Low----------	0.24		
	17-19	---	---	---	---	---	----------	----		
36----------	0-9	10-27	1.25-1.50	0.6-2.0	0.16-0.24	4.5-6.0	Low----------	0.43	5	2-4
Muskogee	9-24	20-40	1.25-1.45	0.2-0.6	0.16-0.24	4.5-6.0	Moderate-----	0.37		
	24-72	40-55	1.20-1.45	0.06-0.2	0.14-0.18	4.5-7.8	High---------	0.32		
37, 38----------	0-7	12-20	1.30-1.45	2.0-6.0	0.08-0.15	4.5-5.5	Low----------	0.15	5	.5-3
Nella	7-24	22-35	1.35-1.55	0.6-2.0	0.08-0.15	4.5-5.5	Low----------	0.15		
	24-72	27-40	1.30-1.45	0.6-2.0	0.07-0.14	4.5-5.5	Low----------	0.15		
39:										
Nella----------	0-7	12-20	1.30-1.45	2.0-6.0	0.08-0.15	4.5-5.5	Low----------	0.15	5	.5-3
	7-24	22-35	1.35-1.55	0.6-2.0	0.08-0.15	4.5-5.5	Low----------	0.15		
	24-72	27-40	1.30-1.45	0.6-2.0	0.07-0.14	4.5-5.5	Low----------	0.15		
Enders----------	0-7	10-20	1.25-1.60	0.6-2.0	0.07-0.15	3.6-5.5	Low----------	0.32	3	2-4
	7-11	15-45	1.25-1.60	0.2-0.6	0.15-0.22	3.6-5.5	Low----------	0.43		
	11-53	40-60	1.15-1.45	<0.06	0.12-0.18	3.6-5.5	High---------	0.37		
	53-59	40-60	1.20-1.45	<0.06	0.08-0.10	3.6-5.5	Moderate-----	0.37		
	59-66	---	---	---	---	---	----------	----		
40:										
Nella----------	0-7	12-20	1.30-1.45	2.0-6.0	0.08-0.15	4.5-5.5	Low----------	0.15	5	.5-3
	7-14	22-35	1.35-1.55	0.6-2.0	0.07-0.14	4.5-5.5	Low----------	0.15		
	14-72	27-40	1.35-1.55	0.6-2.0	0.08-0.15	4.5-5.5	Low----------	0.15		

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/cc	In/hr	In/in	pH				Pct
40:										
Enders----------	0-3	10-20	1.25-1.60	0.6-2.0	0.07-0.15	3.6-5.5	Low----------	0.32	3	.5-2
	3-7	10-20	1.25-1.60	0.6-2.0	0.07-0.15	3.6-5.5	Low----------	0.32		
	7-11	15-45	1.25-1.45	0.2-0.6	0.15-0.20	3.6-5.5	Low----------	0.28		
	11-53	40-60	1.25-1.45	<0.06	0.12-0.18	3.6-5.5	High---------	0.24		
	53-59	40-60	1.25-1.45	<0.06	0.11-0.13	3.6-5.5	Moderate-----	0.24		
	59-66	---	---	---	---	---	----------	----		
41:										
Nella----------	0-7	12-20	1.30-1.45	2.0-6.0	0.08-0.15	4.5-5.5	Low----------	0.15	5	.5-3
	7-14	22-35	1.35-1.55	0.6-2.0	0.07-0.14	4.5-5.5	Low----------	0.15		
	14-72	27-40	1.35-1.55	0.6-2.0	0.08-0.15	4.5-5.5	Low----------	0.15		
Enders----------	0-3	10-20	1.25-1.60	0.6-2.0	0.07-0.15	3.6-5.5	Low----------	0.32	3	.5-2
	3-7	10-20	1.25-1.60	0.6-2.0	0.07-0.15	3.6-5.5	Low----------	0.32		
	7-11	15-45	1.25-1.45	0.2-0.6	0.15-0.20	3.6-5.5	Low----------	0.28		
	11-53	40-60	1.25-1.45	<0.06	0.12-0.18	3.6-5.5	High---------	0.24		
	53-59	40-60	1.25-1.45	<0.06	0.11-0.13	3.6-5.5	Moderate-----	0.24		
	59-66	---	---	---	---	---	----------	----		
Mountainburg----	0-9	5-15	1.30-1.60	2.0-6.0	0.05-0.10	4.5-6.0	Low----------	0.17	1	1-3
	9-17	10-30	1.30-1.55	2.0-6.0	0.05-0.10	4.5-5.5	Low----------	0.24		
	17-19	---	---	---	---	---	----------	----		
42, 43----------	0-6	12-22	1.30-1.50	0.6-2.0	0.20-0.23	4.5-5.5	Low----------	0.43	5	.5-3
Pickwick	6-38	22-35	1.40-1.65	0.6-2.0	0.19-0.22	4.5-5.5	Low----------	0.37		
	38-72	32-40	1.50-1.70	0.6-2.0	0.15-0.20	4.5-5.5	Moderate-----	0.37		
44, 45----------	0-20	40-50	1.40-1.55	0.06-0.2	0.15-0.19	5.6-7.8	High---------	0.32	5	3-6
Roellen	20-44	40-60	1.40-1.55	0.06-0.2	0.14-0.17	5.6-7.8	High---------	0.37		
	44-72	40-60	1.40-1.60	0.06-0.2	0.14-0.20	5.6-7.8	High---------	0.37		
46, 47----------	0-7	5-27	1.35-1.80	0.6-2.0	0.10-0.21	6.1-8.4	Low----------	0.43	5	.5-2
Roxana	7-72	10-18	1.35-1.80	0.6-2.0	0.10-0.19	6.6-8.4	Low----------	0.37		
48, 49----------	0-9	5-18	1.30-1.60	2.0-6.0	0.07-0.11	4.5-7.3	Low----------	0.24	3	.5-1
Sherless	9-36	20-35	1.45-1.70	0.6-2.0	0.09-0.18	4.5-5.5	Low----------	0.28		
	36-38	---	---	---	---	---	----------	----		
50----------	0-6	10-20	1.30-1.60	0.6-2.0	0.11-0.24	4.5-6.0	Low----------	0.37	5	1-3
Spadra	6-52	18-32	1.30-1.60	0.6-2.0	0.12-0.20	4.5-6.0	Low----------	0.37		
	52-72	15-25	1.30-1.60	0.6-2.0	0.10-0.15	4.5-6.0	Low----------	0.24		
51----------	0-14	10-25	1.30-1.40	0.6-2.0	0.20-0.22	4.5-5.5	Low----------	0.43	3	2-4
Taft	14-23	18-35	1.30-1.50	0.6-2.0	0.18-0.20	4.5-5.5	Low----------	0.43		
	23-26	8-20	1.30-1.50	0.6-2.0	0.20-0.22	4.5-5.5	Low----------	0.43		
	26-60	15-35	1.50-1.65	0.06-0.2	0.03-0.07	4.5-5.5	Low----------	0.43		
	60-72	8-45	1.35-1.60	0.2-0.6	0.01-0.03	4.5-5.5	Low----------	0.37		
52. Udipsamments, dredged										
53----------	0-4	10-25	1.25-1.50	0.2-0.6	0.16-0.24	3.6-5.5	Low----------	0.49	5	.5-2
Wrightsville	4-18	20-35	1.30-1.50	0.2-0.6	0.16-0.22	4.5-5.5	Low----------	0.43		
	18-72	35-55	1.20-1.45	<0.06	0.14-0.22	3.6-6.0	High---------	0.37		
	49-72	20-45	1.20-1.50	<0.06	0.14-0.22	3.6-8.4	High---------	0.43		

TABLE 19.--SOIL AND WATER FEATURES

["Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated]

Map symbol and soil name	Hydrologic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					Ft			In			
1, 2--Avilla	B	None	---	---	>6.0	---	---	>60	---	Low	Moderate.
3--Barling	C	Occasional	Very brief	Dec-Apr	1.0-4.0	Perched	Dec-Apr	>60	---	Moderate	Moderate.
4--Bismarck	D	None	---	---	>6.0	---	---	10-20	Soft	Moderate	Moderate.
5--Bruno	A	None	---	---	---	---	---	>60	---	Low	Low.
6--Bruno	A	Occasional	Brief	Dec-Jun	---	---	---	>60	---	Low	Low.
7, 8--Cane	C	None	---	---	2.0-3.0	Perched	Dec-Mar	>60	---	Moderate	High.
9, 10--Carnasaw	C	None	---	---	>6.0	---	---	40-60	Soft	High	High.
11:											
Carnasaw	C	None	---	---	>6.0	---	---	40-60	Soft	High	High.
Sherless	B	None	---	---	>6.0	---	---	20-40	Soft	Moderate	Moderate.
12, 13:											
Carnasaw	C	None	---	---	>6.0	---	---	40-60	Soft	High	High.
Sherless	B	None	---	---	>6.0	---	---	20-40	Soft	Moderate	Moderate.
Clebit	D	None	---	---	>6.0	---	---	10-20	Hard	Low	Moderate.
14--Ceda	B	Frequent	Very brief	Jan-May	>6.0	---	---	>60	---	Low	Moderate.
15:											
Clebit	D	None	---	---	>6.0	---	---	10-20	Hard	Low	Moderate.
Carnasaw	C	None	---	---	>6.0	---	---	40-60	Soft	High	High.
Sherless	B	None	---	---	>6.0	---	---	20-40	Soft	Moderate	Moderate.
16, 17--Dardanelle	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
18, 19, 20--Enders	C	None	---	---	>6.0	---	---	40-60	Soft	High	High.
21, 22:											
Enders	C	None	---	---	>6.0	---	---	40-60	Soft	High	High.
Mountainburg	D	None	---	---	>6.0	---	---	12-20	Hard	Low	Moderate.
23--Guthrie	D	None	---	---	0.5-1.0	Perched	Dec-Apr	>60	---	High	High.

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			
24---------- Guthrie	D	Occasional	Very brief	Dec-Apr	0.5-1.0	Perched	Dec-Apr	>60	---	High-----	High.
25:											
Kenn----------	B	Occasional	Very brief	Jan-May	>6.0	---	---	>60	---	Moderate	Moderate.
Ceda----------	B	Occasional	Very brief	Jan-May	>6.0	---	---	>60	---	Low------	Moderate.
26, 27---------- Leadvale	C	None--------	---	---	2.0-3.0	Perched	Dec-Apr	>48	Soft	Moderate	Moderate.
28---------- Linker	B	None--------	---	---	>6.0	---	---	20-40	Hard	Low------	High.
29:											
Linker----------	B	None--------	---	---	>6.0	---	---	20-40	Hard	Low------	High.
Mountainburg-----	D	None--------	---	---	>6.0	---	---	12-20	Hard	Low------	High.
30---------- McKamie	D	None--------	---	---	>6.0	---	---	>60	---	High-----	Moderate.
31---------- Moreland	D	None--------	---	---	0-1.5	Perched	Dec-Apr	>60	---	High-----	Low.
32, 33---------- Mountainburg	D	None--------	---	---	>6.0	---	---	12-20	Hard	Low------	High.
34, 35---------- Mountainburg	D	None--------	---	---	>6.0	---	---	12-20	Hard	Low------	Moderate.
36---------- Muskogee	C	None--------	---	---	1.0-2.0	Perched	Dec-Apr	>60	---	High-----	Moderate.
37, 38---------- Nella	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
39:											
Nella----------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
Enders----------	C	None--------	---	---	>6.0	---	---	40-60	Soft	High-----	High.
40:											
Nella----------	B	None--------	---	---	>6.0	---	---	>60	---	Low------	Moderate.
Enders----------	C	None--------	---	---	>6.0	---	---	40-60	Soft	High-----	High.
41:											
Nella----------	B	None--------	---	---	>6.0	---	---	>60	---	Low------	Moderate.
Enders----------	C	None--------	---	---	>6.0	---	---	40-60	Soft	High-----	High.
Mountainburg-----	D	None--------	---	---	>6.0	---	---	12-20	Hard	Low------	Moderate.
42, 43---------- Pickwick	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate.

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			
44---------- Roellen	D	None--------	---	---	0-1.0	Apparent	Jan-May	>60	---	High-----	Low.
45---------- Roellen	D	Occasional	Brief-----	Dec-Jun	0-1.0	Apparent	Jan-May	>60	---	High-----	Low.
46---------- Roxana	B	None--------	---	---	---	---	---	>60	---	Low------	Low.
47---------- Roxana	B	Occasional	Brief-----	Dec-Jun	---	---	---	>60	---	Low------	Low.
48, 49------- Sherless	B	None--------	---	---	>6.0	---	---	20-40	Soft	Moderate	Moderate.
50---------- Spadra	B	Occasional	Very brief	Dec-Apr	>6.0	---	---	>60	---	Low------	High.
51---------- Taft	C	None--------	---	---	1.0-2.0	Perched	Dec-Apr	>60	---	High-----	High.
52. Udipsamments, dredged											
53---------- Wrightsville	D	None--------	---	---	0.6-1.5	Perched	Dec-Apr	>60	---	High-----	High.

TABLE 20.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Avilla	Fine-loamy, siliceous, thermic Typic Paleudults
Barling	Coarse-silty, mixed, thermic Fluvaquentic Dystrochrepts
Bismarck	Loamy-skeletal, mixed, thermic, shallow Typic Dystrochrepts
Bruno	Sandy, mixed, thermic Typic Udifluvents
Cane	Fine-loamy, siliceous, thermic Typic Fragiudults
Carnasaw	Clayey, mixed, thermic Typic Hapludults
Ceda	Loamy-skeletal, siliceous, nonacid, thermic Typic Udifluvents
Clebit	Loamy-skeletal, siliceous, thermic Lithic Dystrochrepts
Dardanelle	Fine-silty, mixed, thermic Typic Argiudolls
Enders	Clayey, mixed, thermic Typic Hapludults
Guthrie	Fine-silty, siliceous, thermic Typic Fragiaquults
Kenn	Fine-loamy, siliceous, thermic Ultic Hapludalfs
Leadvale	Fine-silty, siliceous, thermic Typic Fragiudults
Linker	Fine-loamy, siliceous, thermic Typic Hapludults
McKamie	Fine, mixed, thermic Vertic Hapludalfs
*Moreland	Fine, mixed, thermic Vertic Hapludolls
Mountainburg	Loamy-skeletal, siliceous, thermic Lithic Hapludults
Muskogee	Fine-silty, mixed, thermic Aquic Paleudalfs
Nella	Fine-loamy, siliceous, thermic Typic Paleudults
*Pickwick	Fine-silty, mixed, thermic Typic Hapludults
Roellen	Fine, montmorillonitic, thermic Vertic Haplaquolls
Roxana	Coarse-silty, mixed, nonacid, thermic Typic Udifluvents
Sherless	Fine-loamy, mixed, thermic Typic Hapludults
Spadra	Fine-loamy, siliceous, thermic Typic Hapludults
Taft	Fine-silty, siliceous, thermic Glossaquic Fragiudults
Wrightsville	Fine, mixed, thermic Typic Glossaqualfs

* The soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series.

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