SOIL SURVEY

McCurtain County, Oklahoma

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

Issued November 1974

Major fieldwork for this soil survey was done in the period 1957–69. Soil names and descriptions were approved in 1970. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1969. This survey was made cooperatively by the Soil Conservation Service and the Oklahoma Agricultural Experiment Station. It is part of the technical assistance furnished to the Little River and Valliant Soil and Water Conservation District.

Either enlarged or reduced copies of the soil map in this publication can be made by commercial photographers, or they can be purchased on individual order from the Cartographic Division, Soil Conservation Service, United States Department of Agriculture, Washington, D.C. 20250.

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY contains information that can be applied in managing farms, ranches, and woodlands; in selecting sites for roads, ponds, buildings, and other structures; and in judging the suitability of tracts of land for farming, industry, and recreation.

Locating Soils

All the soils of McCurtain County are shown on the detailed map at the back of this publication. This map consists of many sheets made from aerial photographs. Each sheet is numbered to correspond with a number on the Index to Map Sheets.

On each sheet of the detailed map, soil areas are outlined and are identified by symbols. All areas marked with the same symbol are the same kind of soil. The soil symbol is inside the area if there is enough room; otherwise, it is outside and a pointer shows where the symbol belongs.

Finding and Using Information

The "Guide to Mapping Units" can be used to find information. This guide lists all the soils of the county in alphabetic order by map symbol and gives the capability classification of each. It also shows the page where each soil is described and the page for the woodland group and range site in which the soil has been placed.

Individual colored maps showing the relative suitability or degree of limitation of soils for many specific purposes can be developed by using the soil map and the information in the text. Translucent material can be used as an overlay over the soil map and colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

Farmers and those who work with farmers can learn about use and management of the soils from the soil descriptions and from the discussions of the capability units, the range sites, and the woodland suitability groups.

Foresters and others can refer to the section "Use of the Soils as Woodland," where the soils of the county are grouped according to their suitability for trees.

Game managers, sportsmen, and others can find information about soils and wildlife in the section "Use of the Soils for Wildlife Habitat."

Ranchers and others can find, under "Use of the Soils for Range," groupings of the soils according to their suitability for range, and also the names of many of the plants that grow on each range site.

Community planners and others can read about soil properties that affect the choice of sites for dwellings, industrial buildings, and recreation areas in the section "Town and Country Planning."

Engineers and builders can find, under "Engineering Uses of the Soils," tables that contain test data, estimates of soil properties, and information about soil features that affect engineering practices.

Scientists and others can read about how the soils formed and how they are classified in the section "Formation and Classification of the Soils."

Newcomers in McCurtain County may be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the information about the county given in the section "General Nature of the County."

Cover: Well-managed stand of loblolly pine on Felker loam, 0 to 2 percent slopes. Growing trees for wood products is one of the major enterprises in McCurtain County.

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SOIL SURVEY OF McCURTAIN COUNTY, OKLAHOMA

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UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, IN COOPERATION WITH OKLAHOMA AGRICULTURAL EXPERIMENT STATION

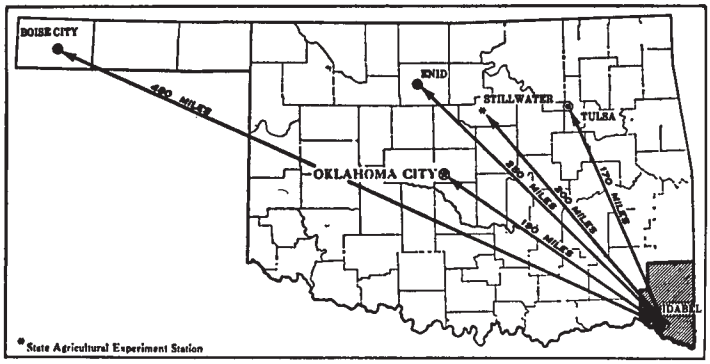

Figure 1.—Location of McCurtain County in Oklahoma.

McCURTAIN COUNTY, located in the extreme southeastern part of Oklahoma (fig. 1) has an area of 1,825 square miles, or 1,167,846 acres. McCurtain County is bounded on the west by Choctaw and Pushmataha Counties, by LeFlore County on the north, and has contiguous borders with Texas to the south and Arkansas to the east. Idabel is the county seat.

McCurtain County has many thousand acres of commercially exploitable timber. There are wide variations in kinds of soils. Large areas are also used for improved pastureland, hayland, and rangeland. In the Red River bottom lands along the southern part of the county are several thousand acres of level productive alluvial soils used for intensive and diversified farming.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soil are in McCurtain County, where they are located, and how they can be used. The soil scientists went into the county knowing they likely would find many soils they had already seen and perhaps some they had not. They observed the steepness, length, and shape of slopes, the size and speed of streams, the kinds of native plants or crops, the kinds of rock, and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material that has not been changed much by leaching or by the action of plant roots.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to nationwide, uniform procedures. The *soil series* and the *soil phase* are the categories of soil classification most used in a local survey.

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, all the soils of one series have major horizons that are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Muskogee and Newtonia, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in those characteristics that affect their behavior in the undisturbed landscape.

Soils of one series can differ in texture of the surface layer and in slope, stoniness, or some other characteristic that affects use of the soils by man. On the basis of such differences, a soil series is divided into phases. The name of a soil phase indicates a feature that affects management. For example, Sherwood fine sandy loam, 3 to 5 percent slopes, is one of several phases within the Sherwood series.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, trees, and other details that help in drawing boundaries accurately. The soil map at the back of this publication was prepared from aerial photographs.

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning the management of farms and fields, a mapping unit is nearly equivalent to a soil phase. It is not exactly equivalent, because it is not practical to show on such a map all the small, scattered bits of soil of some kind that have been seen within an area that is mainly of a recognized soil phase.

Some mapping units are made up of soils of different series, or of different phases within one series. Three such kinds of mapping units are shown on the soil map of McCurtain County: soil complexes, soil associations, and undifferentiated groups.

A soil complex consists of areas of two or more soils,

so intricately mixed or so small in size that they cannot be shown separately on the soil map. Each area of a complex contains some of each of the two or more dominant soils, and the pattern and relative proportions are about the same in all areas. Generally, the name of a soil complex consists of the names of the dominant soils, joined by a hyphen. Bibb-Iuka complex is an example.

A soil association is made up of adjacent soils that occur as areas large enough to be shown individually on the soil map but are shown as one unit because the time and effort of delineating them separately cannot be justified. There is a considerable degree of uniformity in pattern and relative extent of the dominant soils, but the soils may differ greatly one from another. The name of an association consists of the names of the dominant soils, joined by a hyphen. Carnasaw-Goldston association, moderately steep, is an example.

An undifferentiated group is made up of two or more soils that could be delineated individually but are shown as one unit because, for the purpose of the soil survey, there is little value in separating them. The pattern and proportion of soils are not uniform. An area shown on the map may be made up of only one of the dominant soils, or of two or more. Cahaba and Tiak soils, 2 to 8 percent slopes, severely eroded, is an undifferentiated soil group in this county.

In most areas surveyed there are places where the soil material is so rocky, so shallow, so severely eroded, or so variable that it has not been classified by soil series. These places are shown on the soil map and are described in the survey, but they are called land types and are given descriptive names. Rock outcrop, which is mapped only in a complex with Hector soil, is a land type in this county.

While a soil survey is in progress, soil scientists take soil samples needed for laboratory measurements and for engineering tests. Laboratory data from the same kind of soil in other places are also assembled. Data on yields of crops under defined practices are assembled from farm records and from field or plot experiments on the same kind of soil. Yields under defined management are estimated for all the soils.

Soil scientists observe how soils behave when used as a growing place for native and cultivated plants, and as material for structures, foundations for structures, or covering for structures. They relate this behavior to properties of the soils. For example, they observe that filter fields for onsite disposal of sewage fail on a given kind of soil, and they relate this to the slow permeability of the soil or a high water table. They see that streets, road pavements, and foundations for houses are cracked on a named kind of soil, and they relate this failure to the high shrink-swell potential of the soil material. Thus, they use observation and knowledge of soil properties, together with available research data, to predict limitations or suitability of soils for present and potential uses.

After data have been collected and tested for the key, or benchmark, soils in a survey area, the soil scientists set up trial groups of soils. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others. They then adjust the groups according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under current methods of use and management.

General Soil Map

The general soil map at the back of this survey shows, in color, the soil associations in McCurtain County. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

A map showing soil associations is useful to people who want a general idea of the soils in a county, who want to compare different parts of a county, or who want to know the location of large tracts that are suitable for a certain kind of land use. Such a map is a useful general guide in managing a watershed, a wooded tract, or a wildlife area, or in planning engineering works, recreational facilities, and community developments. It is not a suitable map for planning the management of a farm or field, or for selecting the exact location of a road, building, or similar structure, because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect their management.

The soil associations in McCurtain County are discussed in the following pages.

The soil associations in this survey have been grouped into four general kinds of landscapes for broad interpretive purposes. Each of the broad groups and the soil associations in each group are described in the following pages. The terms for texture used in the title for several of the associations apply to the texture of the surface layer. For example, in the title of association 1, the word, "loamy" refers to the texture of the surface layer.

Deep to Shallow Soils Over Sandstone and Shale

These soils are in the Ouachita Mountains. They are mostly wooded, but small areas are used for native range and tame pasture.

1. Carnasaw-Sherwood association

Deep and moderately deep, very gently sloping to moderately steep, well-drained, loamy soils on uplands

Soils in this association formed under a cover of trees in material weathered from sandstone and shale.

This association occupies about 16 percent of the total land area in the county. Carnasaw soils make up 44 percent of the association; Sherwood soils, 24 percent; and minor soils, 32 percent.

Carnasaw soils are on broad crests and side slopes. They are very gently sloping to moderately steep, well-drained, loamy soils that have a clayey subsoil.

Sherwood soils are on crests and side slopes. They are

very gently sloping, moderately steep, well-drained soils that are loamy throughout.

Minor soils in this association are the Goldston, Sacul, Zafra, and others on uplands and Ceda soils on narrow flood plains.

Soils in this association are about equally divided between wooded areas and tame pasture. In places soils are suited to such common crops as cotton, corn, grain sorghum, wheat, peanuts, and soybeans. The soils of this association are fairly well suited to recreation areas and wildlife habitat.

The main concerns of management are maintaining soil structure and fertility and protecting the soils from erosion.

2. *Goldston-Carnasaw-Sacul association*

Moderately deep and deep, moderately steep and steep, moderately well drained to excessively drained, loamy soils on uplands

The soils in this association formed under a cover of trees in material weathered from sandstone and shale.

This association occupies about 31 percent of the total land area in the county. Goldston soils make up 35 percent of the association; Carnasaw soils, 30 percent; Sacul soils, 18 percent; and minor soils, 17 percent.

Goldston soils are moderately deep, moderately steep and steep, and well drained to excessively drained. These are loamy soils that contain shale and sandstone fragments. They are mainly on ridge crests and upper parts of side slopes.

Carnasaw soils are moderately steep and steep and are well drained. These are loamy soils that have a clayey subsoil. They are mainly on smooth side slopes.

Sacul soils are deep, moderately steep and steep, and moderately well drained. These are loamy soils that have a clayey subsoil. They are mainly on smooth side slopes.

Minor soils in this association are the Sherwood, Hector, Pickens, and other soils on uplands and the Ceda, Ochlockonee, and Frizzell soils on narrow flood plains.

Because of steep slopes and stones the soils in this association are used for growing trees. Minor areas of smooth slopes are in tame pastures. The soils of this association have fair suitability for recreation and wildlife.

The principal concerns of management are controlling shale and sandstone fragments on Goldston soils and preventing erosion on Carnasaw and Sacul soils.

3. *Pickens-Alikchi association*

Shallow and moderately deep, nearly level to moderately steep, somewhat excessively drained or poorly drained, loamy soils on uplands.

The soils in this association formed under a cover of trees in material weathered from horizontally bedded shale.

This association occupies about 5 percent of the total land area in the county. Pickens soils make up 46 percent of the association; Alikchi soils, 10 percent; and minor soils, 44 percent.

Pickens soils are shallow, nearly level to moderately steep, and somewhat excessively drained. These are loamy soils that contain shale fragments. They are mainly on broad ridges and upper parts of slopes.

Alikchi soils are moderately deep, nearly level and very gently sloping, and poorly drained. These soils are loamy throughout. They are in drainageways in low flats.

Minor soils in this association are in the Goldston, Carnasaw, Sacul, Sherwood, and other series.

Because of the shallow and wet soils, nearly all of this association is used for growing trees and for range. The soils are fairly well suited to recreation uses and wildlife habitat. The Alikchi soils are suited to late season crops of grain sorghum, soybeans, and tame pasture.

The main concerns of management for the Pickens soils are shallow depth and shale fragments. Management of Alikchi soils involves controlling surface drainage and maintaining soil structure and fertility.

Deep to Very Shallow Soils Over Limestone, Shale, and Clayey Sediment

These are blackland soils used for native range, tame pasture, and minor areas of cropland.

4. *Hollywood-Swink association*

Deep to very shallow, very gently sloping to moderately steep, moderately well drained or well drained, loamy and clayey soils on uplands

The soils in this association formed under a cover of grasses in material weathered from limestone, shales, and clayey sediment.

This association consists of about 4 percent of the total land area in the county. Hollywood soils make up 35 percent of the association; Swink soils, 30 percent; and minor soils, 35 percent.

Hollywood soils are deep, very gently sloping and gently sloping, and moderately well drained. These soils are clayey throughout. They are on side slopes and between areas of Swink soils.

Swink soils are shallow or very shallow, gently sloping to moderately steep, and well drained. These soils are clayey or loamy and contain limestone fragments. They are on crests and side slopes between areas of Hollywood soils.

Minor soils are the Alusa, Newtonia, Panola, and other soils on uplands and Kaufman soils on flood plains.

Most areas of Hollywood soils are suited to such common crops as soybeans, corn, grain sorghum, cotton, alfalfa, and small grains. Some soils are used for native range or tame pasture. Because of the shallowness and slopes, Swink soils are used mostly for native range.

The principal concerns when managing Hollywood soils are controlling water erosion, increasing water intake, and maintaining soil structure and fertility.

Deep Soils Over Marine Deposits of the Southern Coastal Plain

These Coastal Plain soils are used mainly for woodland and tame pasture and minor areas of cropland.

5. *Ruston-Tiak-Saffell association*

Deep, very gently sloping to moderately steep, well drained or moderately well drained, loamy soils on uplands

The soils in this association formed under a cover of trees in material weathered from loamy and clayey sediment.

This association occupies about 19 percent of the total land area in the county. Ruston soils make up 24 percent of the association; Tiak soils, 16 percent; Saffell soils, 10 percent; and other soils, 50 percent.

Ruston soils are deep, gently sloping to moderately steep, and well drained. These soils are loamy throughout. They are on smooth side slopes.

Tiak soils are deep, very gently sloping to moderately steep, and moderately well drained. These soils are loamy, and they have a clayey or loamy subsoil. They are on smooth side slopes and crests.

Saffell soils are deep, very gently sloping to strongly sloping, and well drained. These soils are loamy throughout and contain large amounts of gravel. They are on smooth side slopes.

Among the minor soils are Blevins, Cahaba, Kullit, Muskogee, Cadeville, and Adaton.

The soils in this association are used mainly for tame pasture. Large areas are used for growing trees and small areas for cultivated crops. The soils are fairly well suited to recreation uses and wildlife habitat. Areas of very gently sloping and gently sloping soils are suited to such common crops as corn, grain sorghum, soybeans, cotton, wheat, and peanuts.

The main management concerns are controlling erosion and maintaining soil structure and fertility. The soils in this association respond favorably to good management.

6. *Kinta-Wrightsville association*

Deep, nearly level and very gently sloping, somewhat poorly drained or poorly drained, loamy soils on uplands and terraces

The soils in this association formed under a cover of trees in material weathered from clayey sediment.

This association occupies about 5 percent of the total land area in the county. Kinta soils make up 24 percent of the association; Wrightsville soils, 16 percent; and other soils, 60 percent.

Kinta soils are deep, nearly level and very gently sloping, and somewhat poorly drained. These are soils that have a clayey or loamy subsoil. They are on broad flats.

Wrightsville soils are deep, nearly level, and poorly drained. These are loamy soils that have a clayey or loamy subsoil. They are on broad flats.

Among the minor soils are Elysian, Tomast, Guyton, Felker, Kullit, Cahaba, and Tuscumbia.

Because of soil wetness nearly all of this association is used for woodland or tame pasture. The soils in this association are suited to late season crops, such as soybeans and grain sorghum.

The principal management concerns are surface wetness and maintaining soil structure and fertility.

7. *Felker-Kullit association*

Deep, nearly level and very gently sloping, somewhat poorly drained or moderately well drained, loamy soils on uplands

The soils in this association formed under a cover of trees in material weathered from loamy sediment.

This association occupies about 6 percent of the total land area in the county. Felker soils make up 66 percent of the association; Kullit soils, 18 percent; and minor soils, 16 percent.

Felker soils are deep, nearly level and very gently sloping, and somewhat poorly drained. These soils are loamy throughout. They are on broad, slightly uneven flats.

Kullit soils are deep, very gently sloping, and moderately well drained. These are soils that have a loamy and clayey subsoil. They are on broad, slightly uneven flats.

Minor soils are Tomast, Kinta, Blevins, and Guyton.

Because of soil wetness and low fertility, nearly all of this association is used for woodland or tame pasture. The soils in this association are suited to such common crops as corn, grain sorghum, soybeans, peanuts, and cotton.

The main management concerns are surface wetness and maintaining soil structure and fertility.

This association is in a wooded area that provides large quantities of commercial timber.

Deep Soils on Flood Plains and Terraces of Small Streams and Rivers

These soils formed in alluvium on flood plains and terraces adjacent to the Red River and other streams. They are used mainly for crops and tame pasture. Minor areas are wooded.

8. *Pledger-Roebuck-Redlake association*

Deep, nearly level, moderately well drained to somewhat poorly drained, clayey soils on flood plains of the Red River.

The soils in this association formed under a cover of trees in material weathered from clayey and loamy alkaline sediment.

This association occupies about 4 percent of the total land area in the county. Pledger soils make up 39 percent of the association; Roebuck soils, 26 percent; Redlake soils, 17 percent; and minor soils, 18 percent.

Pledger soils are deep, nearly level, and moderately well drained soils that are clayey throughout. They are on broad flats.

Roebuck soils are deep, nearly level, and somewhat poorly drained soils that are clayey throughout. They are on low areas where water accumulates.

Redlake soils are deep, nearly level, moderately well drained soils that are clayey throughout. They are on broad flats.

Minor soils are Garton and Latanier.

Most areas of soils in this association are used for cultivated crops. The main crops are soybeans, cotton, grain sorghum, corn, alfalfa, and small grains. Some areas are used for tame pasture, woodland, and wildlife.

The main concerns of management are surface drainage, maintaining soil structure, and protecting from damaging overflow. A few areas are subject to ponded surface water; some low areas are flooded once every year for short periods of time. The soils in this association respond favorably to good management.

9. Severn-Oklared-Gallion association

Deep, nearly level and very gently sloping, well drained, loamy soils on flood plains or terraces of the Red River

The soils in this association formed under a cover of trees in material weathered from loamy alkaline sediment.

This association occupies about 3 percent of the total land area in the county. Severn soils make up 27 percent of the association; Oklared soils, 20 percent; Gallion soils, 19 percent; and minor soils, 34 percent.

Severn soils are deep, nearly level, and well drained. These soils are loamy, and they have a loamy subsoil.

Oklared soils are deep, nearly level and very gently sloping, and well drained. These soils are loamy, and they have a loamy subsoil.

Gallion soils are deep, nearly level and very gently sloping, and well drained. These soils are loamy, and they have a loamy subsoil.

Minor soils are the Caspiana, Coushatta, and Idabel.

Most areas of soils in this association are used for cultivated crops and tame pasture. The main crops are soybeans, cotton, grain sorghum, corn, alfalfa, peanuts, and small grains. The soils of this association are the most productive and intensely cultivated soils in the county.

The main concerns of management are maintaining soil structure and fertility. The soils in this association respond favorably to good management and are well suited to intensified and diversified farming. Some areas are flooded once in 5 to 20 years.

10. Guyton-Ochlockonee association

Deep, nearly level, poorly drained or well drained, loamy soils on flood plains and terraces other than those along the Red River.

The soils in this association formed under a cover of trees in material weathered from loamy sediment.

This association occupies about 7 percent of the total land area of the county. Guyton soils make up 28 percent of the association; Ochlockonee soils, 14 percent; and other soils, 58 percent.

Guyton soils are deep, nearly level, and poorly drained. They are loamy throughout.

Ochlockonee soils are deep, nearly level, and well drained. They are loamy throughout.

Minor soils are the Adaton, Bibb, Cahaba, Iuka, Frizzell, Rexor, and Sallisaw.

Most of the soils in the Guyton part of the association are used for tame pasture or are wooded.

The Ochlockonee soils are used mostly for tame pasture. Some areas are cultivated. Some of the soils in this association are suited to commonly grown crops, such as corn, grain sorghum, soybeans, cotton, and peanuts. The soils in this association have fair suitability for recreation use and wildlife habitat.

The principal concerns of management are controlling wetness and maintaining soil structure and fertility. Also important is protecting from damaging overflows. These soils are subject to flooding, and most areas are flooded once every 1 to 5 years. Some low areas are flooded more often than once a year.

Descriptions of the Soils

This section describes the soil series and mapping units in McCurtain County. Each soil series is described in detail, and then, briefly, each mapping unit in that series. Unless it is specifically mentioned otherwise, it is to be assumed that what is stated about the soil series holds true for the mapping units in that series. Thus, to get full information about any one mapping unit, it is necessary to read both the description of the mapping unit and the description of the soil series to which it belongs.

An important part of the description of each soil series is the soil profile, that is, the sequence of layers from the surface downward to rock or other underlying material. Each series contains two descriptions of this profile. The first is brief and in terms familiar to the layman. The second is much more detailed and is for those who need to make thorough and precise studies of soils.

The profile described in the series is representative for mapping units in that series. If the profile of a given mapping unit is different from the one described for the series, these differences are stated in describing the mapping unit, or they are differences that are apparent in the name of the mapping unit. Color terms are for moist soil unless otherwise stated.

Following the name of each mapping unit is a symbol in parentheses. This symbol identifies the mapping unit on the detailed soil map. Listed at the end of each description of a mapping unit is the capability unit, range site, and woodland group in which the mapping unit has been placed. The page for the description of each capability unit, range site, woodland group, or other interpretative group can be learned by referring to the "Guide to Mapping Units" at the back of this survey.

The acreage and proportionate extent of each mapping unit are shown in table 1. Many of the terms used in describing soils can be found in the Glossary, and more detailed information about the terminology and methods of soil mapping can be obtained from the Soil Survey Manual (*6*).[1]

Adaton Series

The Adaton series consists of deep, nearly level and very gently sloping, poorly drained soils on uplands. These soils formed under a cover of pines and hardwoods and an understory of mid and tall grasses in clayey and loamy sediment.

In a representative profile the surface layer is 5 inches of grayish-brown loam, and the subsurface layer is 7 inches of light brownish-gray loam. Mottles in these layers are in shades of brown. The upper part of the subsoil, to a depth of 59 inches, is gray clay loam. The

[1] Italic numbers in parentheses refer to Literature Cited, p. 96.

TABLE 1.—*Approximate acreage and proportionate extent of the soils*

Soil	Acreage	Percent	Soil	Acreage	Percent
Adaton loam	6,660	0.6	Panola silty clay loam	3,841	0.3
Alikchi loam, 0 to 3 percent slopes	4,572	.4	Pickens shaly silt loam, 5 to 15 percent slopes	26,065	2.2
Alusa loam	2,800	.2	Pickens-Alikchi complex, 0 to 3 percent slopes	3,737	.3
Bibb-Iuka complex	28,649	2.4	Pledger clay	9,730	.8
Blevins fine sandy loam, 1 to 3 percent slopes	21,269	1.8	Pledger-Roebuck complex	16,700	1.4
Cadeville loam, 2 to 5 percent slopes	8,800	.8	Redlake clay	10,503	.9
Cahaba loamy fine sand, 0 to 3 percent slopes	3,125	.3	Rexor loam	8,665	.7
Cahaba loamy fine sand, 3 to 8 percent slopes	8,450	.7	Rexor-Guyton complex, 0 to 3 percent slopes	4,200	.4
Cahaba fine sandy loam, 0 to 1 percent slopes	8,000	.7	Roebuck clay, ponded	4,890	.4
Cahaba fine sandy loam, 1 to 3 percent slopes	3,380	.3	Ruston fine sandy loam, 3 to 8 percent slopes	41,437	3.5
Cahaba and Tiak soils, 2 to 8 percent slopes, severely eroded	9,475	.8	Ruston fine sandy loam, 3 to 8 percent slopes, eroded	3,478	.3
Carnasaw-Goldston association, moderately steep	96,893	8.3	Sacul fine sandy loam, 5 to 15 percent slopes	6,197	.5
Carnasaw-Zafra complex, 1 to 8 percent slopes	22,638	1.9	Saffell gravelly fine sandy loam, 1 to 5 percent slopes	4,135	.3
Caspiana loam	2,450	.2	Saffell gravelly fine sandy loam, 5 to 12 percent slopes	18,690	1.6
Ceda-Rubble land complex	16,000	1.4	Sallisaw loam	4,884	.4
Coushatta silty clay loam	4,165	.4	Severn very fine sandy loam	10,740	.9
Felker loam, 0 to 2 percent slopes	50,870	4.4	Sherwood fine sandy loam, 1 to 3 percent slopes	8,690	.7
Frizzell loam	7,626	.7	Sherwood fine sandy loam, 3 to 5 percent slopes	5,200	.4
Gallion very fine sandy loam	7,625	.7	Sherwood soils, 2 to 5 percent slopes, eroded	1,500	.1
Garton silt loam	3,600	.3	Sherwood-Zafra complex, 1 to 5 percent slopes	11,312	1.0
Goldston-Carnasaw-Sacul association, moderately steep	249,932	21.4	Sherwood-Zafra complex, 5 to 12 percent slopes	33,000	2.8
Goldston-Carnasaw-Sacul association, steep	107,270	9.2	Sumter silty clay loam, 3 to 12 percent slopes	250	----
Guyton silt loam	22,830	2.0	Swink-Hollywood complex, 5 to 20 percent slopes	26,994	2.3
Guyton-Elysian complex	21,130	1.8	Tiak fine sandy loam, 1 to 3 percent slopes	1,632	.1
Hector-Rock outcrop complex, 35 to 60 percent slopes	15,000	1.3	Tiak fine sandy loam, 3 to 5 percent slopes	6,769	.6
Hollywood silty clay, 1 to 3 percent slopes	6,345	.6	Tiak fine sandy loam, 5 to 8 percent slopes	5,635	.5
Hollywood silty clay, 3 to 5 percent slopes	1,748	.2	Tiak-Ruston complex, 1 to 5 percent slopes	29,175	2.5
Idabel silt loam	4,902	.4	Tiak-Ruston complex, 5 to 15 percent slopes	15,490	1.3
Kaufman clay	2,880	.3	Tomast silt loam	8,802	.8
Kaufman clay, frequently flooded	1,080	.1	Tuscumbia clay	5,600	.5
Kinta clay loam, 0 to 2 percent slopes	14,748	1.3	Wrightsville-Elysian complex	12,707	1.1
Kullit fine sandy loam, 1 to 3 percent slopes	17,899	1.5			
Latanier clay	4,970	.4	Total	1,167,846	100.0
Muskogee loam, 1 to 3 percent slopes	9,056	.8			
Newtonia silt loam, 1 to 3 percent slopes	1,515	.1			
Ochlockonee fine sandy loam	11,095	1.0			
Oklared very fine sandy loam	7,751	0.7			

lower part of the subsoil extends to a depth of 79 inches or more and is gray clay. Mottles in the subsoil are in shades of brown.

Available water capacity is high in Adaton soils, and permeability is slow. The seasonal water table is at a depth of 0 to 1 foot.

Representative profile of Adaton loam (2,800 feet north and 750 feet east of the SW. corner of sec. 1, T. 8 S., R. 24 E.):

Ap—0 to 5 inches, grayish-brown (10YR 5/2) loam; common, fine, faint, yellowish-brown mottles; weak granular structure; friable; few, soft, black to strong-brown concretions; medium acid; clear, smooth boundary.

A2g—5 to 12 inches, light brownish-gray (10YR 6/2) loam; many, medium, distinct, yellowish-brown (10YR 5/6) and few, fine, faint, strong-brown mottles; weak, fine, granular structure; friable; strongly acid; clear, wavy boundary.

B21tg—12 to 29 inches, gray (10YR 6/1) clay loam; many, medium and coarse, distinct, yellowish-brown (10YR 5/8) mottles and common, fine, distinct, light yellowish-brown mottles; weak, medium, subangular blocky structure; firm; thin, continuous clay films on ped faces; few, fine, black concretions; strongly acid; gradual, smooth boundary.

B22tg—29 to 47 inches, gray (10YR 5/1) clay loam; many, fine and few, medium, distinct, yellowish-brown (10YR 5/6) and strong-brown (7.5YR 5/6) mottles; weak, medium, angular blocky structure; firm; few slightly brittle peds; patchy clay films on ped faces; thick continuous clay films in old root channels; strongly acid; gradual, smooth boundary.

B23tg—47 to 59 inches, gray (10YR 6/1) clay loam; common, fine, distinct, strong-brown mottles that have yellowish-red centers; weak, medium, angular blocky structure; firm; few patchy clay films; few rounded pebbles; few iron and manganese films; medium acid; gradual, smooth boundary.

B24tg—59 to 79 inches, gray (10YR 6/1) clay; many, fine and medium, distinct, strong-brown (7.5YR 5/6) and yellowish-brown (10YR 5/6) mottles; weak, medium, blocky structure; firm; clay films on peds; few iron and manganese films; few rounded pebbles; medium acid.

The A1 or Ap horizon is grayish brown, dark grayish brown, brown, and very dark grayish brown. The A2g horizon is light brownish gray, light gray, and gray. Mottles in this horizon are in shades of brown. They range from few through many and are fine and medium and faint or distinct. Reaction in the A horizon is strongly acid through slightly acid.

The B2tg horizon is gray, light gray, or light brownish gray. Texture in the B21tg and B22tg horizons is clay loam

or silty clay loam; texture in the B23tg and B24tg horizons is clay loam or clay. Mottles in the B2tg horizon are in shades of brown and range from few through many. They are fine and medium and faint or distinct. This horizon is strongly acid through slightly acid.

These soils are outside the defined range for the Adaton series. They differ by having slightly more than 15 percent sand coarser than very fine sand and by having a reaction that ranges from strongly acid to slightly acid. They are enough like the Adaton soils in morphology, composition, and behavior so that a new series is not warranted.

Adaton soils are grayer in the upper part of the solum than similar Felker soils. They lack the tongues of A2 material in the B horizon that are in associated Guyton soils.

Adaton loam (Ad).—This is the only Adaton soil mapped in the county. It is nearly level and very gently sloping and is on uplands.

Included with this soil in mapping are soils that are similar to Adaton loam except that the upper part of the subsoil is yellower. Also included are small areas of Muskogee loam.

This soil is poorly suited to crops because of wetness late in spring and dryness late in summer. Late season crops such as grain sorghum and soybeans can be grown. The soil, however, is better suited to tame pasture and trees than to other uses, and it is used mainly for those purposes.

Management practices are needed that maintain or improve fertility and soil structure and remove excess surface water. A cropping system is required, and it should include crops that produce large amounts of residue. The residue should be returned to the soil. Land smoothing improves surface drainage in places. An adequate surface-drainage system and proper drainage outlets are needed in places. Proper row direction helps to drain surface water in areas that pond. Capability unit IIIw–3; woodland suitability group 2w9; pasture and hayland suitability group 8H.

Alikchi Series

The Alikchi series consists of moderately deep, nearly level, poorly drained and very gently sloping soils on uplands. They formed under a cover of pines and hardwoods and an understory of mid and tall grasses, in material weathered from shale.

In a representative profile the surface layer is 6 inches of dark-gray loam, and the subsurface layer is 6 inches of gray loam. Mottles in these layers are in shades of brown. The subsoil, which extends to a depth of 31 inches, is light-gray silty clay loam that has tongues of silt loam. Mottles in the subsoil are in shades of brown. The underlying material is dark-gray fractured shale.

Available water capacity is high in Alikchi soils, and permeability is slow. The seasonal water table is at a depth of 0 to 1 foot.

Representative profile of Alikchi loam, 0 to 3 percent slopes (1,400 feet north and 850 feet east of the SW. corner of sec. 20, T. 5 S., R. 23 E.):

A1g—0 to 6 inches, dark-gray (10YR 4/1) loam; few, fine, faint, dark yellowish-brown mottles; weak, fine, granular structure; very friable; many fine roots; strongly acid; clear, smooth boundary.

A2g—6 to 12 inches, gray (10YR 5/1) loam; few, fine, distinct, dark yellowish-brown mottles; weak, fine, granular structure; very friable; many fine roots; medium acid; clear, irregular boundary.

B2tg—12 to 23 inches, light-gray (10YR 6/1) silty clay loam; common, medium and coarse, distinct, yellowish-brown (10YR 5/4) mottles; weak, medium, subangular blocky structure; firm; few fine roots; few fine pores lined with clay films; continuous thin clay films on faces of peds; tongues of light-gray (10YR 7/2) silt loam and clean sand grains extend to a depth of 31 inches; medium acid; gradual, smooth boundary.

B3g—23 to 31 inches, light-gray (10YR 6/1) silty clay loam; weak, fine, subangular and blocky structure; firm; patchy clay films on peds; few fine roots; medium acid; abrupt, wavy boundary.

C—31 inches, dark-gray (5Y 4/1) fractured shale; slightly acid.

The A1g horizon is very dark grayish brown, dark gray, dark grayish brown, or grayish brown. The A2g horizon is gray, grayish brown, light brownish gray, or light gray. The A horizon is medium acid or strongly acid.

The B2tg horizon is dark gray, gray, light gray, or light brownish gray. Mottles are present in shades of brown and yellow. This horizon is silt loam or silty clay loam. It is medium acid or strongly acid. The B3 horizon is dark gray, gray, light gray, or light brownish gray. Mottles are in shades of brown. This horizon is silt loam or silty clay loam. It is medium acid through neutral.

Depth to the C horizon ranges from 20 to 40 inches.

Alikchi soils are associated with Carnasaw, Pickens, and Sherwood soils. Alikchi soils have a grayer B horizon than Sherwood and Carnsaw soils. They have a thicker solum than Pickens soils.

Alikchi loam, 0 to 3 percent slopes (AkB).—This is the only Alikchi soil mapped in the county. It is on uplands.

Included with this soil in mapping, and making up 15 percent of the mapped areas, are similar soils that are yellower in the upper part of the subsoil than this Alikchi soil. Also included are spots of a Pickens shaly silt loam.

This Alikchi soil is suited to tame pasture and to trees. It is used mainly as woodland. It is poorly suited to crops because of wetness late in spring, but such late-season crops as grain sorghum and soybeans can be grown.

Management practices are needed that help to maintain or to improve soil fertility and structure and that remove excess surface water. Suitable crops in a cropping system are those providing large amounts of residue that can be returned to the soil. Tillage needs to be timely and kept to a minimum. In some areas an adequate surface drainage system is needed to reduce wetness. Crop rows can be arranged so that the furrows help to drain ponded surface water. Capability unit IVw–2; woodland suitability group 4w9; pasture and hayland suitability group 8H.

Alusa Series

The Alusa series consists of deep, nearly level, poorly drained soils on uplands. These soils formed under a cover of pines and hardwoods and an understory of mid and tall grasses in calcareous clayey sediment.

In a representative profile the surface layer is 3 inches of grayish-brown loam with mottles in shades of brown. The subsurface layer extends to a depth of 9 inches and is light brownish-gray loam with mottles in shades of brown. The upper part of the subsoil, to a depth of 20 inches, is light brownish-gray clay with mottles in

shades of brown. The middle part of the subsoil, to a depth of 54 inches, is gray clay with mottles in shades of gray, brown, and red. The lower part of the subsoil extends to a depth of 72 inches or more and is gray clay with mottles in shades of brown. It contains a few cemented calcium carbonate concretions.

Permeability is very slow in Alusa soils, and available water capacity is high. The seasonal water table is at a depth of 0 to 1 foot.

Representative profile of Alusa loam (1,520 feet east and 50 feet south of the NW. corner of sec. 36, T. 6 S., R. 21 E.):

Ap—0 to 3 inches, grayish-brown (10YR 5/2) loam; few, fine, faint, yellowish-brown mottles; weak, fine, granular structure; friable; many roots; few, fine, brown and black concretions; medium acid; clear, smooth boundary.

A2g—3 to 9 inches, light brownish-gray (10YR 6/2) loam; common, medium, distinct, light yellowish-brown (10YR 6/4) mottles; weak, fine, granular structure; friable; organic stains on ped faces and on root channels; few, fine, brown and black concretions; medium acid; abrupt, wavy boundary.

B21tg—9 to 20 inches, light brownish-gray (10YR 6/2) clay; common, medium and coarse, distinct, yellowish-brown (10YR 5/4) and yellowish-red (5YR 5/8) mottles; moderate, medium, blocky structure; very firm; thin clay films on peds and common pressure faces; common silt coatings of light gray (10YR 7/2) on some ped faces and in voids; few, fine, brown concretions; very strongly acid; gradual, wavy boundary.

B22tg—20 to 36 inches, gray (10YR 6/1) clay; common, medium and coarse, faint and prominent, light brownish-gray and red (2.5YR 4/8) mottles; moderate, medium, blocky structure; very firm; thin clay films on peds; many shiny ped faces; few, hard, black and brown concretions; strongly acid; gradual, smooth boundary.

B23tg—36 to 54 inches, gray (10YR 6/1) clay; many, coarse, distinct, yellowish-brown (10YR 5/4) and strong-brown (7.5YR 5/6) mottles; weak, coarse, blocky structure; very firm; few slickensides that do not intersect; thin patchy clay films on peds; many shiny pressure faces; common, soft and hard, brown and black concretions; neutral, gradual, smooth boundary.

B3tg—54 to 72 inches, gray (10YR 6/1) clay; many, medium and coarse, distinct, yellowish-brown (10YR 5/6) and strong-brown (7.5YR 5/6) mottles; weak, coarse, blocky structure; very firm; shiny peds; few intersecting slickensides; many, fine and medium, brown and black concretions and few, cemented, calcium carbonate concretions; moderately alkaline.

The A1 or Ap horizon is very dark grayish brown, dark grayish brown, grayish brown, gray, and dark gray. The A2g horizon is light brownish gray, grayish brown, gray, and light gray. Mottles are few to common, fine or medium, and faint or distinct in shades of brown. The A horizon is medium acid or strongly acid.

The B2tg horizon is light brownish gray, gray, dark gray, and grayish brown. Mottles are common or many, fine through coarse, and faint through prominent in shades of brown, red, and gray. The B2tg horizon is silty clay loam, clay loam, clay, or silty clay, and it is very strongly acid to neutral. The B3tg horizon is gray, dark gray, and light brownish gray. Mottles are common or many, medium or coarse, and faint or distinct and are in shades of brown. This horizon is moderately or mildly alkaline.

Alusa soils have more gray colors in the upper part of the solum than the associated Cadeville soils. They have less clay in the A horizon than the associated Hollywood soils and lack the gilgai microrelief. Alusa soils, unlike associated Panola soils, have an A2 horizon and an abrupt boundary between the A2g and B2tg horizons.

Alusa loam (As).—This is the only Alusa soil mapped in the county. It is a nearly level soil on uplands. This soil has the profile described as representative of the Alusa series.

Included with this soil in mapping are a few small areas that are yellower in the upper part of the subsoil. Also included are spots of Panola silty clay loam, Cadeville loam, and Muskogee loam.

This soil is poorly suited to crops because of wetness late in spring and dryness late in summer. Late-season crops such as grain sorghum and soybeans can be grown. This soil is difficult to till because of its extreme wetness and dryness. This soil is suited to tame pasture and to trees.

Management practices are needed that help to maintain or to improve soil fertility and structure and that remove excess surface water. A cropping system is needed to provide crops that produce large amounts of residue for return to the soil. Smoothing the surface improves surface drainage. In places a surface-drainage system is needed to reduce wetness. Crop rows can be arranged so that the furrows help to drain ponded surface water. Capability unit IIIw–3; woodland suitability group 3w9; pasture and hayland suitability group 8H.

Bibb Series

The Bibb series consists of deep, nearly level, poorly drained soils on flood plains in the county other than those along the Red River. These soils formed under a cover of pines and hardwoods and an understory of mid and tall grasses in loamy sediment.

In a representative profile the upper 6 inches of the surface layer is dark grayish-brown and yellowish-brown fine sandy loam. Below this, to a depth of 14 inches, is gray very fine sandy loam with mottles in shades of brown. The underlying material is gray fine sandy loam and light brownish-gray very fine sandy loam mottled in shades of brown and white.

Permeability is moderate in Bibb soils, and available water capacity is high. The seasonal water table is at a depth of 0 to 1 foot, and these soils are subject to flooding.

Representative profile of Bibb fine sandy loam in an area of Bibb-Iuka complex (350 feet east and 75 feet south of the NW. corner of sec. 29, T. 5 S., R. 21 E.):

A11—0 to 3 inches, dark grayish-brown (10YR 4/2) fine sandy loam; massive; very friable; stratified with lenses of gray (10YR 5/1) silt loam; many roots; strongly acid; clear, smooth boundary.

A12—3 to 6 inches, yellowish-brown (10YR 5/4) fine sandy loam; weak, fine, granular structure; friable; many roots; faint, partly destroyed, gray (10YR 5/1) and yellow (10YR 7/6) bedding planes; common brown stains; strongly acid; clear, smooth boundary.

A13g—6 to 14 inches, gray (10YR 5/1) very fine sandy loam; many, medium, distinct, yellowish-brown (10YR 5/4) mottles; weak, fine and medium, granular structure; friable; many roots; strongly acid; gradual, smooth boundary

C1g—14 to 34 inches, gray (10YR 5/1) fine sandy loam; many, coarse, distinct, pale-brown (10YR 6/3) and yellowish-brown (10YR 5/4) mottles; weak, fine and medium, granular structure; friable; common fine pores; many roots, few brown stains; strongly acid; gradual, smooth boundary.

C2g—34 to 45 inches, light brownish-gray (10YR 6/2) very

fine sandy loam; many, coarse, distinct, pale-brown (10YR 6/3), yellowish-brown (10YR 5/6), and light-gray (10YR 7/2) mottles; weak, fine, granular structure; friable; few roots, very strongly acid; clear, smooth boundary.

C3g—45 to 68 inches, coarsely mottled white (10YR 8/2), yellowish-brown (10YR 5/6), and pale-brown (10YR 6/3) sandy loam; massive, friable; few, brown, brittle peds; very strongly acid.

The A11 and A12 horizons are dark grayish brown, grayish brown, brown, or yellowish brown with gray thin bedding planes. The A13g horizon is gray, light gray, or light brownish gray. It has few to many, medium, distinct mottles in shades of brown or yellow. The A horizon is strongly acid or very strongly acid.

The Cg horizon is gray, light brownish gray, or dark gray and has few to many, fine through coarse, distinct mottles in shades of yellow, brown, or white. The Cg horizon is fine sandy loam, sandy loam, or very fine sandy loam that is stratified with silt loam or loamy very fine sand. It is strongly acid or very strongly acid.

Bibb soils are near areas of Guyton, Iuka, and Ochlockonee soils. Bibb soils are grayer than Ochlockonee soils, and they are less clayey than Guyton soils. Bibb soils are grayer in the upper part of the profile than Iuka soils.

Bibb-Iuka complex (Bk).—In this mapping unit are nearly level soils of flood plains, except those along the Red River. About 50 percent of this unit is Bibb fine sandy loam, 40 percent is Iuka fine sandy loam and loam, and 10 percent is Ochlockonee fine sandy loam and Guyton silt loam.

The Bibb and Iuka soils occur in such an intricate pattern that it is impractical to map each soil separately. The Bibb soil has the profile described as representative of the Bibb series, and the Iuka soil has the profile described as representative of the Iuka series. The Bibb soils are in the low areas and the Iuka soils are on low ridges.

These soils are used mainly for tame pasture and as woodland, and they are suited to these uses. They are not suited to cultivated crops because of the hazard of flooding. These soils are subject to damaging floods each year, but in some years floods occur three to five times.

The quality of the tame pasture can be maintained or improved by controlling brush, applying fertilizer, and using suitable grazing practices. Wooded areas can be maintained or improved by protecting them from fire, removing or controlling inferior species, planting suitable species, and selectively harvesting trees on a planned schedule. Capability unit Vw–1; woodland suitability group 2w6a; Bibb soils in pasture and hayland suitability group 2B; Iuka soils in pasture and hayland suitability group 2A.

Blevins Series

The Blevins series consists of deep, very gently sloping, well-drained soils on uplands. These soils formed in loamy sediment under a cover of pines and hardwoods and an understory of mid and tall grasses.

In a representative profile the surface layer is 5 inches of dark grayish-brown fine sandy loam. The subsurface layer, to a depth of 12 inches, is a light yellowish-brown fine sandy loam. The upper part of the subsoil, to a depth of 32 inches, is yellowish-brown loam. The middle part of the subsoil, to a depth of 54 inches, is light yellowish-brown loam with mottles in shades of brown, red, and gray. The lower part of the subsoil, to a depth of 70 inches or more, is yellowish-brown, gray, and red loam and is mottled.

Permeability is moderate in Blevins soils, and available water capacity is high.

Representative profile of Blevins fine sandy loam, 1 to 3 percent slopes, (600 feet east and 100 feet south of the NW. corner of sec. 14, T. 6 S., R. 25 E.):

A1—0 to 5 inches, dark grayish-brown (10YR 4/2) fine sandy loam; weak, fine, granular structure; very friable; many fine and medium roots; medium acid; clear, smooth boundary.

A2—5 to 12 inches, light yellowish-brown (10YR 6/4) fine sandy loam; weak, fine, granular structure; very friable; few fine and medium roots; medium acid; clear, wavy boundary.

B21t—12 to 32 inches, yellowish-brown (10YR 5/4) loam; few, fine, faint, strong-brown mottles; weak, medium, subangular blocky structure; friable; common roots; common fine pores; clay films bridging sand grains and few, thin, discontinuous clay films in pores and on ped faces; occasional brown iron-oxide concretions; very strongly acid; clear, smooth boundary.

B22t and A'2—32 to 54 inches, light yellowish-brown (10YR 6/4) loam; many, fine, medium, faint, pale-brown and many, fine and medium, distinct, red (2.5YR 5/6) and gray (10YR 6/1) mottles; weak, medium, subangular blocky structure; friable; few fine roots; common fine pores; few, pitted, brown and reddish iron-oxide concretions; clean sand grains and silt coatings on ped faces and as small bodies; thin continuous clay films on ped faces and in pores; very strongly acid; gradual, smooth boundary.

B23t—54 to 70 inches, prominently mottled, yellowish-brown (10YR 5/6), gray (10YR 6/1), and red (2.5YR 4/8) loam; weak, medium, subangular blocky structure; friable; few fine pores; thin continuous clay films on ped faces and in pores; few, soft, red concretions with brittled interiors; very strongly acid.

The A1 or Ap horizon is dark grayish brown, grayish brown, or brown. The A2 horizon is yellowish brown, light yellowish brown, pale brown, or brown. Reaction of the A horizon is medium acid or strongly acid.

The B21t horizon is yellowish brown, light yellowish brown, yellow, and strong brown. The B22t horizon has these colors and has common to many, fine or coarse, distinct mottles in shades of red, gray, yellow, or brown. The B23t horizon is prominently mottled in colors of yellowish brown, gray, strong brown, and pale brown. Texture of the B2t horizon is loam, sandy clay loam, or clay loam. Reaction of the B2t horizons ranges from medium acid through very strongly acid.

These soils are outside the defined range for the Blevins series because they lack the silt content in the subsoil and typically are grayer in the lower part of the subsoil. They are enough like the Blevins series in morphology, composition, and behavior so that a new series is not warranted.

Blevins soils are associated with Kullitt, Muskogee, Ruston, and Tiak soils. Blevins soils lack gray mottles within 30 inches of the surface that are present in Kullit soils, and they have a yellower B horizon than Ruston soils. They are less clayey in the lower part of the B horizon than Tiak and Muskogee soils.

Blevins fine sandy loam, 1 to 3 percent slopes (BlB). This is the only Blevins soil mapped in the county. It is on uplands.

Included with this soil in mapping, and making up 15 percent of the mapped areas, are areas of Ruston fine sandy loam, minor areas where the surface layer is loam and silt loam, and spots of Kullit fine sandy loam.

This Blevins soil is well suited to such common crops in the county as corn, grain sorghum, soybeans, cotton, small grains, and peanuts. It is suited to tame pasture or as woodland and is used mainly for these purposes.

Management practices are needed that help to maintain or to improve soil fertility and structure, and that reduce erosion. Terraces and contour tillage are needed, unless minimum tillage (with large amounts of crop residue and use of fertilizer) is a part of management. During winter and spring plant cover is necessary to protect the soil from water erosion. Sown crops can be grown continuously if fertilizer is added according to soil tests and adequate crop residues are used. The residues should be returned to the soil, and excessive tillage should be avoided. Capability unit IIe–1; woodland suitability group 2o7; pasture and hayland suitability group 8B.

Cadeville Series

The Cadeville series consists of deep, very gently sloping and gently sloping, moderately well drained soils on uplands. These soils formed in clayey sediment under a cover of pines and hardwoods and an understory of mid and tall grasses.

In a representative profile the surface layer, which extends to a depth of 4 inches, is a dark grayish-brown loam. The subsurface layer extends to a depth of 7 inches and is brown loam that is mottled in shades of brown. The upper part of the subsoil extends to a depth of 16 inches and is a strong-brown clay that is mottled in shades of red and brown. The lower part of the subsoil, to a depth of 43 inches, is clay that is mottled in shades of brown, gray, and red. The underlying material is also clay. It is mottled in shades of gray and brown.

Permeability is very slow in Cadeville soils, and available water capacity is high. The seasonal perched water table is 2 to 3 feet below the surface.

Representative profile of Cadeville loam, 2 to 5 percent slopes (100 feet west and 50 feet south of the NE. corner of sec. 14, T. 7 S., R. 22 E.):

A1—0 to 4 inches, dark grayish-brown (10YR 4/2) loam; moderate, granular structure; friable; many roots; medium acid; clear, wavy boundary.

A2—4 to 7 inches, brown (10YR 5/3) loam; few, fine, faint, yellowish-brown mottles; weak, fine, granular structure; friable; many roots; strongly acid; clear, wavy boundary.

B21t—7 to 16 inches, strong-brown (7.5YR 5/6) clay; common, medium, distinct, yellowish-red (5YR 4/6) and fine, faint, pale-brown mottles; moderate, fine and medium, subangular blocky structure; firm; many fine roots; thick, continuous clay films; very strongly acid; clear, wavy boundary.

B22t—16 to 29 inches, mottled, light yellowish-brown (10YR 6/4), yellowish-brown (10YR 5/6), light brownish-gray (10YR 6/2), and red (2.5YR 4/6) clay; moderate, fine and medium, blocky and subangular blocky structure; very firm; few fine roots; thick, continuous clay films; few, fine, iron-manganese concretions; very strongly acid; gradual, wavy boundary.

B23t—29 to 43 inches, mottled, yellowish-brown (10YR 5/4), gray (10YR 5/1), and strong-brown (7.4YR 4/6) clay; moderate, fine and medium, blocky and coarse, subangular blocky structure; very firm; thin patchy clay films on peds; many shiny pressure faces; few slickensides; few iron-manganese concretions; slightly acid; gradual, wavy boundary.

C1—43 to 56 inches, fine and medium, mottled, gray (10YR 5/1), grayish-brown (2.5Y 5/2), and yellowish-brown (10YR 5/4) clay; common slickensides that intersect; a few part to blocky and wedge-shaped parallelepiped aggregates; very firm; many shiny pressure faces; few, fine, iron-manganese concretions; neutral; gradual, wavy boundary.

C2—56 to 68 inches, fine and medium, mottled, light olive-brown (2.5Y 5/4), olive-gray (5Y 5/2), and yellowish-brown (10YR 5/6) clay; many slickensides that intersect; very firm; few, hard, calcium carbonate concretions that have soft exteriors; many, fine, iron-manganese concretions; moderately alkaline.

The A1 horizon is very dark grayish brown, dark grayish brown, or grayish brown. The A2 horizon is brown, yellowish brown, or pale brown. Reaction of the A horizon is medium acid through strongly acid.

The B21t horizon is strong brown, reddish brown, or yellowish red. Mottles are common, fine or medium, and distinct and are in shades of brown and red. The B22t and B23t horizons are mottled in shades of red, gray, and brown. The B2t horizon is clay or silty clay. The upper Bt horizon is medium acid through very strongly acid.

The C horizon is mottled in shades of gray, olive, brown, and yellow. It is medium acid through moderately alkaline.

These soils are outside the defined range for the Cadeville series because reaction is higher in the lower part of the subsoil and in the substratum. They are enough like the Cadeville series in morphology, composition, and behavior so that a new series is not warranted.

Cadeville soils are associated with Alusa, Muskogee, Panola, Sumter, and Tiak soils. They are lower in calcium carbonate equivalent than the Sumter soils and are more clayey in the upper part of the B horizon than Muskogee soils. Cadeville soils are redder in the upper part of the B horizon than Alusa and Panola soils and have a thinner solum than Tiak soils.

Cadeville loam, 2 to 5 percent slopes (CaC).—This is the only Cadeville soil mapped in the county. It is on uplands.

Included with this soil in mapping, and making up 8 percent of the mapped areas, are areas of a similar soil that is about 40 inches deep over soft shaly clay and limestone, minor areas where the surface layer is silt loam, and spots of Alusa loam, Muskogee loam, and Tiak soils that have a gravelly fine sandy loam surface layer.

Cadeville loam, which is poorly fitted for cultivation, is best suited to trees or pasture and thus is used mainly for those purposes. Erosion hazard is very severe. Common crops are grain sorghum and soybeans, but the soil is suited to cotton and corn.

Management practices are needed that help to maintain or improve soil fertility and structure and reduce the hazard of erosion. The intensive use of crop residue and green-manure crops, together with applications of lime and fertilizer according to soil tests, helps to control erosion and maintain or improve soil fertility and soil structure. Terraces and contour tillage are needed for the efficient control of erosion with row crops. Crops that produce large amounts of residue are necessary, as is plant cover, in order to protect the soil from water erosion during winter and spring. Crop residue should be returned to the soil and excessive tillage avoided. Capability unit IVe–3; woodland suitability group 3c2; pasture and hayland suitability group 8F.

Cahaba Series

The Cahaba series consists of deep, nearly level through sloping, well-drained soils on terraces and uplands. These soils formed in loam sediment under a cover of pines and hardwoods and an understory of mid and tall grasses.

In a representative profile the surface layer is 5 inches of very dark grayish-brown fine sandy loam. The sub-

surface layer extends to a depth of 12 inches and is a dark-brown fine sandy loam. The subsoil, to a depth of 18 inches, is a yellowish-red loam. The lower part, to a depth of 42 inches, is a yellowish-red clay loam and loam. The underlying material is a yellowish-red fine sandy loam.

Permeability is moderate in Cahaba soils, and available water capacity is high.

Representative profile of Cahaba fine sandy loam, 0 to 1 percent slopes (2,700 feet south and 650 feet east of the NW. corner of sec. 16, T. 6 S., R. 23 E.):

A1—0 to 5 inches, very dark grayish-brown (10YR 3/2) fine sandy loam; moderate, medium, granular structure; friable; medium acid; clear, smooth boundary.

A2—5 to 12 inches, dark-brown (10YR 4/3) fine sandy loam; moderate, fine, granular structure; friable; medium acid; clear, smooth boundary.

B1—12 to 18 inches, yellowish-red (5YR 4/8) loam; weak, fine, subangular blocky structure; friable; strongly acid; gradual, smooth boundary.

B2t—18 to 34 inches, yellowish-red (5YR 4/8) clay loam; moderate, medium, subangular blocky structure; friable; distinct, continuous clay films; strongly acid; gradual, smooth boundary.

B3t—34 to 42 inches, yellowish-red (5YR 5/8) loam; faces of many peds red (2.5YR 4/6); weak, medium, subangular blocky structure; friable; thin patchy clay films; occasional fine gravel; strongly acid; gradual, smooth boundary.

C—42 to 65 inches, yellowish-red (5YR 5/8) fine sandy loam; many, medium, distinct, red (2.5YR 4/6) and strong-brown (7.5YR 5/6) mottles; massive; friable; very strongly acid.

The A1 or Ap horizon is very dark grayish brown, brown, pale brown, and dark grayish brown. The A2 horizon is dark brown, brown, and yellowish brown. The A horizon is fine sandy loam or loamy fine sand. It is medium acid or strongly acid.

The B2t horizon is yellowish-red, reddish-yellow, or red loam, clay loam, or sandy clay loam. This horizon ranges from medium acid through very strongly acid.

The C horizon is yellowish red and strong brown in color. Mottles are in shades of red and brown.

Cahaba soils are associated with Elysian, Guyton, Ochlockonee, Ruston, Sacul, Sallisaw, and Tiak soils. Cahaba soils have thinner sola than Ruston soils, are lower in base saturation than similar Rexor soils, and are more clayey than Elysian and Ochlockonee soils. They are less clayey than Tiak and Sacul soils. Cahaba soils are redder than Guyton soils, and they lack the gravelly substratum of Sallisaw soils.

Cahaba loamy fine sand, 0 to 3 percent slopes (CbB).—This soil is on uplands. It is similar to the soil described as representative of the Cahaba series, except that the surface and subsurface layers are loamy fine sand, the subsoil is thicker, and in places the substratum is underlain by soft sandstone bedrock.

Included with this soil in mapping, and making up 15 percent of the mapped areas, are areas where the surface layer is more than 20 inches thick and spots of Ruston fine sandy loam.

This Cohaba soil is well suited to such common crops in the county as corn, grain sorghum, soybeans, cotton, small grains, and peanuts. It is well suited to tame pasture and trees.

Management practices are needed that help to maintain or to improve soil fertility and water-holding capacity. Suitable practices are seeding legumes, adding fertilizer according to soil tests, and using crops that produce a large amount of residue. Crop residues need to be returned to the soil. Plant cover is needed during winter and spring to protect the soil from water erosion. Capability unit IIs–2; woodland suitability group 3o1; pasture and hayland suitability group 9A.

Cahaba loamy fine sand, 3 to 8 percent slopes (CbD).—This soil is on uplands. It is similar to that described as representative of the Cahaba series, except that the surface and subsurface layers are loamy fine sand. Also, the subsoil is thicker than that in the representative profile, and in places the substratum is underlain by soft sandstone bedrock.

Included in mapping are a few small areas of soils that have a surface layer more than 20 inches thick and spots of Ruston fine sandy loam and Sacul fine sandy loam.

This soil is well suited to the common crops in the county, such as corn, grain sorghum, soybeans, cotton, small grains, and peanuts. It is well suited to tame pasture and trees. It is used mostly for tame pasture.

Management practices are needed that help to maintain or to improve soil fertility and reduce erosion. A suitable cropping system is one that provides plant cover during the winter and spring to protect the soil from erosion. Suitable practices are seeding legumes, adding fertilizer according to soil tests, and using crops that produce a large amount of residue for return to the soil. Cover crops should be planted after low-residue crops. Diversion terraces are needed in some areas. Capability unit IIIe–3; woodland suitability group 3o1; pasture and hayland suitability group 9A.

Cahaba fine sandy loam, 0 to 1 percent slopes (ChA).—This soil is on uplands or terraces. It has the profile described as representative for the Cahaba series.

Included with this soil in mapping, and making up 20 percent of the mapped areas, are soils that are yellower and have a thicker combined surface layer and subsoil and minor areas of Elysin fine sandy loam and Guyton silt loam.

This soil is well suited to the common crops in the county, such as corn, grain sorghum, soybeans, cotton, small grains, and peanuts. It is also well suited to tame pasture and trees. It is mainly used for tame pasture (fig. 2).

Management practices are needed that help to maintain or to improve soil fertility and soil structure. Soil fertility and structure can be maintained by seeding legumes, adding fertilizers according to soil tests, effectively using crop residues, and avoiding excessive tillage. Sown crops can be grown continuously if fertilizer is added and crop residues are used. Capability unit I–2; woodland suitability group 2o7; pasture and hayland suitability group 8B.

Cahaba fine sandy loam, 1 to 3 percent slopes (ChB).—This soil is on uplands or terraces. Included in mapping, and making up 20 percent of the mapped areas, are similar soils that are yellower and have a thicker combined surface layer and subsoil.

This soil is well suited to the common crops in the county, such as corn, grain sorghum, soybeans, cotton, small grains, and peanuts. It is also well suited to tame pasture and trees. It is mainly used for tame pasture.

Management practices are needed that help to maintain or improve soil structure and fertility and reduce the hazard of erosion. Terraces and contour tillage are

Figure 2.—**Pasture of Coastal bermudagrass in an area of Cahaba fine sandy loam, 0 to 1 percent slopes. Well-managed areas such as this provide ample forage or hay for raising beef cattle.**

needed unless minimum tillage and return of large amounts of crop residue to the soil are included in the management program. Crops are needed that produce large amounts of residue. Plant cover is necessary during the winter and spring to protect the soil from water erosion. Sown crops can be grown continuously if fertilizer is added and adequate crop residues are used. Crop residues should be returned to the soil and excessive tillage avoided. Capability unit IIe–1; woodland suitability group 2o7; pasture and hayland suitability group 8B.

Cahaba and Tiak soils, 2 to 8 percent slopes, severely eroded (CkD3).—These soils, which are on uplands, occur in an irregular pattern. They are large enough to be mapped separately but are similar in use and management. They are severely eroded but are otherwise similar to the soils described as representative of the Cahaba and Tiak series.

About 46 percent of the acreage is Cahaba fine sandy loam, loamy fine sand, and loam and eroded Cahaba soils; and 26 percent is Tiak fine sandy loam and loam and eroded Tiak soils. Gullies account for 20 percent of the mapped areas, and 8 percent is Kullit fine sandy loam, Muskogee loam, and minor areas of Sherwood fine sandy loam.

In about 30 percent of the areas of eroded soils, the surface layer is less than 3 inches thick. In many places all of the original surface layer has been removed by erosion, exposing the loam, sandy clay loam, and clay subsoil. The number of gullies in a given area varies. Usually gullies are at 75- to 250-foot intervals. About half of them cannot be crossed by the common types of farm machinery.

These soils are so severely eroded that they are not suitable for cultivation. They should be returned to such permanent vegetation as tame pasture or trees. Adding fertilizer according to soil tests, sloping gully banks, diverting overhead water, and mulching are needed for the successful establishment of tame pasture. Shaping of gully banks is needed for the establishment of loblolly pine. The quality of the grasses can be maintained or improved by controlling brush, using lime and fertilizers, and employing suitable grazing practices. A wooded area can be maintained or improved by protecting it from fire, removing or controlling inferior species of trees, planting suitable trees, and selectively harvesting trees on a planned schedule. Capability unit VIe–3; woodland suitability group 4c3e; pasture and hayland suitability group 8F.

Carnasaw Series

The Carnasaw series consists of deep, very gently sloping to steep, well-drained soils on uplands. These soils formed in material weathered from tilted shale and sandstone. Natural vegetation consisted of a cover of pines and hardwoods and an understory of mid and tall grasses.

In a representative profile the surface and subsurface layers combined are 9 inches of very dark grayish-brown and yellowish-brown loam. The upper part of the subsoil, to a depth of 37 inches, is a yellowish-red silty clay loam and silty clay. The lower part of the subsoil, to a depth of 42 inches, is a yellowish-red silty clay with mottles in shades of brown and red. The underlying material is fractured shale and sandstone.

Permeability is slow in Carnasaw soils, and available water capacity is high.

Representative profile of Carnasaw loam from an area of Goldston-Carnasaw-Sacul association, moderately steep (2,500 feet east and 800 feet north of the SW. corner of sec. 7, T. 5 S., R. 25 E.):

A1—0 to 3 inches, very dark grayish-brown (10YR 3/2) loam; moderate, medium and fine, granular structure; very friable; many fine and medium roots; about 6 percent fine quartzite and thin fragments of sandstone; medium acid; clear, wavy boundary.

A2—3 to 9 inches, yellowish-brown (10YR 5/4) loam; weak, medium and fine, granular structure; very friable; many fine and medium roots; about 12 percent fine, gravelly quartzite and thin, flat sandstone fragments; strongly acid; clear, wavy boundary.

B21t—9 to 15 inches, yellowish-red (5YR 5/8) silty clay loam; strong, medium and fine, subangular blocky structure; friable; common fine and medium roots; nearly continuous clay films on ped faces; few, fine, flat shale fragments and few, fine, rounded sandstone fragments; very strongly acid; gradual, smooth boundary.

B22t—15 to 37 inches, yellowish-red (5YR 4/8) silty clay; strong, medium, subangular blocky structure; friable; common fine roots; nearly continuous clay films on ped faces; many peds coated with red (2.5YR 4/6) stains; few, thin, shale fragments; very strongly acid; gradual, smooth boundary.

B3t—37 to 42 inches, yellowish-red (5YR 4/8) silty clay;

many, fine and medium, distinct, strong-brown (7.5YR 5/8) and red (2.5YR 4/6) mottles; moderate, fine, blocky structure; friable; common fine and few medium roots; patchy clay films on ped faces; about 20 percent, by volume, sandstone and shale fragments; strongly acid; clear, irregular boundary.

C—42 inches, fractured shale bedrock laminated with layers of sandstone; brown and reddish coatings along fractures and cleavage planes. Shale and sandstone bedrock tilted 30° from a horizontal plane.

The Ap or A1 horizon is very dark grayish brown, dark grayish brown, brown, or dark brown. The A2 horizon is brown, yellowish-brown, light yellowish-brown, pale-brown, or strong-brown loam, silt loam, or fine sandy loam. It is medium acid or strongly acid.

The B21t horizon is strong-brown, reddish-yellow, or yellowish-red silty clay loam, clay loam, or clay. The B22t horizon is yellowish red or red. Mottles are common in some profiles and, where present, are fine or medium and distinct in shades of brown or yellow. This horizon is silty clay or clay. Fifty percent or more of the B3t horizon is soil material that formed between the tilted fractions in the underlying sandstone and shale. This horizon is yellowish-red, reddish-yellow, or strong-brown silty clay or clay. The B horizons are strongly acid or very strongly acid.

The C horizon is shale and sandstone tilted more than 20 degrees from horizontal. Depth to the bedrock is 40 to 60 inches and extremely variable within short distances because of the irregular boundary between the B3t horizon and the underlying bedrock.

Carnasaw soils are associated with areas of Alikchi, Goldston, Sacul, Sherwood, and Zafra soils. They have continuous Bt horizons that are not present in Goldston soils, and they are redder than Alikchi soils. Sacul soils have gray mottles in the upper part of their subsoil. Carnasaw soils have more clay in their subsoil than Sherwood and Zafra soils.

Carnasaw-Goldston association, moderately steep (CmE).—These soils are on uplands, most of which are rolling and dissected. About 70 percent of this association is Carnasaw loam and silt loam, 20 percent is Goldston gravelly loam, and 10 percent is Sherwood fine sandy loam. The Carnasaw and Goldston soils have the profiles described as representative of their respective series. Carnasaw soils are on smooth side slopes and broad ridges, and Goldston soils have long slopes and are on crests and short ridgetops.

These soils are not suited to crops, but they are well suited to trees and tame pasture. Most of the areas are wooded. A large acreage, however, has been cleared of trees and is used for tame pasture.

The quality of the tame pasture can be maintained or improved by controlling brush, using lime and fertilizer according to soil tests, and employing suitable grazing practices.

Wooded areas can be maintained or improved by protecting them from fire, removing or controlling inferior species, planting suitable species, and selectively harvesting trees on a planned schedule. Capability unit VIe–2; Carnasaw soil in woodland suitability group 3o1, Goldston soil in woodland suitability group 4f2; Carnasaw soil in pasture and hayland suitability group 8B, Goldston soil in pasture and hayland suitability group 14A.

Carnasaw-Zafra complex, 1 to 8 percent slopes (CnD).—These soils are on uplands. About 52 percent of this unit is Carnasaw loam and fine sandy loam, 33 percent is Zafra fine sandy loam, and 15 percent is Sherwood fine sandy loam and spots of Goldston loam. The Carnasaw and Zafra soils in this association are in an intricate pattern, Zafra soils occurring on crests and sides of microcrests between areas of Carnasaw soils.

Most of the areas of these soils are wooded. A small acreage has been cleared and is used for tame pasture. These soils are suited to such common crops as corn, grain sorghums, and soybeans.

Management practices for cropland are needed that help to maintain or improve soil fertility and reduce the severe erosion hazard. Terraces and contour tillage are essential for row crops. Crops are needed that produce a large amount of residue. Crop residue should be returned to the soil and excessive tillage avoided. Plant cover is needed during winter and spring to protect the soil from water erosion.

These soils are best suited to tame pasture or trees. The quality of the tame pasture can be maintained or improved by controlling brush, applying fertilizer according to soil tests, and using suitable grazing practices.

Wooded areas can be maintained or improved by protecting them from fire, removing or controlling inferior species, planting suitable species, and selectively harvesting trees on a planned schedule. Capability unit IVe–2; woodland suitability group 3o1; pasture and hayland suitability group 8B.

Caspiana Series

The Caspiana series consists of deep, nearly level, well-drained soils on the terraces of the Red River. These soils formed under a cover of hardwoods and an understory of mid and tall grasses in loamy alkaline sediment.

In a representative profile the surface layer is 18 inches of very dark grayish-brown and dark-brown loam. The subsoil extends to a depth of 48 inches and is reddish-brown silty clay loam and loam. The underlying material is reddish-brown very fine sandy loam.

Permeability is slow in Caspiana soils, and available water capacity is high.

Representative profile of Caspiana loam (1,500 feet north and 100 feet east of the SW. corner of sec. 17, T. 8 S., R. 23 E.):

Ap—0 to 6 inches, very dark grayish-brown (10YR 3/2) loam; weak, fine, granular structure; very friable; many fine pores; slightly acid; clear, smooth boundary.

A1—6 to 18 inches, dark-brown (7.5YR 3/2) loam; moderate, medium and fine, granular structure; friable; many fine pores; many worm casts; slightly acid; clear, smooth boundary.

B2t—18 to 32 inches, reddish-brown (5YR 4/3) silty clay loam; moderate, medium and fine, subangular blocky structure; friable; weak, thin, patchy clay films on ped faces; neutral; gradual, smooth boundary.

B3—32 to 48 inches, similar to B2t except clay percentage decreases with increasing depth and texture is loam; gradual, smooth boundary.

C—48 to 70 inches, reddish-brown (5YR 4/4) very fine sandy loam; massive; friable; upper part is moderately alkaline, mass is calcareous in the lower part.

The A1 and Ap horizons are very dark grayish brown or dark brown, and the A horizon is slightly acid through neutral. The B2t horizon is reddish brown, red, or yellowish red. This horizon is loam or silty clay loam. The B horizon ranges from slightly acid through moderately alkaline. The C horizon is reddish brown or yellowish red and is very fine sandy loam, loam, or silty clay loam. This horizon is neutral through moderately alkaline.

Caspiana soils are associated with areas of Gallion, Garton, and Pledger soils. Caspiana soils are more silty than Gallion soils and less clayey than Garton and Pledger soils.

Caspiana loam (Cp).—This is the only Caspiana soil mapped in the county. It is a nearly level soil on the terraces of the Red River.

Included with this soil in mapping, and making up 10 percent of the mapped areas, are Gallion very fine sandy loam, Garton silt loam, and minor areas of Caspiana soil that has a silt loam surface layer.

This soil is highly suited to the common crops in the county, such as alfalfa, soybeans, cotton, corn, grain sorghum, small grains, and peanuts. It is also very well suited to tame pasture and trees. This soil is used mainly for crops.

Management practices are needed that help to maintain or improve soil structure and fertility. Crop residue needs to be returned to the soil, and excessive tillage should be avoided. Capability unit I–1; woodland suitability group 2o4; pasture and hayland suitability group 2A.

Ceda Series

The Ceda series consists of deep, nearly level and very gently sloping, well-drained soils on the flood plains in the mountains. These soils formed under a cover of pines and hardwoods and an understory of mid and tall grasses in loamy sediment and coarse fragments.

In a representative profile the surface layer is 9 inches of dark grayish-brown gravelly loam and 28 percent waterworn gravel. The underlying material is a dark yellowish-brown and yellowish-brown gravelly loam and very gravelly loam.

Permeability is rapid in Ceda soils, and available water capacity is low to moderate. These soils are subject to flooding.

Representative profile of Ceda gravelly loam from an area of Ceda-Rubble land complex (1,840 feet south of the NE. corner of sec. 31, T. 5 S., R. 25 E.):

A1—0 to 9 inches, dark grayish-brown (10YR 4/2) gravelly loam; moderate, fine, granular structure; friable; 28 percent, by volume, waterworn quartz, sandstone, and shale gravel ⅛ inch to 3 inches in diameter, a few cobblestones and other stones; medium acid; clear, wavy boundary.

C1—9 to 29 inches, dark yellowish-brown (10YR 4/4) gravelly loam; massive; friable; 42 percent, by volume, waterworn quartz, sandstone, and shale gravel ⅛ inch to 3 inches in diameter; a few cobblestones and other stones; medium acid; diffuse, wavy boundary.

C2—29 to 65 inches, yellowish-brown (10YR 5/4) very gravelly loam; massive; friable; partly interrupted by few thin strata of gravel that is less than 5 percent fines; 65 percent, by volume, waterworn quartz, sandstone, and shale ⅛ inch to 3 inches in diameter; a few cobblestones and other stones; medium acid.

The A horizon is very dark grayish-brown, dark grayish-brown, dark-brown, brown, and grayish-brown gravelly loam or loam. The amount of coarse fragments ranges from 10 to 50 percent.

The C horizon is dark yellowish brown, brown, light yellowish brown, yellowish brown, and strong brown. Texture is gravelly and very gravelly loam, gravelly and very gravelly silt loam, gravelly and very gravelly fine sandy loam, and gravelly and very gravelly clay loam. The amount of coarse fragments ranges from 35 to 85 percent by volume. The C horizon is medium acid through slightly acid.

Ceda soils are associated with Iuka, Ochlockonee, and Rexor soils and with Rubble land. They have more gravel, cobblestones, and other stones than Ochlockonee, Iuka, and Rexor soils, and they are less gravelly than Rubble land.

Ceda-Rubble land complex (Cr).—In this mapping unit are nearly level and very gently sloping Ceda soils and Rubble land flood plains in the mountains. About 55 percent of this mapping unit is Ceda loam and Ceda gravelly loam and another 35 percent is Rubble land. About 10 percent is Rexor loam, Ochlockonee fine sandy loam, and Iuka fine sandy loam. The Ceda soils and Rubble land are in an intricate pattern, with Rubble land occurring in narrow stream channels and as narrow areas of the flood plain surrounded by areas of Ceda soils.

The Ceda soils in this complex are the soils described as representative of the Ceda series. Rubble land consists of boulders, stones, cobblestones, and gravel. A few thin interstices of loamy soil material in Rubble land make up less than 10 percent by volume. Rubble land is more gravelly than the associated Ceda soils.

The Ceda soils are best suited to and used for trees and wildlife habitat, because of the hazard of flooding and coarse fragments. The flood plains are narrow and of high gradient. A few small areas have been cleared of trees and are used for tame pasture.

Wooded areas can be maintained or improved by protecting them from fire, removing or controlling inferior species, planting suitable species, and selectively harvesting trees on a planned schedule. Vegetation on Rubble land is sparse. Capability unit VIIs–4; woodland suitability group 3x9; Ceda soil in pasture and hayland suitability group 3A.

Coushatta Series

The Coushatta series consists of deep, nearly level, well-drained soils on the flood plains of the Red River. These soils formed in loamy alkaline sediment under a cover of pines and hardwoods and an understory of mid and tall grasses.

In a representative profile the surface layer is 8 inches of reddish-brown silty clay loam. The subsoil is 19 inches of reddish-brown silty clay loam. The underlying material is reddish-brown and yellowish-red silt loam.

Permeability is moderately slow in Coushatta soils, and available water capacity is high.

Representative profile of Coushatta silty clay loam (2,000 feet west and 75 feet north of the SE. corner of sec. 13, T. 9 S., R. 23 E.):

Ap—0 to 8 inches, reddish-brown (5YR 4/3) silty clay loam; moderate, medium and fine, subangular blocky structure; firm; few worm casts; neutral; clear, smooth boundary.

B—8 to 27 inches, reddish-brown (5YR 4/3) silty clay loam; moderate, medium and fine, subangular blocky structure; firm; many worm casts; moderately alkaline; calcareous in spots; clear, smooth boundary.

C1—27 to 34 inches, reddish-brown (5YR 4/4) silt loam, massive; friable; moderately alkaline; calcareous in spots; clear, smooth boundary.

C2—34 to 60 inches, yellowish-red (5YR 4/6) silt loam and many thin lenses of reddish-brown silty clay loam and reddish-yellow very fine sandy loam; massive; friable; many thin bedding planes; moderately alkaline, calcareous.

The A horizon is slightly acid through neutral. The B horizon is reddish brown or red silty clay loam or silt loam.

The C horizon is reddish brown, yellowish red, or reddish yellow. It contains strata of silt loam or very fine sandy loam and in places has strata of loamy very fine sand to silty clay.

Coushatta soils are associated with areas of Idabel, Latanier, Oklared, Redlake, and Severn soils. Coushatta soils are more clayey than Oklared, Severn, and Idabel soils and less clayey than Latanier and Redlake soils.

Coushatta silty clay loam (Cs).—This is the only Coushatta soil mapped in the county. It is a nearly level soil on the flood plains of the Red River.

Ten percent of the mapped areas included with this soil in mapping is Idabel silt loam, and 5 percent is Latanier clay and Redlake clay and spots of Coushatta with a silt loam surface layer.

This soil is highly suited to the common crops in the county, such as alfalfa, soybeans, cotton, corn, grain sorghum, and small grains. It is also well suited to tame pasture and trees but is mainly used for crops.

Management practices are needed to help to maintain soil structure and fertility. Crop residue should be returned to the soil, and land smoothing is needed in many areas to remove irregularities. Capability unit I–1; woodland suitability group 2o4; pasture and hayland suitability group 2A.

Elysian Series

The Elysian series consists of deep, nearly level to gently sloping, moderately well drained mound soils on terraces. These soils formed in loamy sediment under a cover of pines and hardwoods and an understory of mid and tall grasses.

In a representative profile the surface layer is 6 inches of dark grayish-brown fine sandy loam. The next layer, which extends to a depth of 29 inches, is strong-brown fine sandy loam. The subsoil, to a depth of 44 inches, is strong-brown loam with mottles in shades of brown and tongues of pale-brown fine sandy loam.The lower part of the subsoil, which extends to a depth of 72 inches or more, is mottled, strong-brown and yellowish-brown loam with light-gray tongues of fine sandy loam.

Permeability is moderate in Elysian soils, and available water capacity is high.

Representative profile of Elysian fine sandy loam in an area of the Wrightsville-Elysian complex (2,600 feet west and 200 feet south of the NE. corner of sec. 10, T. 10 S., R. 26 E.):

A1—0 to 6 inches, dark grayish-brown (10YR 4/2) fine sandy loam; weak, fine, granular structure; very friable; medium acid; clear, smooth boundary.

B1—6 to 29 inches, strong-brown (7.5YR 5/6) fine sandy loam; weak, fine, granular structure; very friable; medium acid; clear, wavy boundary.

B21t and A'21—29 to 44 inches, strong-brown (7.5YR 5/6) loam; few, fine, faint, yellowish-brown mottles; weak, medium, subangular blocky structure; friable; about 15 percent of horizon is streaks and tongues of fine sandy loam that are pale brown (10YR 6/3) above a depth of 40 inches and light gray (10YR 7/2) below; few clay films in pores; few small pockets of clean sand grains; 20 to 30 percent yellowish-red (5YR 5/6) peds that are brittle when moist; few, fine, iron-manganese concretions; very strongly acid; gradual, wavy boundary.

B22t and A'22—44 to 72 inches, mottled, strong-brown (7.5YR 5/6) and yellowish-brown (10YR 5/4) loam; weak medium, subangular blocky structure; firm; about 30 percent of horizon is light-gray (10YR 7/2) streaks and tongues of fine sandy loam; common pockets of clean sand grains; 5 percent yellowish-red (5YR 5/6) peds that are brittle when moist; nearly continuous clay films on faces of peds and within pores; very strongly acid.

The A1 horizon is dark grayish brown, grayish brown, light yellowish brown, brown, and light brown. The B1 horizon has similar colors but includes light brownish gray, brownish yellow, pale brown, strong brown, and reddish yellow. Reaction in the A1 and B1 horizons is slightly acid through very strongly acid. The Bt and A'2 horizons are dark yellowish brown, yellowish brown, light yellowish brown, brownish yellow, brown, light brown, strong brown, and reddish yellow. Mottles are few to many and are in shades of brown. Clay content, on a weighted average basis, is 10 to 18 percent. The A'2 material makes up 5 to 30 percent of the Bt and A'2 horizons, and it is less clayey than the Bt material. It is medium acid through very strongly acid.

Elysian soils have more sand than the similar Frizzell soils. They are on mounds and are less clayey than the associated Cahaba, Guyton, Kullit, Tomast, and Wrightsville soils.

Elysian soils in this county are mapped only with Wrightsville and Guyton soils.

Felker Series

The Felker series consists of deep, nearly level and very gently sloping, somewhat poorly drained soils on uplands. These soils formed in loamy sediment under a cover of pines and hardwoods and an understory of mid and tall grasses.

In a representative profile the surface and the subsurface layers are 10 inches of very dark grayish-brown and pale-brown loam. The upper part of the subsoil, to a depth of 43 inches, is a light yellowish-brown and yellowish-brown silt loam. Mottles are in shades of gray and brown. The middle part of the subsoil, to a depth of 51 inches, is a light brownish-gray silt loam and has mottles in shades of brown and red. The lower part of the subsoil, to a depth of 70 inches or more, is coarsely mottled, gray, yellowish-brown and pale-brown silty clay loam.

Permeability is moderately slow in Felker soils, and available water capacity is high. The seasonal water table is at a depth of 2 to 3 feet.

Representative profile of Felker loam, 0 to 2 percent slopes (600 feet west and 100 feet south of the NE. corner of sec. 23, T. 8 S., R. 25 E.):

A1—0 to 2 inches, very dark grayish-brown (10YR 3/2) loam; weak, fine, granular structure; very friable; medium acid; clear, smooth boundary.

A2—2 to 10 inches, pale-brown (10YR 6/3) loam; weak, fine, granular structure; very friable; many roots; few thin organic stains; medium acid; clear, smooth boundary.

B21t—10 to 26 inches, light yellowish-brown (10YR 6/4) silt loam; many, fine, faint, light brownish-gray and dark-brown mottles; weak, medium, granular structure; friable; thin, discontinuous clay films on ped faces and within pores; strongly acid; gradual, smooth boundary.

B22t—26 to 43 inches, yellowish-brown (10YR 5/6) silt loam; many, medium and coarse, distinct, light brownish-gray (10YR 6/2) and pale-brown (10YR 6/3) mottles; weak, medium and fine, subangular blocky structure; friable; few medium and fine pores; patchy clay films on ped faces and bridged sand grains; strongly acid; gradual, smooth boundary.

B23t—43 to 51 inches, light brownish-gray (10YR 6/2) silt loam; many, medium and coarse, distinct, light yel-

lowish-brown (10YR 6/4) and yellowish-red (5YR 5/6) mottles; weak, medium, subangular blocky structure; friable; thin clay films on ped faces; slightly brittle; clean sand grains and silt coatings on ped surfaces and in small bodies; very strongly acid; gradual, smooth boundary.

B24t—51 to 70 inches, coarsely mottled, gray (10YR 6/1), yellowish-brown (10YR 5/4), and pale-brown (10YR 6/3) silty clay loam; weak, subangular blocky structure; friable; thin clay films on ped faces; streaks and pockets of less clayey material that is light gray (10YR 7/2) and light brownish gray (10YR 6/2); very strongly acid.

The A1 horizon is very dark grayish brown, dark grayish brown, brown, or grayish brown. The A2 horizon is brown, yellowish brown, pale brown, and light yellowish brown. The A horizon is very strongly acid through medium acid.

The B21t and B22t horizons are brown, yellowish brown, pale brown, light yellowish brown, or brownish yellow. Mottles are many to common, fine through medium, and distinct in shades of gray, red, brown, or yellow. These horizons are loam, silt loam, or silty clay loam.

The B23t horizon is yellowish brown, gray, light brownish gray, or pale brown. Mottles are common to many, medium through coarse, and distinct in shades of gray, brown, red, and yellow. The B23t horizon is silt loam, loam, clay loam, or silty clay loam. Bodies of clean sand grains and silt coatings on ped surfaces are common. The B24t horizon is coarsely mottled in shades of gray, brown, red, and yellow and it is silt loam or silty clay loam. The B2t horizons are very strongly acid and strongly acid.

Felker soils are associated with Guyton, Kinta, Kullit, and Tomast soils. Felker soils have more silt than Kullit soils and are not so gray in the upper horizons as Guyton, Kinta, Tomast, and similar Adaton soils.

Felker loam, 0 to 2 percent slopes (FeA).—This is the only Felker soil mapped in the county. It is on uplands.

Included with this soil in mapping are areas of a soil that has a silt loam surface layer. They make up 25 percent of the mapped areas. Also included, and making up 10 percent of the mapped areas, is a soil similar to this one except it is less clayey. Spots of Elysian fine sandy loam as mounds, Kinta clay loam, Kullit fine sandy loam, Tomast silt loam, and Guyton silt loam are also included.

This soil is used mostly for trees and tame pasture. It is suited to cultivation, but a seasonal high water table and ponded water during wet periods late in spring are concerns in management. The soil can be used for grain sorghum, soybeans, corn, and cotton.

Management practices are needed to help maintain or to improve soil fertility and structure and to remove excess surface water. A suitable cropping system, one which maintains or improves soil fertility and structure. is needed to provide crops that produce large amounts of residue that can be returned to the soil. In places the Elysian fine sandy loam on mounted relief retards runoff. Land smoothing improves surface drainage in these areas. Occasionally, crop rows can be arranged so that the furrows help to drain ponded surface water. Capability unit IIw–1; woodland suitability group 2w8; pasture and hayland suitability group 8G.

Frizzell Series

The Frizzell series consists of deep, nearly level, moderately well drained soils on flood plains other than those along the Red River. These soils formed in loamy sediment under a cover of pines and hardwoods and an understory of mid and tall grasses.

In a representative profile the surface layer is 10 inches of brown loam. The upper part of the subsoil, to a depth of 45 inches, is yellowish-brown loam that has mottles in shades of gray and brown. It contains bodies of light brownish-gray silt loam that are less clayey than the loam. The lower part of the subsoil, to a depth of 70 inches, is mottled gray and yellowish-brown silt loam and loam.

Permeability is slow in Frizzell soils, and available water capacity is high. The seasonal water table is at a depth of 2 to 3 feet, and these soils are subject to flooding.

Representative profile of Frizzell loam (about 140 feet west and 3,150 feet south of the NE. corner of sec. 10, T. 6 S., R. 22 E.):

A1—0 to 10 inches, brown (10YR 4/3) loam; weak, fine, granular structure; friable; many roots; very strongly acid; abrupt, smooth boundary.

B & A21—10 to 24 inches, yellowish-brown (10YR 5/4) loam; common, medium, distinct, light brownish-gray (10YR 6/2) and few, fine, faint, yellowish-brown mottles; weak, medium, subangular blocky structure; friable; clay films bridging grains; few roots; many fine pores; 15 percent of horizon is small bodies of light brownish-gray (10YR 6/2) silt loam that is less clayey than surrounding material; very strongly acid; diffuse, smooth boundary.

B & A22—24 to 45 inches, yellowish-brown (10YR 5/4) loam; common, medium, distinct, light brownish-gray (10YR 6/2) and few, faint, yellowish-brown mottles; weak, medium, subangular blocky structure; friable; thin clay films in pores; few fine pores; discontinuous bleached sand grains on ped faces; few, hard, black concretions; 10 percent of horizon is small bodies of light brownish-gray (10YR 6/2) silt loam that is less clayey than surrounding material; very strongly acid; gradual, wavy boundary.

B21t—45 to 56 inches, mottled, yellowish-brown (10YR 5/4) (55 percent) and gray (10YR 6/1) (45 percent) silt loam; few, medium, distinct, strong-brown (7.5YR 5/6) mottles; weak, medium, subangular blocky structure; friable; few roots; few fine pores; few black and few brown concretions; few patchy clay films on peds, continuous clay films in root channels; very strongly acid; abrupt, wavy boundary.

B22t—56 to 70 inches, mottled, gray (10YR 6/1) (55 percent) and yellowish-brown (10YR 5/4) (45 percent) loam; moderate, medium, subangular blocky structure; firm; common fine pores; clay films continuous on ped faces; few medium-brown concretions; very strongly acid.

The A1 horizon is dark grayish brown, grayish brown, light brownish gray, brown, and pale brown. The B and A2 horizons are more than 24 inches thick. The B part of these horizons is pale brown, light yellowish brown, brown, or yellowish brown. It has common to many mottles in shades of gray and brown. The A2 part consists of streaks, spots, or tongues of less clayey material that are pale brown, grayish brown, light brownish gray, or light gray. They make up 10 to 40 percent of the B and A2 horizon. The A2 horizon is silt loam or loam. The Bt horizon is brown, yellowish brown, or light yellowish brown, and is mottled in shades of gray or has a mottled matrix of gray and yellowish brown. This horizon is silt loam, loam, clay loam, or silty clay loam. It is strongly acid or very strongly acid.

Frizzell soils are associated with Guyton, Iuka, and Rexor soils. Frizzell soils are not so gray in the upper part of the solum as Guyton soils and are grayer than Rexor soils. Frizzell soils are more silty than similar Elysian and associated Iuka soils.

Frizzell loam (Fr).—This is the only Frizzell soil mapped in the county. It is nearly level and is on flood plains other than those along the Red River.

Included with this soil in mapping, and making up 8 percent of the mapped areas, are similar soils that have a gray matrix in more than 40 percent of the upper 30 inches. Also included are areas where the surface layer is silt loam and spots of Guyton silt loam, Sallisaw loam, and Rexor loam.

This soil is suited to the common crops in the county, such as corn, grain sorghum, soybeans, and cotton. It is also suited to tame pasture and to trees. It is used mostly for tame pasture (fig. 3).

Management practices are needed that help to maintain or to improve soil fertility and structure. Most of the crops grown produce large amounts of residue, and they can be grown continuously if the residue is returned to the soil along with fertilizer. Frizzell soils are subject to damaging floods once in 1 to 5 years for short periods. In places low-lying areas flood more often. Crop damage that results from overflow of streams is a serious concern. Capability unit IIw–3; woodland suitability group 2w8; pasture and hayland suitability group 2A.

Gallion Series

The Gallion series consists of deep, nearly level and very gently sloping, well-drained soils on the terraces of the Red River. These soils formed under a cover of hardwoods and an understory of mid and tall grasses in loamy alkaline sediment.

In a representative profile the surface layer is 8 inches of dark grayish-brown very fine sandy loam. The next layer is 10 inches of brown very fine sandy loam. The subsoil, which extends to a depth of 40 inches, is yellowish-red loam. The underlying material is a strong-brown very fine sandy loam.

Figure 3.—**Area of Coastal bermudagrass used for production of hay. The soil is Frizzell loam.**

Permeability is moderate in Gallion soils, and available water capacity is high.

Representative profile of Gallion very fine sandy loam (2,500 feet south and 150 feet east of the NW. corner of sec. 30, T. 8 S., R. 24 E.):

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) very fine sandy loam; weak, fine, granular structure; friable; many roots; medium acid; clear, smooth boundary.

A3—8 to 18 inches, brown (10YR 5/3) very fine sandy loam; weak, fine, granular structure; friable; slightly acid; clear, wavy boundary.

B2t—18 to 40 inches, yellowish-red (5YR 5/6) loam; weak, medium, subangular blocky structure that parts easily to moderate granular; friable; pale-brown (10YR 6/3) silt coating on major ped faces; thin, continuous clay films on ped faces and bridging sand grains; medium acid; gradual, smooth boundary.

IIC—40 to 80 inches, strong-brown (7.5YR 5/6 moist) very fine sandy loam; massive; soft; very friable; neutral.

The Ap or A1 horizon is dark grayish brown or brown, and the A3 horizon is brown or yellowish brown. These horizons are medium acid through neutral. The B2t horizon is yellowish-red, reddish-brown, or red loam or sandy clay loam, and reaction is medium acid through neutral. The IIC horizon is strong-brown, yellowish-red, or reddish-brown very fine sandy loam, loam, or clay loam, with or without stratification of lighter textures. It is slightly acid through mildly alkaline.

These soils are outside the defined range for the Gallion series because they lack the silt content in the horizon of clay accumulation. They are enough like the Gallion series in morphology, composition, and behavior so that a new series is not warranted.

Gallion soils are associated with Caspiana, Garton, and Pledger soils. Gallion soils are less silty than Caspiana soils, and they are less clayey than Garton and Pledger soils.

Gallion very fine sandy loam (Ga).—This is the only Gallion soil mapped in the county. It is a nearly level and very gently sloping soil on the terraces of the Red River.

Included with this soil in mapping, and making up 10 percent of the mapped areas, are soils having a dark-brown surface layer, soils having a loam surface layer, and spots of a similar soil with a subsoil that is less clayey than that in the representative profile. Also included are spots of Caspiana loam.

This soil is highly suited to the common crops in the county, such as alfalfa, soybeans, cotton, corn, grain sorghum, small grains, and peanuts. It is also highly suited to tame pasture and to trees. It is used mostly for crops.

Management practices are needed that help to maintain soil structure and fertility. Crop residue needs to be returned to the soil. Capability unit I–1; woodland suitability group 2o4; pasture and hayland suitability group 2A.

Garton Series

The Garton series consists of a deep, nearly level, moderately well drained soil on the terraces of the Red River. These soils formed under a cover of hardwoods and an understory of mid and tall grasses in loamy and clayey alkaline sediment.

In a representative profile the surface layer is 6 inches of very dark gray silt loam. The upper part of the subsoil, to a depth of 26 inches, is very dark gray and dark-brown silty clay loam with mottles in shades of gray and

brown. The middle part of the subsoil extends to a depth of 42 inches and is reddish-brown clay loam. The lower part of the subsoil, to a depth of 75 inches, is a yellowish-red loam.

Permeability is slow in these soils, and available water capacity is high. The seasonal perched water table is at a depth of 2 to 3 feet.

Representative profile of Garton silt loam (2,400 feet west and 1,800 feet south of the NE. corner of sec. 5, T. 9 S., R. 24 E.):

Ap—0 to 6 inches, very dark gray (10YR 3/1) silt loam; moderate, medium and fine, granular structure; friable; neutral; clear, smooth boundary.

B1t—6 to 17 inches, very dark gray (10YR 3/1) silty clay loam; few, fine, faint, light-gray mottles; moderate, medium and fine, subangular blocky structure; firm; neutral; gradual, smooth boundary.

B21t—17 to 26 inches, dark-brown (7.5YR 3/2) silty clay loam; few, medium, distinct, reddish-brown (5YR 5/4) mottles; moderate, medium and fine, granular structure; firm; patchy clay films or pressure faces on ped faces; slightly acid; clear, smooth boundary.

B22t—26 to 42 inches, reddish-brown (5YR 5/4) clay loam; weak, medium and fine, subangular blocky structure; friable; clay films or pressure faces on ped faces; neutral; gradual, smooth boundary.

B3—42 to 75 inches, yellowish-red (5YR 5/6) loam; thin strata of reddish-yellow (5YR 6/8) loam; weak, fine, subangular blocky structure; very friable; few, hard, calcium carbonate concretions; mildly alkaline.

The A and B1t horizons are black, very dark brown, very dark gray, very dark grayish brown, or dark brown. They are slightly acid or neutral. The B1t horizon is silty clay loam or clay loam. Mottles are few through many and fine or medium. They are in shades of gray.

The B21t horizon is dark brown, dark reddish brown, or reddish brown. Mottles are few or many and fine or medium and are in shades of red or brown. The B22t horizon is dark brown, reddish brown, yellowish red, or red. The B2t horizon is clay loam, silty clay loam, silty clay, or clay. It is slightly acid through mildly alkaline.

The B3 horizon is yellowish-red, reddish-yellow, or dark-brown loam or clay loam. It is neutral or mildly alkaline.

Garton soils are associated with Caspiana, Gallion, and Pledger soils. Garton soils are more clayey than Gallion and Caspiana soils and less clayey in the A horizon than Pledger soils.

Garton silt loam (Gr).—This is the only Garton soil mapped in the county. It is a nearly level soil on the terraces of the Red River.

Included with this soil in mapping are small areas of soils that have a silty clay loam surface layer and minor areas of Caspiana loam and Pledger clay.

Garton loam is used mainly for crops. This soil is highly suited to the common crops in the county, such as alfalfa, soybeans, cotton, corn, grain sorghum, and small grains. It is also highly suited to tame pasture and trees.

Management practices are needed to help to maintain or to improve soil structure and fertility. All crop residue should be returned to the soil, and excessive tillage should be avoided. Capability unit I–1; woodland suitability group 2o4; pasture and hayland suitability group 2A.

Goldston Series

The Goldston series consists of moderately deep, moderately steep and steep, well-drained to excessively drained soils on uplands. These soils formed under a cover of pines and hardwoods and an understory of mid and tall grasses in material weathered from tilted shale and sandstone.

In a representative profile the surface layer is 4 inches of dark grayish-brown gravelly loam. The upper part of the subsoil, to a depth of 10 inches, is yellowish-brown gravelly loam that is 38 percent sandstone and shale fragments. The lower part of the subsoil extends to a depth of 24 inches and is yellowish-brown very gravelly loam. This part of the subsoil is 55 percent sandstone and shale fragments. The underlying material is tilted, fractured, and weathered sandstone and shale.

Permeability is moderately rapid in these soils. Available water capacity is low.

Representative profile of Goldston gravelly loam in an area of Goldston-Carnasaw-Sacul association, moderately steep (1,600 feet east of the NW. corner of sec. 3, T. 5 S., R. 27 E.):

A1—0 to 4 inches, dark grayish-brown (10YR 4/2) gravelly loam that is 34 percent fine-grained sandstone and shale less than 3 inches in diameter; weak, medium, granular structure; friable; many roots; medium acid; clear, smooth boundary.

B21—4 to 10 inches, yellowish-brown (10YR 5/6) gravelly loam that is 38 percent fine-grained sandstone and shale at various stages of weathering (this weathering of the interbedded shale reflects an erratic depth of the surface layer within short distances); moderate, fine, granular structure; friable; strongly acid; irregular boundary that is gradual in places, A2 material mixed with rock fragments, or abrupt boundary to solid rock.

B22—10 to 24 inches, yellowish-brown (10YR 5/4) very gravelly loam; moderate, medium, granular and subangular blocky structure; friable; about 55 percent weathered silty shale fragments; 1½ to 3 inches in diameter; fragments are interbedded with larger rock fragments that ultimately rest upon a fragmented, tilted rock formation that extends to uncertain depths; very strongly acid; irregular boundary.

C & B—24 to 30 inches, mottled and streaked, yellowish-brown, strong-brown, red, and olive-gray fine-grained sandstone and shale that are highly weathered and have interstices and fractures filled with loam; rock structure; friable; about 70 percent sandstone and shale and 30 percent soil material; very strongly acid.

The A2 horizon, where present, is light yellowish brown, yellowish brown, brown, or pale brown. The A horizon is gravelly loam or gravelly silt loam, with varying amounts of gravelly-size to cobblestone-size shale and sandstone fragments. This horizon is strongly acid or medium acid.

The B horizon is light yellowish-brown, yellowish-brown, brown, and strong-brown gravelly and very gravelly loam or gravelly and very gravelly silt loam. Shale and sandstone fragments make up more than 35 percent of the mass, by volume. In places this horizon is broken within a few linear feet by a thin, discontinuous Bt horizon of gravelly clay loam. This Bt horizon has the color range of the B horizon, and it is strongly acid or very strongly acid.

The C and B horizon is more than 50 percent coarse fragments and less than 50 percent clay loam or loam-filling interstices. This horizon is absent in some places. The R horizon is acid-fractured interbedded shale and sandstone, and it is tilted more than 20 degrees from horizontal. Within short distances the solum varies greatly in thickness because of the irregular boundary between the B horizon and the underlying bedrock.

Goldston soils are associated with Carnasaw, Hector, Pickens, Sacul, Sherwood, and Zafra soils. Goldston soils have more coarse fragments than Hector soils. They have more tilted bedrock than Pickens soils, and unlike Pickens soils their solum is more than 20 inches thick over hard bed-

rock. Goldston soils lack the continuous Bt horizons of the Carnasaw, Sacul, Sherwood, and Zafra soils.

Goldston-Carnasaw-Sacul association, moderately steep (GsE).—These soils are on uplands. About 37 percent is Goldston gravelly loam and gravelly silt loam, 32 percent is Carnasaw loam and silt loam, and 20 percent is Sacul loam and fine sandy loam. Making up the remaining 5 percent are soils similar to Carnasaw soils but having coarse fragments in the subsoil, and 6 percent Sherwood fine sandy loam or Pickens shaly silt loam. These soils are also similar to Goldston soils, but their combined surface layer and subsoil solum is 16 to 20 inches thick. The Goldston, Carnasaw, and Sacul soils have the profiles described as representative of their respective series.

The hardness of interlaminated sandstone and shale has influenced stability of the landscape, especially ridges, slope crests, and a few broad plateaus. The Goldston soils are dominant in these areas. The Carnasaw and Sacul soils are mainly on the unstable fractured shale with thin interlamination on side slopes and ridges.

Most of the areas of these soils are wooded. A small acreage has been cleared and is used for tame pasture. These soils are not suited to crops, but they are suited to trees, grasses, and food and cover for wildlife.

Wooded areas can be maintained or improved by protecting them from fire, removing or controlling inferior species, planting suitable species, and selectively harvesting trees on a planned schedule. The quality of grasses can be maintained or improved by controlling brush, applying lime and fertilizer according to soil tests, and using suitable grazing practices. Capability unit VIe–1; Goldston soil in woodland suitability group 4f2, Carnasaw soil in woodland suitability group 3o1, and Sacul soil in woodland suitability group 3c2; Goldston soil in pasture and hayland suitability group 14A, Carnasaw soil and Sacul soil in pasture and hayland suitability group 8B.

Goldston-Carnasaw-Sacul association, steep (GsF).—These soils are on uplands.

About 40 percent is Goldston gravelly loam and gravelly silt loam, 30 percent is Carnasaw loam and silt loam, and 20 percent is Sacul loam and fine sandy loam. The remaining 5 percent is made up of soils similar to Goldston soils that are shallower to rock, small areas of rock outcrop, and areas of Hector fine gravelly sandy loam.

The profile of each soil in this unit is similar to that described as representative of its respective series, except that stones are on the surface and in the surface layer.

All areas of these soils are wooded. These soils are not suited to crops, because of the steepness of slopes and stones on the surface, but they are well suited to trees and as a source of food and cover for wildlife.

The wooded areas can be maintained or improved by protecting them from fire, removing or controlling inferior species, planting suitable species, and selectively harvesting trees on a planned schedule. Capability unit VIIs–1; Goldston soil in woodland suitability group 4x3, Carnasaw soil and Sacul soil in woodland suitability group 3x3.

Guyton Series

The Guyton series consists of deep, nearly level, poorly drained soils on flood plains and terraces other than those along the Red River. These soils formed under a cover of hardwoods and pines and an understory of mid and tall grasses in loamy sediment.

In a representative profile the surface layer is 4 inches of dark grayish-brown silt loam, and the subsurface layer is 16 inches of light brownish-gray silt loam with mottles and bodies in shades of brown and gray. The upper part of the subsoil, to a depth of 38 inches, is a gray silty clay loam with mottles, streaks, and bodies in shades of brown and gray. Silt loam tongues from the upper horizon. The lower part of the subsoil extends to a depth of more than 70 inches and is a coarsely mottled, gray, yellowish-brown, strong-brown, and light-gray silty clay loam. It also contains vertical streaks of light-gray silt loam.

Permeability is slow in Guyton soils, and available water capacity is high. The seasonal water table is at a depth of 0 to 1 foot.

Representative profile of Guyton silt loam (600 feet north and 80 feet west of the Little River bridge on Highway 70, sec. 14, T. 7 S., R. 24 E.):

A1—0 to 4 inches, dark grayish-brown (10YR 4/2) silt loam; few, fine, faint, yellowish-brown and dark-gray mottles; moderate, medium and fine, granular structure; friable; many roots; clear, wavy boundary.

A2 & B—4 to 16 inches, light brownish-gray (10YR 6/2) silt loam; common, medium, distinct, yellowish-brown (10YR 5/4) mottles; weak, fine, granular and subangular blocky structure; friable; common fine and few medium pores; few, small, soft iron-manganese concretions; 10 percent bodies of gray (10YR 6/1) heavy silt loam; very strongly acid; diffuse, smooth boundary

B21t & A2—16 to 28 inches, gray (10YR 6/1) silty clay loam; many, coarse, faint and distinct, pale-brown and yellowish-brown (10YR 5/6) mottles; weak, medium, subangular blocky structure; friable; common fine and few medium pores; few, thin, patchy clay films; few, small, soft and hard iron-manganese concretions; 20 percent light brownish-gray (10YR 6/2) silt loam tongues from above; very strongly acid; gradual, irregular boundary.

B22t & A2—28 to 38 inches, gray (10YR 6/1) silty clay loam; many, coarse, distinct and faint, yellowish-brown (10YR 5/6) and pale-brown mottles; moderate, medium and fine, subangular blocky structure; friable; many fine pores; few brittle peds; thin and patchy clay films on ped faces and in pores; common iron-manganese spots and concretions; gray and light brownish-gray tongues of silt loam from above extend to depth of 38 inches; many peds are surrounded by clean sand grains; very strongly acid; gradual, irregular boundary.

B23tg—38 to 45 inches, coarse mottles and vertical streaks and bodies of light-gray (10YR 6/1) silty clay loam, yellowish-brown (10YR 5/6) silty clay loam, light-gray (10YR 7/2) silt loam that contains clean sand grains, and gray (10YR 5/1 and 5/0) silty clay loam; weak, medium, subangular blocky structure; firm to friable with varying textural bodies; numerous iron-manganese spots and concretions that are black or strong brown; few thin clay films on horizontal ped faces and few thick clay films in old root channels; very strongly acid; gradual, smooth boundary.

B24tg—45 to 70 inches, coarsely mottled, gray (10YR 6/1), yellowish-brown (10YR 5/6), and strong-brown (7.5YR 5/6) silty clay loam; weak, coarse, subangular blocky structure; firm; many strong-brown,

brittle peds; few thin clay films on ped faces and in pores; few pockets of gray (10YR 5/1) heavy silty clay loam that tend to be vertical; many iron-manganese spots and concretions; strongly acid.

The A1 horizon is dark grayish brown, grayish brown, or brown. The A2 and B horizon is gray or light brownish gray. Mottles in this horizon are common to many, fine or coarse, and distinct and are in shades of brown and yellow. The B part of the A2 and B horizon consists of bodies of more clayey material.

The Bt and A2 horizon is gray or light brownish gray. Mottles are common to many, fine or coarse, and distinct. They are in shades of yellow, gray, and brown. This horizon is silty clay loam, silt loam, or clay loam. A2 material from the horizon above extends into this horizon. It is the same color and has the same texture here as it does above. It is strongly acid or very strongly acid.

Guyton soils are associated with Bibb, Cahaba, Elysian, Felker, Frizzell, Kinta, and Rexor soils. Guyton soils are grayer in the upper horizons than Frizzell, Rexor, Felker, and Cahaba soils and more clayey than Elysian and Bibb soils. They have tonguing of A2 material in the B2t horizons that is absent in Adaton soils, and they are less clayey than Kinta soils.

Guyton silt loam (Gu).—This is the only Guyton soil mapped in the county. It is nearly level and is on flood plains other than those of the Red River.

Included with this soil in mapping, and making up 10 percent of the mapped areas, are similar soils that lack the tonguing of the subsurface layer in the subsoil and have a silty clay loam surface layer. Also included are minor areas of Frizzell loam and Bibb fine sandy loam.

This soil is best suited to and mainly used for tame pasture (fig. 4) or trees. Damaging floods occur each year, and in some years areas are flooded three or more times. Guyton loam has a seasonal high water table, and water remains on the surface for long periods early in spring. The quality of the tame pasture can be maintained or improved by controlling brush, applying lime and fertilizer according to soil tests, and using suitable grazing practices and surface drainage. Wooded areas can be maintained or improved by protecting them from fire, removing or controlling inferior species, planting suitable species, and selectively harvesting trees on a planned schedule. Capability unit Vw–1; woodland suitability group 2w6a; pasture and hayland suitability group 2B.

Figure 4.—Area of Fescue and Ladino clover on Guyton silt loam.

Guyton-Elysian complex (Gy).—In this mapping unit are nearly level Guyton soils and nearly level to gently sloping Elysian soils on terraces (fig. 5). About 75 percent of this unit is Guyton silt loam, 23 percent is Elysian fine sandy loam, and 2 percent is small areas of Cahaba fine sandy loam and Felker loam.

The Guyton and Elysian soils are in an intricate pattern, with Guyton soil occurring in the intermound areas and Elysian soil appearing as mounds. The Guyton soil is similar to the soil described as representative of the series but has less tonguing of the subsurface layer in the upper part of the subsoil. This soil supports native stands of loblolly pine. The Elysian soil is similar to the soil described as representative of the series.

These soils are best suited to and are used mainly for trees and tame pasture. A small acreage can be used for growing soybeans or grain sorghum. The Guyton soil in this unit does not flood and does not have much ponded surface water. These soils are poorly suited to crops because of wetness late in spring and dryness late in summer.

Management practices are needed that help to maintain or to improve soil fertility and structure and that

Figure 5.—Landscape of Guyton and Elysian soils in the Guyton-Elysian complex.

control surface wetness. A suitable cropping system is one that provides crops that produce large amounts of residue that can be returned to the soil. In places the Elysian fine sandy loam on mounded relief retards runoff. Smoothing the soil and arranging crop rows so that the furrows help to drain ponded surface water improve surface drainage. Capability unit IVw–1; woodland suitability group 2w9; Guyton soil in pasture and hayland suitability group 8H, Elysian soil in pasture and hayland suitability group 8B.

Hector Series

The Hector series consists of shallow, steep and very steep, well-drained soils on uplands. These soils formed under a cover of hardwoods and pines and an understory of mid and tall grasses in material weathered from sandstone.

In a representative profile the surface and subsurface layers are 7 inches of very dark grayish-brown and yellowish-brown gravelly fine sandy loam. The subsoil is yellowish-brown gravelly fine sandy loam. Thick, flat, bedded sandstone is at a depth of about 12 inches.

Permeability is rapid in Hector soils, and available water capacity is low.

Representative profile of Hector gravelly fine sandy loam in an area of Hector-Rock outcrop complex, 35 to 60 percent slopes (200 feet NE. of the Boktukola bridge on Highway 259, sec. 9, T. 2 S., R. 25 E.):

A1—0 to 3 inches, very dark grayish-brown (10YR 3/2) gravelly fine sandy loam; weak, fine, granular structure; very friable; 15 percent sandstone fragments ½ to 3 inches in diameter; many roots; medium acid; clear, wavy boundary.

A2—3 to 7 inches, yellowish-brown (10YR 5/4) gravelly fine sandy loam; weak, fine, granular structure; friable; 20 percent sandstone fragments ½ to 3 inches in diameter and a few small shale fragments; few roots; strongly acid; gradual, wavy boundary.

B—7 to 12 inches, yellowish-brown (10YR 5/6) gravelly fine sandy loam; weak, fine, granular structure; friable; 20 percent sandstone fragments up to 3 inches in diameter below a depth of 10 inches, few above 10 inches; strongly acid; abrupt, irregular boundary.

R—12 to 20 inches, thick, flat, bedded sandstone; hard, massive.

The A1 horizon is very dark grayish brown, dark grayish brown, or brown. The B horizon is yellowish brown or strong brown. It is strongly acid or very strongly acid. The depth to the R layer is 8 to 20 inches.

Hector soils have fewer coarse fragments than the associated Goldston and similar Pickens soils.

Hector-Rock outcrop complex, 35 to 60 percent slopes (HkF).—In this mapping unit are Hector soil and Rock outcrop. They occupy the dissected mountain ridgetops and escarpments. About 62 percent of this unit is Hector gravelly fine sandy loam, 10 percent is soil similar to Hector that has more than 35 percent coarse fragments in the surface layer and subsoil and on the surface, and 25 percent is Rock outcrop. The remaining 3 percent is small areas of Carnasaw loam. This complex occurs in an intricate pattern, with Rock outcrop occurring in a regular pattern surrounded by areas of Hector soils. The Hector soil has the profile described as representative of the Hector series. Rock outcrop consists of exposures of sandstone bedrock.

This soil is best suited to and used mainly for native range. In places small areas of commercial trees are suitable for wildlife. The quality of the native grasses can be maintained or improved by controlling brush, using suitable grazing practices, and protecting from fire. Wooded areas can be maintained or improved by protecting them from fire, removing or controlling inferior species, and selectively harvesting trees on a planned schedule. Capability unit VIIs–2; woodland suitability group 5x9; Savannah Breaks range site.

Hollywood Series

The Hollywood series consists of deep, very gently sloping and gently sloping, moderately well drained, gilgai-relief soils on uplands. These soils formed under a cover of mid and tall grasses in material weathered from calcareous clays and shales.

In a representative profile the surface layer is 30 inches of very dark gray silty clay. Mottles in shades of olive are in the lower part. The next layer extends to a depth of 68 inches and is olive-gray silty clay that has mottles in shades of olive.

Permeability is very slow in Hollywood soils, and available water capacity is high. These soils crack when they are dry.

Representative profile of Hollywood silty clay, 1 to 3 percent slopes (2,100 feet east and 800 feet south of the NW. corner of sec. 2, T. 7 S., R. 21 E.):

A11—0 to 16 inches, very dark gray (10YR 3/1) silty clay; weak, coarse, blocky structure parting to strong, fine and medium, granular; very firm; many shiny ped faces; few, very dark brown, strongly cemented iron-manganese concretions; few, fine, weakly cemented calcium carbonate concretions; moderately alkaline; diffuse, wavy boundary.

A12—16 to 30 inches, very dark gray (10YR 3/1) silty clay; few, fine, distinct, olive mottles; moderate, coarse, blocky structure parting to strong, fine, subangular blocky; very firm; common, coarse, intersecting slickensides border distinct parallelepipeds having long axis tilted about 40 degrees from the horizontal; shiny pressure faces on peds; few, very dark brown, strongly cemented iron-manganese concretions; moderately alkaline; diffuse, wavy boundary.

AC1—30 to 45 inches, olive-gray (5Y 4/2) silty clay; many, fine and medium, faint, olive mottles; many, coarse, deeply grooved, intersecting slickensides with parallelepipeds having long axis tilted 30 to 60 degrees from the horizontal; very firm; common shiny pressure faces; few, brown and black, iron-manganese concretions; calcareous in spots; moderately alkaline; diffuse, wavy boundary.

AC2—45 to 68 inches, olive-gray (5Y 4/2) silty clay; many, fine and medium, faint, olive mottles; many, coarse, deeply grooved, intersecting slickensides with parallelepipeds having long axis tilted 30 to 60 degrees from the horizontal; few, fine, brown iron-manganese concretions surrounded by fine, strong-brown mottles; few, fine, hard calcium carbonate concretions; 10 percent, by volume, soft masses of calcium carbonate in lower part; calcareous; moderately alkaline.

The A horizon is black or very dark gray. Reaction is slightly acid through moderately alkaline. Intersecting slickensides begin at depths of 12 to 28 inches below the surface. The AC horizon is olive gray, light olive brown, and olive brown. Mottles are many or common, fine or medium, and faint or distinct. They are in shades of brown, yellow, gray, or olive. In most places there are cracks in this horizon that are filled with material from the A horizon. The AC horizon is silty clay or clay and is mildly alkaline or moderately alkaline. Thin broken ledges of limestone rock interrupt the

horizon between depths of 48 and 72 inches in some places.

Hollywood soils are associated with Alusa, Newtonia, Panola, Sumter, and Swink soils. Hollywood soils have a thicker solum than Swink soils. They are more clayey in the A horizon than Panola, Alusa, and Newtonia soils and have gilgai relief. Hollywood soils are lower in calcium carbonate equivalent than Sumter soils.

Hollywood silty clay, 1 to 3 percent slopes (HoB).—This soil is on uplands, and it has the profile described as representative of the Hollywood series.

Included with this soil in mapping, and making up 5 percent of the mapped areas, are Panola silty clay loam and similar soils that have a silty clay loam or clay loam surface layer.

This Hollywood soil is used mainly for tame pasture and for growing soybeans. It is well suited to the common crops in the county, such as corn, grain sorghum, soybeans, cotton, small grains, and alfalfa, and it is well suited to tame pasture and range.

Management practices are needed that improve soil structure, reduce surface crusting, increase water intake, and reduce water erosion. A suitable cropping system is one that provides crops that produce large amounts of residue that can be returned to the soil to improve soil structure, increase water intake, and prevent surface crusting. This soil is difficult to till because of the clayey material. Tillage needs to be timely and kept to a minimum. Large cracks occur at the surface when these soils are dry. Terraces and contour tillage are needed if row crops are grown. Sown crops can be grown continuously if fertilizer is added and crop residues are used. Capability unit IIe–3; Blackclay Prairie range site; woodland suitability group 5o0; pasture and hayland suitability group 7A.

Hollywood silty clay, 3 to 5 percent slopes (HoC).—This soil is on uplands. Included in mapping, and making up 5 percent of the mapped areas, are Panola silty clay loam and minor areas of similar soils with silty clay loam or clay loam surface layers.

This soil is well suited to the common crops in the county, such as corn, grain sorghum, soybeans, cotton, and small grains. It is well suited to tame pasture and range and is used mainly for tame pasture.

Management practices are needed that help to improve soil structure, reduce surface crusting, increase water intake, and reduce the hazard of water erosion. A suitable cropping system is one that provides crops that produce large amounts of residue that can be returned to the soil to improve soil structure, increase water intake, and prevent surface crusting. This soil is difficult to till because of the clayey material. Tillage needs to be timely and kept to a minimum. Large cracks occur at the surface when these soils are dry. Erosion can be reduced by terraces, contour farming, and use of crop residues. Sown crops can be grown continuously if fertilizer is added and crop residues are used. Capability unit IIIe–4; Blackclay Prairie range site; Woodland suitability group 5o0; pasture and hayland suitability group 7A.

Idabel Series

The Idabel series consists of deep, nearly level, well-drained soils on the flood plains of the Red River. These soils formed under a cover of hardwoods and an understory of mid and tall grasses in loamy alkaline sediment.

In a representative profile the surface layer is 6 inches of dark reddish-brown silt loam. The subsoil, to a depth of 20 inches, is a reddish-brown silt loam. The underlying material is a reddish-brown or yellowish-red very fine sandy loam and silt loam with lenses of loam and fine sandy loam.

Permeability is moderately rapid in these soils, and available water capacity is high.

Representative profile of Idabel silt loam (600 feet west and 400 feet south of the NE. corner of sec. 17, T. 10 S., R. 26 E.):

Ap—0 to 6 inches, dark reddish-brown (5YR 3/3) silt loam; weak, fine, granular structure; very friable; few worm casts; calcareous in part of the mass; abrupt, smooth boundary.

B—6 to 20 inches, reddish-brown (5YR 4/3) silt loam; weak, medium and fine, subangular blocky structure; friable; many fine pores; many worm casts; calcareous in part of the mass; clear, smooth boundary.

IIC1—20 to 35 inches, reddish-brown (5YR 4/4) very fine sandy loam; structureless; very friable; few worm casts; thin bedding planes with lenses of loam and fine sandy loam; calcareous in part of the mass in the upper part and calcareous below; clear, smooth boundary.

IIC2—35 to 52 inches, yellowish-red (5YR 5/6) very fine sandy loam; structureless; very friable; common bedding planes; calcareous; gradual, smooth boundary.

IIC3—52 to 60 inches, reddish-brown (5YR 5/4) silt loam; structureless; friable; common bedding planes; strata of reddish-yellow (5YR 7/6) and yellowish-red (5YR 5/6) very fine sandy loam and fine sandy loam; calcareous.

The Ap or A1 horizon is reddish brown or dark reddish brown. Reaction is neutral or mildly alkaline. The B and C horizons are reddish brown, yellowish red, and reddish yellow. The B horizon and part of the C horizon are loam, silt loam, and very fine sandy loam. The lower part of the C horizon is stratified with fine sandy loam, very fine sandy loam, loam, silt loam, and silty clay loam. Typically this soil is calcareous in the surface layer, calcareous in part of the mass between 10 and 25 inches, and calcareous in all parts below 25 inches.

Idabel soils are associated with Coushatta, Latanier, Oklared, Redlake, and Severn soils. Idabel soils are less clayey in the upper part than Latanier, Redlake, and Coushatta soils; sandier than Severn soils; and less stratified in the upper part than Oklared soils.

Idabel silt loam (Id).—This is the only Idabel soil mapped in the county. It is a nearly level soil on the flood plains of the Red River.

Included with this soil in mapping and making up 10 percent of the mapped areas are areas where the loam surface layer is loam, areas of Severn very fine sandy loam, and areas of Coushatta silty clay loam.

This soil is well suited to the common crops in the county, such as alfalfa, soybeans, cotton, corn, grain sorghum, small grains, and peanuts. It is well suited to tame pasture and trees but is mainly used for crops (fig. 6).

Management practices are needed that help to maintain or to improve soil structure and fertility. All crop residue should be returned to the soil, and excessive tillage should be avoided. Land smoothing is needed in many areas to remove irregularities on the surface. Capability unit I–1; woodland suitability group 2o4; pasture and hayland suitability group 2A.

Figure 6.—**Soybeans in an area of Idabel silt loam. Soybeans are a major cash crop in McCurtain County.**

Iuka Series

The Iuka series consists of deep, nearly level, moderately well drained soils on flood plains other than those along the Red River. These soils formed in loamy sediment under a cover of pines and hardwoods and an understory of mid and tall grasses.

In a representative profile the surface layer is 11 inches of dark grayish-brown fine sandy loam that has thin lenses of yellow and brown fine sandy loam. The next layer, to a depth of 22 inches, is yellowish-brown fine sandy loam that has mottles in shades of yellow and gray. The underlying material is coarsely mottled light-gray, light brownish-gray, and light yellowish-brown sandy loam.

Permeability is moderate in Iuka soils, and available water capacity is high. The seasonal perched water table is at a depth of 1 to 3 feet, and these soils are subject to flooding.

Representative profile of Iuka fine sandy loam in an area of Bibb-Iuka complex (1,800 feet east and 75 feet north of the SW. corner of sec. 23, T. 6 S., R. 23 E.):

A11—0 to 4 inches, dark grayish-brown (10YR 4/2) fine sandy loam; massive; very friable; many roots; stratified with thin lenses of yellow (10YR 7/6) fine sandy loam; medium acid; clear, smooth boundary.

A12—4 to 11 inches, dark grayish-brown (10YR 4/2) fine sandy loam; weak, fine, granular structure; friable; a few, thin, distinct bedding planes of brown (10YR 4/3) fine sandy loam; many roots; medium acid; clear, smooth boundary.

C1—11 to 22 inches, yellowish-brown (10YR 5/4) fine sandy loam; few, medium, distinct yellow (10YR 7/6) and light brownish-gray (10YR 6/2) mottles; massive; friable; many roots; many, thin, distinct bedding planes; very strongly acid; clear, smooth boundary.

C2g—22 to 65 inches, coarsely mottled light-gray (10YR 7/2), light brownish gray (10YR 6/2), and light yellowish-brown (10YR 6/4) fine sandy loam; massive; friable; stratified with lenses of loamy fine sand and loam; very strongly acid.

The A horizon is dark grayish brown, very dark grayish brown, brown, or grayish brown fine sandy loam or loam. It is medium acid through very strongly acid.

The C1 horizon is brown, dark brown, light yellowish brown, yellowish brown, or pale brown. It has few to common, medium and distinct mottles in shades of yellow, brown, and gray. In the C2 horizon are distinct mottles in shades of brown and gray and matrices of brown, light yellowish brown, and pale brown that have gray mottles. This horizon is fine sandy loam, very fine sandy loam, or silt loam stratified with loam or loamy very fine sand. It is strongly acid or very strongly acid.

Iuka soils are associated with Bibb, Ceda, and Frizzell soils. Iuka soils are less gray in the upper part than Bibb soils but are grayer than Frizzell soils. They lack the coarse fragments common in Ceda soils. Iuka soils in this county are mapped only with Bibb soils.

Kaufman Series

The Kaufman series consists of deep, nearly level, somewhat poorly drained soils on flood plains. These soils formed under a cover of hardwoods and an understory of mid and tall grasses in clayey alkaline sediment.

In a representative profile the surface layer is 18 inches of black clay. The next layer, to a depth of 28 inches, is a very dark gray clay with mottles in shades of brown. The subsoil, which extends to a depth of 65 inches, is a very dark gray clay. Mottles are in shades of brown.

Permeability is very slow in Kaufman soils, and available water capacity is high. These soils crack when dry. The seasonal water table is at a depth of 3 to 5 feet in Kaufman soils, and they are subject to flooding.

Representative profile of Kaufman clay (1,380 feet west and 50 feet south of the NE. corner of sec. 10, T. 8 S., R. 23 E.):

A11—0 to 18 inches, black (10YR 2/1) clay; moderate, medium and fine, subangular blocky structure; very firm; many fine roots; neutral; gradual, smooth boundary.

A12—18 to 28 inches, very dark gray (10YR 3/1) clay; few, fine, distinct, reddish-brown mottles; strong, medium, subangular blocky structure; very firm; few shiny ped faces; slightly acid; gradual, smooth boundary.

Bg—28 to 65 inches, very dark gray (10YR 3/1) clay; many, coarse, distinct, dark-brown (10YR 3/3) mottles and a few, fine, faint, dark-gray and brown mottles; moderate, coarse, blocky structure; very firm; few nonintersecting slickensides; neutral.

The A11 or Ap horizon is black or very dark gray. It is slightly acid through mildly alkaline. The A12 and Bg horizons are very dark gray and gray. Mottles are few to many, fine through coarse, and faint to distinct and are in shades of brown and gray. Texture is clay or silty clay. The A12 and B horizons range from slightly acid through moderately alkaline.

The C horizon, where present, is very dark gray and has common, fine to coarse, distinct mottles in shades of brown, olive, and gray. This horizon is clay or silty clay. It ranges from slightly acid through moderately alkaline.

Kaufman soils are grayer in the lower part of the solum than the associated Pledger and Roebuck soils.

Kaufman clay (Ka).—This is a nearly level soil on flood plains. It has the profile described as representative of the Kaufman series.

Included with this soil in mapping are a few small areas where the surface layer is silty clay loam and spots of Pledger clay.

This Kaufman soil is used mainly for crops and tame pasture. It is highly suited to the common crops in the county, such as alfalfa, soybeans, cotton, corn, grain sorghum, and small grains. It is equally well suited to tame pasture and trees.

Management practices are needed that help to control surface wetness, increase water intake, maintain soil structure and soil fertility, and reduce surface crusting. Soil fertility and structure, water intake, and surface crusting can be maintained or improved by seeding legumes and fescue, adding fertilizer, and effectively using crop residue.

This soil is difficult to till because of the clayey material. Tillage should be timely and kept to a minimum. Low wet areas often require an adequate surface drainage system. Flooding occurs in low areas for short periods late in winter once in 1 to 5 years. Also, this soil is wet during the spring months. Capability unit IIs–1; woodland suitability group 2w6; pasture and hayland suitability group 1A.

Kaufman clay, frequently flooded (Kc).—This is a nearly level soil on flood plains. It is similar to the soil described as representative of the Kaufman series except for a slightly thinner combined surface layer and subsoil.

Included with this soil in mapping are a few small areas of soils that have a silty clay loam surface layer and spots of a similar soil with thin strata of limestone gravel.

Kaufman soil is used mainly for trees and tame pasture. It is not suited to cultivation because of frequent flooding.

The quality of the tame pasture can be maintained or improved by controlling brush, employing fertilizer according to soil tests, and using suitable grazing practices. Wooded areas can be maintained or improved by protecting them from fire, removing or controlling inferior species, planting suitable species, and selectively harvesting trees on a planned schedule. Capability unit Vw–2, woodland suitability group 2w6; pasture and hayland suitability group 1A.

Kinta Series

The Kinta series consists of deep, nearly level, somewhat poorly drained and very gently sloping soils on uplands. These soils formed under a cover of pines and hardwoods and an understory of mid and tall grasses in clayey sediment.

In a representative profile the surface and subsurface layers combined are 8 inches of very dark grayish-brown and brown clay loam. Mottles in the lower part are in shades of gray and brown. The subsoil, to a depth of 72 inches or more, is a gray clay. Mottles are in shades of brown, red, and gray.

Permeability is very slow in Kinta soils and available water capacity is high. The seasonal water table is at a depth of 1 to 2 feet from the surface.

A representative profile of Kinta clay loam, 0 to 2 percent slopes (2,500 feet north and 200 feet west of the SE. corner of sec. 2, T. 8 S., R. 26 E.):

A1—0 to 2 inches, very dark grayish-brown (10YR 3/2) clay loam; moderate, medium, granular structure; firm; few, fine, light-gray coatings on ped faces; very strongly acid; clear, smooth boundary.

A2—2 to 8 inches, brown (10YR 4/3) clay loam; few, fine, distinct light-gray and yellowish-brown mottles; weak, medium, subangular blocky structure; firm; common medium roots; very strongly acid; clear, wavy boundary.

B21tg—8 to 22 inches, gray (10YR 5/1) clay; common, fine and medium, distinct, yellowish-brown (10YR 5/4 and 5/8) mottles; moderate, coarse, blocky structure parting to moderate, fine, blocky; firm, continuous clay films on ped faces; very strongly acid; gradual, wavy boundary.

B22tg—22 to 54 inches, gray (10YR 5/1) clay; many, medium and coarse, prominent, red (2.5YR 5/6) and few, fine, distinct, yellowish-brown mottles; weak, coarse, blocky structure parting to strong, fine, blocky; firm; continuous clay films on ped faces; very strongly acid; gradual, wavy boundary.

B23tg—54 to 72 inches, gray (10YR 5/1) clay; many, medium, prominent, red (2.5YR 4/6) and common, medium, faint, light brownish-gray mottles; weak, coarse, blocky structure parting to moderate, fine, blocky; firm; clay films on ped faces; strongly acid.

The A1 horizon is very dark grayish brown, dark brown, or brown. Few to common, fine to coarse, faint or distinct mottles in shades of brown and gray are present in some places. The A2 horizon is brown, dark brown, or yellowish brown. Mottles are common or many, fine through coarse, and distinct. They are in shades of gray or brown. The A horizon is strongly acid or very strongly acid.

The B2tg horizon is dark gray or gray. Mottles are few to many, fine through coarse, and distinct or prominent and are in shades of brown, gray, or red. This horizon is typically clay but in places is clay loam, silty clay loam, or silty clay. It is strongly acid or very strongly acid.

Kinta soils are associated with Felker, Guyton, Kullit, Tiak, and Tomast soils. They are more clayey in the upper part of the solum than Tomast soils and grayer in the upper part of the solum than Kullit, Felker, and Tiak soils. Kinta soils are more clayey than Guyton soils.

Kinta clay loam, 0 to 2 percent slopes (KnA).—This is the only Kinta soil mapped in the county. It is on uplands.

Included with this soil in mapping, and making up 10 percent of the mapped areas, are areas of Felker loam, Tomast silt loam, and Guyton silt loam.

Most of this soil is wooded except for small areas that are cleared and used for tame pasture. Kinta soil is not cultivated (fig. 7). It is poorly suited to crops because of wetness late in spring. Late season crops, however, such as grain sorghum and soybeans, can be grown.

Management practices are needed that help to maintain or to improve soil fertility and structure and dispose of excess surface water. A suitable cropping system provides crops that produce large amounts of residue for return to the soil. In some places the concave relief retards the runoff of water. A surface drainage system and a suitable arrangement of crop rows will help to drain ponded surface water. Capability unit IVw–1; woodland suitability group 3w9; pasture and hayland suitability group 8H.

Figure 7.—**Area of Kinta clay loam, 0 to 2 percent slopes, woodland suitability group 3w9.**

Kullit Series

The Kullit series consists of deep, very gently sloping, moderately well drained soils on uplands. These soils formed in loamy sediment under a cover of pines and hardwoods and an understory of mid and tall grasses.

In a representative profile the surface layer is 7 inches of dark grayish-brown fine sandy loam. The subsurface layer, to a depth of 16 inches, is brown fine sandy loam. The upper part of the subsoil, to a depth of 54 inches, is brown and red sandy clay loam. It has mottles in shades of gray, brown, and red. The lower part of the subsoil, to a depth of 72 inches or more, is light-gray sandy clay and has many coarse mottles and bodies in shades of brown and red.

Permeability is moderate in Kullit soils, and available water capacity is high. The seasonal water table is at a depth of 2 to 3 feet.

Representative profile of Kullit fine sandy loam, 1 to 3 percent slopes (2,000 feet east and 150 feet south of the NW. corner of sec. 31, T. 8 S., R. 26 E.):

A1—0 to 7 inches, dark grayish-brown (10YR 4/2) fine sandy loam; weak, medium, granular structure; very friable; slightly acid; clear, smooth boundary.

A2—7 to 16 inches, brown (10YR 5/3) fine sandy loam; weak, fine, granular structure; very friable; strongly acid; clear, wavy boundary.

B21t—16 to 26 inches, brown (7.5YR 4/4) sandy clay loam; few, coarse, distinct, light-gray (10YR 6/1) and yellowish-red (5YR 5/8) mottles; weak, medium, subangular blocky structure; friable; patchy clay films on ped faces and on bridging between sand grains; thin coatings of fine sandy loam on vertical ped surfaces; very strongly acid; clear, wavy boundary.

B22t—26 to 54 inches, red (2.5YR 4/8) sandy clay loam; many, coarse, prominent mottles and light-gray (10YR 6/1) and strong-brown (7.5YR 5/6) bodies; weak, medium, subangular blocky structure; friable; thin, continuous clay films on ped faces; texture of the light-gray bodies ranges from fine sandy loam with clean sand grains to sandy clay loam. Some of these are bodies of A'2 water channels that strip clays and plug up in another part of the channel; a few brittle peds and iron-manganese concretions; very strongly acid; gradual, wavy boundary.

B23t and A'2—54 to 72 inches, light-gray (10YR 6/1) sandy clay; many coarse mottles and bodies of yellowish-brown (10YR 5/6) sandy clay loam, strong-brown (7.5YR 5/6) loam, red (2.5YR 4/6) loam, slightly brittle peds, and light-gray (10YR 7/2) fine sandy loam with clean sand grains; weak, medium, subangular blocky structure; firm and friable; clay films are stripped from some bodies and are thin on ped faces and thick in some pores; a few iron-manganese concretions; average texture is a sandy clay loam; very strongly acid.

The A1 or Ap horizon is dark grayish brown, grayish brown, or brown. The A2 horizon is brown, yellowish brown, pale brown, or light yellowish brown. The A horizon is slightly acid through strongly acid.

The B21t horizon is brown, strong brown, reddish yellow, or yellowish red. The B22t horizon is red or yellowish red. Mottles are many or common, medium or coarse, and distinct. They are in shades of gray or brown. The B21t and B22t horizons are loam, sandy clay loam, and clay loam. The B23t and A'2 horizon is light gray, light brownish gray, brownish yellow, or strong brown. Mottles and bodies are many, fine through coarse, and distinct. They are in shades of brown, gray, or red. This horizon is sandy clay or clay. It is strongly acid or very strongly acid.

Kullit soils are associated with Blevins, Elysian, Felker, Kinta, Ruston, Tiak, and Tomast soils. Kullit soils differ from Ruston and Blevins soils by having gray mottles at a depth of less than 30 inches. They are less silty than Felker soils. Kullit soils are not so gray in the upper part of the solum as Kinta soils, and they are redder in the upper part than Tomast soils. They are not so clayey as Tiak soils, but they are more clayey than Elysian soils.

Kullit fine sandy loam, 1 to 3 percent slopes (KuB).—This is the only Kullit soil mapped in the county. It is on uplands.

Included with this soil in mapping are small areas of soils that have a yellower subsoil than this soil. Also included are spots of Felker loam, Elysian fine sandy loam, Ruston fine sandy loam, and Blevins fine sandy loam.

This Kullit soil is used mainly for tame pasture or growing trees (fig. 8) and is suited to these uses. It is suited to common crops in the county, such as corn, grain sorghum, soybeans, cotton, and peanuts.

Management practices are needed that help to maintain or to improve soil fertility and structure and that remove excess surface water. A suitable cropping system provides crops that produce large amounts of residue that can be returned to the soil. In places the Elysian soils on mounded relief retard runoff. Plant cover is needed during the winter and spring to protect the soil from water erosion. Crop rows can be arranged to drain ponded surface water. Capability unit IIw–1; woodland suitability group 2w8; pasture and hayland suitability group 8G.

Latanier Series

The Latanier series consists of deep, nearly level and very gently sloping, moderately well drained soils on the flood plains of the Red River. These soils formed in

Figure 8.—**Young pines on Kullit fine sandy loam, 1 to 3 percent slopes.**

clayey and loamy alkaline sediment under a cover of hardwoods and an understory of mid and tall grasses.

In a representative profile the surface layer is 8 inches of dark reddish-brown clay. The subsoil, to a depth of 28 inches, is dark reddish-brown clay. The underlying material is a yellowish-red very fine sandy loam.

Permeability is very slow in these soils, and available water capacity is high. Latanier soils crack when they are dry.

Representative profile of Latanier clay (2,400 feet west and 400 feet south of the NE. corner of sec. 18, T. 10 S., R. 26 E.):

Ap—0 to 8 inches, dark reddish-brown (5YR 3/3) clay; moderate, medium, subangular blocky structure breaking to fine, blocky; firm; mildly alkaline; clear, smooth boundary.

B—8 to 28 inches, dark reddish-brown (5YR 3/3) clay; moderate, fine, blocky structure; very firm; shiny ped surfaces; moderately alkaline, calcareous; clear, wavy boundary.

IIC1—28 to 46 inches, yellowish-red (5YR 5/6) very fine sandy loam; weak, fine, granular structure; very friable; moderately alkaline, calcareous; few, thin, indistinct strata of yellowish-red (5YR 4/6) silt loam; clear, wavy boundary.

IIC2—46 to 72 inches, yellowish-red (5YR 5/6) very fine sandy loam; strata of reddish-brown (5YR 5/4), reddish-yellow (5YR 6/6) silt loam; loamy very fine sand and loamy fine sand; massive; very friable; edges of bedding planes are distinct; moderately alkaline, calcareous.

The A1 or Ap horizon is dark reddish brown or dark brown. This horizon is mildly alkaline or moderately alkaline. The B horizon is dark reddish brown or dark red and clay or silty clay. The IIC horizon is yellowish red, reddish brown, reddish yellow, light reddish brown, or strong brown. It is stratified with very fine sandy loam or fine sandy loam, with or without strata of loamy fine sand, fine sand, silt loam, and clay loam. The IIC horizon is moderately alkaline and calcareous.

The Latanier soil is more clayey in the upper part than the associated Coushatta, Severn, Idabel, and Oklared soils. Its solum is not so thick as similar Redlake and Roebuck soils.

Latanier clay (La).—This is the only Latanier soil mapped in the county. This nearly level and very gently sloping soil is on the flood plains of the Red River.

Included with this soil in mapping, and making up 10 percent of the mapped areas, are soils that have a combined thickness of the surface layer and subsoil of less than 15 inches. Also included are spots of Redlake clay and Coushatta silty clay loam.

This Latanier soil is used mainly for crops. It is highly suited to tame pasture and trees and to common crops in the county, such as alfalfa, soybeans, cotton, corn, grain sorghum, and small grains.

Management practices are needed that help to control wetness and to maintain soil structure. This soil is difficult to till because of the clayey material. Tillage should be timely and kept to a minimum. Soil fertility and structure can be maintained by seeding legumes and grasses, adding fertilizer according to soil tests, and effectively using crop residue. Land smoothing and adequate surface drainage are needed for this soil. Flooding rarely occurs but does occur for short periods in low areas once every 1 to 5 years late in winter. Capability unit IIIw–2; woodland suitability group 2w5; pasture and hayland suitability group 1A.

Muskogee Series

The Muskogee series consists of deep, very gently sloping, moderately well drained soils on uplands. These soils formed in clayey sediment under a cover of pines and hardwoods and an understory of mid and tall grasses.

In a representative profile the surface and subsurface layers combined are 8 inches of dark grayish-brown and yellowish-brown loam. The upper part of the subsoil, to a depth of 26 inches, is yellowish-brown loam and clay loam. It is mottled in shades of red, brown, and gray in the lower part. The middle part of the subsoil, to a depth of 52 inches, is mottled, light brownish-gray, gray, yellowish-brown, and red clay loam and clay. The lower part of the subsoil, to a depth of 80 inches or more, is gray clay that is mottled in shades of brown.

Permeability is slow in these soils, and the available water capacity is high. The seasonal perched water table is at a depth of 1 to 2 feet.

Representative profile of Muskogee loam, 1 to 3 percent slopes (2,800 feet north and 200 feet west of the SE. corner of sec. 15, T. 7 S., R. 22 E.):

A1—0 to 3 inches, dark grayish-brown (10YR 4/2) loam; weak, medium, granular structure; friable; many roots; medium acid; clear, smooth boundary.

A2—3 to 8 inches, yellowish-brown (10YR 5/4) loam; weak, medium, granular structure; friable; common fine roots; medium acid; clear, smooth boundary.

B1—8 to 16 inches, yellowish-brown (10YR 5/6) loam; weak, medium, subangular blocky structure; friable; common fine roots; strongly acid; gradual, smooth boundary.

B21t—16 to 26 inches, yellowish-brown (10YR 5/6) clay loam; common, medium, distinct, red (2.5YR 4/6) and few, increasing to common with depth, medium, distinct, light brownish-gray (10YR 6/2) and pale-brown (10YR 6/3) mottles; moderate, medium, subangular

blocky structure; friable; thin, continuous clay films on ped faces and in pores; few fine roots; few fine pores; occasional, dark, soft, iron-oxide concretions; strongly acid; gradual, smooth boundary.

B22t—26 to 36 inches, medium-mottled, light brownish-gray (10YR 6/2), yellowish-brown (10YR 5/6), red (2.5YR 4/6), and strong-brown (7.5YR 5/6) clay loam; moderate, medium, subangular blocky structure; firm; thick, continuous clay films; few fine and medium pores; strongly acid; gradual, smooth boundary.

B23t—36 to 52 inches, coarsely mottled, gray (10YR 6/1), red (2.5YR 4/6), and yellowish-brown (10YR 5/6) clay; weak, fine, blocky structure; firm; thick, continuous clay films; strongly acid; gradual, smooth boundary.

B24t—52 to 80 inches, gray (10YR 6/1) clay; many, medium, distinct, yellowish-brown (10YR 5/6) mottles; weak, fine, blocky structure; firm, continuous clay films; common, soft iron-oxide concretions; medium acid.

The A1 or Ap horizon is brown or dark grayish brown. The A2 horizon is yellowish brown, light yellowish brown, or brown. The A horizon is medium acid or strongly acid.

The B1 horizon is loam or clay loam, and it is medium acid or strongly acid. The B21t horizon is yellowish brown, light yellowish brown, or strong brown. Mottles are few to common, fine through coarse, and distinct. They are in shades of gray, brown, or red. The B22t horizon is light brownish gray, gray, or yellowish brown. In places it has a mottled matrix with fine through coarse, distinct mottles in shades of red, brown, gray, or yellow. This horizon is clay loam or clay. The B21t and B22t horizons are medium acid or strongly acid. The B23t and B24t horizons are gray and have many, fine through coarse, distinct mottles in shades of red, brown, gray, or yellow. In places the matrix is mottled in shades of gray, brown, red, and yellow and is strongly acid through mildly alkaline.

The Muskogee soil is less clayey in the upper part of the B horizon than the associated Cadeville soil, and more clayey in the lower part than the associated Blevins soil.

Muskogee loam, 1 to 3 percent slopes (MuB).—This is the only Muskogee soil mapped in the county. It is on uplands. The Muskogee soils in this county have a seasonal water table in winter and in spring that interferes with the use of equipment in harvesting woodcrops. Included with this soil in mapping, and making up 10 percent of the mapped areas, are areas of Alusa loam, Cadeville loam, and minor areas where the surface layer is fine sandy loam.

Muskogee soil is used mainly as tame pasture (fig. 9). This soil is suited to tame pasture and trees and to some common crops in the county, such as corn, grain sorghum, soybeans, and cotton.

Management practices are needed that help to maintain or improve soil fertility and structure and control erosion. The hazard of erosion can be reduced by using terraces, contour tillage, and crop residue. Plant cover is needed during the winter and spring to protect the soil from water erosion. Sown crops can be grown continuously if fertilizer is added and crop residues are used properly. Terracing and contour farming are needed if row crops are to be grown. Crop residue should be returned to the soil and excessive tillage avoided. Capability unit IIe–2; woodland suitability group 3w8; pasture and hayland suitability group 8G.

Newtonia Series

The Newtonia series consists of deep, very gently sloping, well-drained soils on uplands. These soils formed

Figure 9.—Area of common bermudagrass and tall fescue on Muskogee loam, 1 to 3 percent slopes.

under a cover of mid and tall grasses in material weathered from limestone and calcareous shales.

In a representative profile the surface layer is 9 inches of dark-brown silt loam. The upper part of the subsoil, to a depth of 16 inches, is dark reddish-brown silty clay loam. The middle part of the subsoil, to a depth of 52 inches, is yellowish-red and red silty clay loam. The lower part of the subsoil, to a depth of 72 inches or more, is red and reddish-brown silty clay. Mottles in shades of yellow are in the lower part.

Permeability is moderate in Newtonia soils, and available water capacity is high.

Representative profile of Newtonia silt loam, 1 to 3 percent slopes (1,320 feet west and 150 feet south of the NE. corner of sec. 35, T. 6 S., R. 21 E.):

Ap—0 to 5 inches, dark-brown (7.5YR 3/3) silt loam; weak, fine, granular structure; very friable; many roots; few, very fine, hard iron-manganese concretions; slightly acid; clear, smooth boundary.

A1—5 to 9 inches, dark-brown (7.5YR 3/3) silt loam; moderate, fine and medium, granular structure; very friable; few worm casts; few, very fine, hard iron-manganese concretions; slightly acid; clear, smooth boundary.

B21t—9 to 16 inches, dark reddish-brown (5YR 3/3) silty clay loam; strong, medium and fine, granular structure; friable; thin, discontinuous clay films; many worm casts; many fine iron-manganese concretions; slightly acid; gradual, smooth boundary.

B22t—16 to 38 inches, yellowish-red (5YR 4/6) silty clay loam; moderate, medium, subangular blocky structure; friable; thick, continuous clay films; few worm casts; many fine iron-manganese concretions; slightly acid; gradual, smooth boundary.

B23t—38 to 52 inches, red (2.5YR 4/6) silty clay loam; strong, medium, subangular blocky structure; firm, thick, continuous clay films; many, fine, hard iron-manganese concretions; medium acid; gradual, smooth boundary.

B24t—52 to 65 inches, same as B23t horizon, except texture is silty clay.

B3—65 to 72 inches, reddish-brown (5YR 4/4) silty clay; many, coarse, distinct, reddish-yellow (7.5YR 6/6) mottles; weak, medium, blocky structure; firm; few fine iron-manganese concretions; medium acid.

The A1 or Ap horizon is very dark grayish brown or dark brown. Reaction is slightly acid or medium acid.

The B21t horizon is dark reddish-brown or dark-brown loam or silty clay loam. The remaining part of the B2t horizon is yellowish-red, reddish-brown, or red silty clay loam or silty clay. It is slightly acid through strongly acid. The B3 horizon is reddish brown, red, or yellowish red. Mottles are in shades of brown or yellow. This horizon is clay or silty clay that is medium acid through mildly alkaline.

Newtonia soils are associated with Hollywood, Panola, and Swink soils. Newtonia soils are redder than Panola and Hollywood soils, and they have less clay in the upper horizons. Newtonia soils have a thicker solum than Swink soils.

Newtonia silt loam, 1 to 3 percent slopes (NeB).—This is the only Newtonia soil mapped in the county. It is on uplands.

Included with this soil in mapping, and making up 20 percent of the mapped areas, are areas of similar soils that are 40 to 60 inches thick to limestone bedrock, areas where the soil lacks a dark surface layer, and minor areas of Panola silty clay loam.

This Newtonia soil is used mainly as tame pasture. It is well suited to this use and to range, and it is well suited to the common crops in the county, such as corn, grain sorghum, soybeans, cotton, small grains, peanuts, and alfalfa.

Management practices are needed that help to maintain or to improve soil structure and fertility and control erosion. The hazard of erosion is slight on this soil. Terraces, contour tillage, and the use of crop residue will reduce the slight erosion hazard and maintain fertility. Plant cover is needed during the winter and spring to protect the soil from water erosion. Sown crops can be grown continuously if fertilizer is added according to soil tests and crop residues are used. Crop residues should be returned to the soil and excessive tillage avoided. Capability unit IIe–4; Loamy Prairie range site; woodland suitability group 5o0; pasture and hayland suitability group 8A.

Ochlockonee Series

The Ochlockonee series consists of deep, nearly level, well-drained soils on flood plains other than those along the Red River. These soils formed in loamy sediment under a cover of pines and hardwoods and an understory of mid and tall grasses.

In a representative profile the surface layer is 10 inches of dark grayish-brown fine sandy loam. The next layer, to a depth of 24 inches, is dark-brown fine sandy loam. The underlying material is brown fine sandy loam with mottles in shades of brown and gray in the lower part.

Permeability is moderately rapid in Ochlockonee soils, and available water capacity is high. These soils are subject to flooding.

Representative profile of Ochlockonee fine sandy loam (2,000 feet south and 1,200 feet west of the NE. corner of sec. 24, T. 6 S., R. 22 E.):

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

C1—10 to 24 inches, dark-brown (10YR 4/3) fine sandy loam; weak, fine, granular structure; very friable; few roots; strongly acid; gradual, smooth boundary.

C2—24 to 42 inches, brown (10YR 5/3) fine sandy loam; massive; strongly acid; gradual, smooth boundary.

C3—42 to 70 inches, brown (10YR 5/3) fine sandy loam; few, fine and medium, faint to distinct, yellowish-brown and light brownish-gray mottles; massive; very friable; strongly acid.

The A1 or Ap horizon is dark brown or dark grayish brown. The C1 and C2 horizons are brown, yellowish brown, dark brown, or dark yellowish brown. The C3 horizon has these colors and has few to common, fine to medium, distinct mottles in shades of brown and gray. Reaction is strongly acid or very strongly acid.

Ochlockonee soils are associated with Bibb, Cahaba, Ceda, Iuka, and Rexor soils. Ochlockonee soils are better drained and are not so gray as Iuka and Bibb soils. These soils are less clayey than Rexor and Cahaba soils, and they lack the coarse fragments common to Ceda soils.

Ochlockonee fine sandy loam (Oc).—This is the only Ochlockonee soil mapped in the county. This nearly level soil is on flood plains other than those along the Red River.

Included with this soil in mapping, and making up 10 percent of the mapped areas, are medium-acid soils having a very dark grayish-brown surface layer more than 8 inches thick. Also included, and making up 8 percent of the mapped areas, are areas of Rexor loam, Ceda gravelly loam, and Iuka fine sandy loam.

This Ochlockonee soil is used mainly for tame pasture and is well suited to this use. It is well suited to trees and to the common crops in the county, such as corn, grain sorghum, soybeans, cotton, and peanuts.

Management practices are needed that help to maintain or to improve soil fertility and structure and that protect the soil from damage by overflow of streams. This soil is subject to damaging floods once in 1 to 5 years for short periods. Also needed are terraces for diverting water that runs off adjacent uplands and crop residues that can be returned to the soil. Capability unit IIw–3; woodland suitability group 2o7; pasture and hayland suitability group 2A.

Oklared Series

The Oklared series consists of deep, well-drained, nearly level and very gently sloping soils on the flood plains of the Red River. These soils formed in loamy alkaline sediment under a cover of hardwoods and an understory of mid and tall grasses.

In a representative profile the surface layer is 14 inches of yellowish-red very fine sandy loam. The underlying material is stratified, reddish-yellow, yellowish-red, and reddish-brown fine sandy loam, very fine sandy loam, and silt loam.

Permeability is moderately rapid in Oklared soils, and water capacity is moderate.

Representative profile of Oklared very fine sandy loam (2,000 feet south and 1,100 feet west of the NE. corner of sec. 30, T. 9 S., R. 24 E.):

A1—0 to 14 inches, yellowish-red (5YR 5/6) very fine sandy loam; weak, fine, granular structure; very friable; calcareous; clear, smooth boundary.

C1—14 to 24 inches, reddish-yellow (5YR 6/6) fine sandy loam; weak, fine, granular structure; very friable; few discontinuous bedding planes; calcareous; gradual, wavy boundary.

C2—24 to 44 inches, yellowish-red (5YR 5/6) very fine sandy loam; massive; very friable; common bedding planes;

thin strata of sandy loam and loamy sand; calcareous; gradual, smooth boundary.

IIC3—44 to 50 inches, reddish-brown (5YR 5/4) silt loam; massive; very friable; calcareous; gradual, smooth boundary.

IIIC4—50 to 60 inches, reddish-yellow (5YR 6/6) fine sandy loam; massive; very friable; common bedding planes; thin strata of very fine sandy loam and loamy sand; calcareous.

The A1 or Ap horizon is dark brown, brown, strong brown, dark reddish brown, reddish brown, or yellowish red. The C horizon is yellowish red, pink, strong brown, reddish brown, light reddish brown, reddish yellow, red, or light red. This horizon is stratified fine sandy loam, loamy fine sand, very fine sandy loam, or silt loam.

Oklared soils are associated with Coushatta, Idabel, Latanier, and Severn soils. Oklared soils have an average texture that is sandier than Severn, Latanier, and Coushatta soils, and they have more stratification in the upper horizons than Idabel soils.

Oklared very fine sandy loam (Ok).—This is the only Oklared soil mapped in the county. It is a nearly level and very gently sloping soil on the flood plains of the Red River.

Included with this soil in mapping, and making up 10 percent of the mapped areas, are soils that have less than 30 inches of an average texture coarser than loamy fine sand. Also included are areas where the soil material is fine sandy loam and loam and spots of Severn very fine sandy loam.

This soil is highly suited to tame pasture and trees and to the common crops in the county, such as corn, grain sorghum, soybeans, cotton, small grains, peanuts, and alfalfa. It is used mainly for tame pasture.

Management practices are needed that help to maintain or to improve soil fertility and structure, and that decrease dryness and protect the low areas from the backwater floods of the Red River. The low areas of this soil are subject to flooding for short periods once in 1 to 5 years.

The soil structure in the surface layer can be improved and dryness in late summer can be decreased by returning large amounts of crop residue to the soil. Fertilizer should be added frequently in small amounts according to soil tests. Also beneficial are legumes and cover crops. Land smoothing is needed to remove irregularities on the land surface. Capability unit IIw–4; woodland suitability group 2o4; pasture and hayland suitability group 2A.

Panola Series

The Panola series consists of deep, nearly level and very gently sloping, somewhat poorly drained soils on uplands. These soils formed under a cover of mid and tall grasses in material weathered from alkaline shale and clay.

In a representative profile the surface layer is 8 inches of very dark gray silty clay loam. The upper part of the subsoil, to a depth of 20 inches, is dark grayish-brown and brown silty clay loam with mottles in shades of brown and gray. The middle part of the subsoil, to a depth of 35 inches, is dark-gray and grayish-brown clay with mottles in shades of brown. The lower part of the subsoil, to a depth of 51 inches, is clay that has mottles of gray, yellowish brown, and shades of red and brown. Below this, to a depth of 72 inches or more, the subsoil is gray mottled with shades of brown.

Permeability is very slow in Panola soils, and available water capacity is high. These soils crack when they are dry. The seasonal perched water table is at a depth of 0 to 1 foot.

Representative profile of Panola silty clay loam (1,500 feet north and 50 feet west of the SE. corner of sec. 4, T. 7 S., R. 22 E.):

A1—0 to 8 inches, very dark gray (10YR 3/1) silty clay loam; weak, medium, subangular blocky and moderate, medium and fine, granular structure; firm; strongly acid; clear, smooth boundary.

B21t—8 to 13 inches, dark grayish-brown (10YR 4/2) silty clay loam; common, fine, faint, brown mottles; moderate, medium, subangular blocky and moderate, fine, blocky structure; very firm; thin clay films on ped faces; common iron-manganese concretions; thin dark-gray (10YR 4/1) coatings from above on ped faces; clean sand and silt grains on ped faces; strongly acid; gradual, wavy boundary.

B22t—13 to 20 inches, brown (10YR 5/3) silty clay loam; common, fine, distinct, yellowish-brown and light brownish-gray mottles; moderate, medium, subangular blocky structure; very firm; thick coatings on peds of grayish-brown (10YR 5/2) silt loam; clean sand grains and silt coatings on ped faces; thin clay films on peds; common brown and black iron-manganese concretions; strongly acid; clear, wavy boundary.

B23t—20 to 35 inches, dark-gray (10YR 4/1) and grayish-brown (10YR 5/2) clay; many fine and medium, distinct, yellowish-brown and a few fine, distinct, strong-brown mottles; moderate, coarse, prismatic and moderate, medium and coarse, blocky structure; extremely firm; clay films on peds; thin silt coatings on top of prisms; common shiny ped faces; few brown and black iron-manganese concretions and stains; strongly acid; gradual, wavy boundary.

B24t—35 to 51 inches, mottled-gray (10YR 6/1) and yellowish-brown (10YR 5/6) clay; common, fine, prominent, yellowish-red, brown, and red mottles; moderate, coarse, prismatic and moderate, medium and fine, blocky structure; extremely firm; shiny ped faces; gray coatings on ped surfaces; many slickensides with few intersecting below 40 inches; few dark-gray (10YR 4/1) streaks and pockets; few calcium sulfate crystals; medium acid; gradual, wavy boundary.

B3g—51 to 72 inches, gray (10YR 6/1) clay; many, coarse, distinct, yellowish-brown (10YR 5/6) mottles; moderate, fine, blocky structure; very firm; common, hard, brown and black iron-manganese concretions and stains; few calcium sulfate crystals; mildly alkaline.

The A1 or Ap horizon is very dark gray, very dark grayish brown, or dark brown. The A horizon is slightly acid through strongly acid.

The B21t horizon is dark grayish brown, grayish brown or brown. Mottles are common or many, fine through coarse, and distinct. They are in shades of red, brown, or yellow. This horizon is silty clay loam or clay, and it is slightly acid through very strongly acid. The B22t horizon is dark grayish brown, brown, grayish brown, light brownish gray, or pale brown. Mottles are common or many, fine through coarse, and distinct and are in shades of red, brown, gray, or yellow. This horizon is silty clay loam, silty clay, or clay. Reaction is slightly acid through very strongly acid. The B23t horizon is dark gray, gray, light brownish gray, or grayish brown. Mottles are the same as in the B22t horizon. The B23t horizon is slightly acid to strongly acid. The B24t horizon is similar to the B23t horizon, except that it is medium acid through mildly alkaline. The B3g horizon either has a gray or mottled matrix, is gray through olive brown, or is grayish brown to dark gray.

Panola soils are associated with Alusa, Hollywood, and Swink soils. Panola soils lack the A2 horizon and the abrupt A to B horizon boundary that is present in Alusa soils. They

are not so clayey in the A horizon as Hollywood soils, and their solum is thicker than that of Swink soils.

Panola silty clay loam (Pa).—This is the only Panola soil mapped in the county. It is nearly level and very gently sloping and is on uplands.

Included with this soil in mapping, and making up 10 percent of the mapped areas, are areas of soils having a very dark grayish-brown surface layer more than 10 inches thick, areas where the loam surface layer is loam, and spots of Hollywood silty clay and Alusa loam.

Panola loam is mainly used for tame pasture and for growing soybeans. It is suited to the common crops in the county, such as grain sorghum, cotton, and small grains. It is also used for range.

Management practices are needed that help to maintain or to improve soil fertility and structure and that control erosion and increase water intake. The erosion hazard can be reduced by terraces, contour farming, and use of crop residue. Crops are needed that provide large amounts of residue for return to the soil to improve soil structure and fertility and increase water intake. Sown crops can be grown continuously if fertilizer is added according to soil tests and crop residues are used. Capability unit IIIe–4; Loamy Prairie range site; woodland suitability group 5o0; pasture and hayland suitability group 8C.

Pickens Series

The Pickens series consists of shallow, nearly level to moderately steep, somewhat excessively drained soils on uplands. These soils formed under a cover of pines and hardwoods and an understory of mid and tall grasses in material weathered from shale.

In a representative profile the surface layer is 4 inches of very dark grayish-brown shaly silt loam. The subsurface layer extends to a depth of 10 inches and is brown shaly silt loam. The subsoil is about 25 percent yellowish-brown very shaly silt loam and 75 percent hard shale fragments. Very dark gray fractured alkaline shale is at a depth of about 17 inches.

Permeability is moderate in Pickens soils, and available water capacity is moderate to low.

Representative profile of Pickens shaly silt loam, 5 to 15 percent slopes (1,320 feet west and 600 feet south of the NE. corner of sec. 22, T. 2 S., R. 23 E.):

A1—0 to 4 inches, very dark grayish-brown (10YR 3/2) shaly silt loam; moderate, fine, granular structure; slightly hard, friable; slightly acid; clear, smooth boundary.

A2—4 to 10 inches, brown (10YR 5/3) shaly silt loam; moderate, fine, granular structure; slightly hard, friable; strongly acid; diffuse, wavy boundary.

B2—10 to 17 inches, yellowish-brown (10YR 5/4) very shaly silt loam; weak, fine, granular structure; slightly hard, friable; about 75 percent hard shale fragments; strongly acid; clear, wavy boundary.

R—17 to 30 inches, very dark gray (10YR 3/1), hard, alkaline shale, fractured, with less than 5 percent soil in fractures.

The A1 horizon is dark brown, brown, very dark grayish brown, dark grayish brown, or dark yellowish brown. It consists of shaly loam and shaly silt loam and is slightly acid through strongly acid. The A2 horizon is brown, dark grayish-brown, grayish-brown, and yellowish-brown shaly silt loam and shaly loam. It is medium acid or strongly acid. The B horizon consists of 35 to 90 percent shale fragments and 10 to 65 percent soil material. It is brown, dark yellowish brown, yellowish brown, olive brown, and light olive brown. Reaction is medium acid through very strongly acid. Depth to the R layer is 10 to 20 inches. The R layer is hard, alkaline shale bedrock.

Pickens soils are associated with Alikchi, Golston, and Hector soils. Pickens soils, unlike Goldston soils, have a solum less than 20 inches thick and horizontally bedded bedrock. They have more coarse fragments in the solum than Hector soils and a thinner solum than Alikchi soils.

Pickens shaly silt loam, 5 to 15 percent slopes (PcE).—This soil is on uplands. It has the profile described as representative of the Pickens series.

Included with this soil in mapping, and making up 10 percent of the mapped areas, are similar soils with surface layers that are shaly loam or shaly clay loam. Also included, and making up another 10 percent of the mapped areas, are areas of Goldston gravelly loam, Carnasaw loam, and Alikchi loam.

Pickens loam is best suited to and is used mainly for native range. In places are areas of trees for commercial timber. The quality of the native grasses can be maintained or improved by controlling brush, using suitable grazing practices, and protecting them from fire. The wooded areas can be maintained or improved by protecting them from fire, removing or controlling inferior species, planting suitable species, and selectively harvesting trees on a planned schedule. Capability unit VIIs–2; woodland suitability group 5d3; Shallow Savannah range site; pasture and hayland suitability group 14A.

Pickens-Alikchi complex, 0 to 3 percent slopes (PeB).—These soils are on uplands. Pickens and Alikchi soils are in such an intricate pattern that it is impractical to map each one separately. The Pickens soil is on ridges and the Alikchi soil is in low flats and drainageways.

About 52 percent of the acreage is Pickens shaly loam and shaly silt loam, 36 percent is Alikchi silt loam, and 12 percent is Sherwood fine sandy loam and Carnasaw loam.

These soils are best suited to and are used mainly for native range and growing trees. The quality of the native grasses can be maintained or improved by controlling brush, using suitable grazing practices, and protecting from fire. The wooded areas can be maintained or improved by protecting them from fire, removing or controlling inferior species, planting suitable species, and selectively harvesting trees on a planned schedule. Capability unit VIIs–2; woodland suitability group 5d3; Pickens soil in Shallow Savannah range site; Pickens soil in pasture and hayland suitability group 14A, Alikchi soil in pasture and hayland suitability group 8H.

Pledger Series

The Pledger series consists of deep, nearly level, moderately well drained to somewhat poorly drained soils on the flood plains of the Red River. These soils formed in clayey and loamy alkaline sediment under a cover of hardwoods and an understory of mid and tall grasses.

In a representative profile the surface layer is 15 inches of very dark brown and black clay. Below this layer, to a depth of 27 inches, is a dark-brown and brown clay. The subsoil, which extends to a depth of 45 inches, is dark reddish-brown clay. The underlying material is a yellowish-red stratified layer that averages clay loam.

Pledger soils have very slow permeability, and available water capacity is high. These soils crack when dry. The seasonal perched water table is at a depth of 3 to 6 feet.

Representative profile of Pledger clay (2,000 feet west and 200 feet south of the NE. corner of sec. 36, T. 8 S., R. 23 E.):

Ap—0 to 6 inches, very dark brown (10YR 2/2) clay; moderate, medium and fine, subangular blocky structure; firm, neutral; clear, smooth boundary.

A1—6 to 15 inches, black (10YR 2/1) clay; moderate, fine, blocky structure; very firm; neutral; clear, wavy boundary.

A & B—15 to 27 inches, dark-brown (7.5YR 3/2) clay and mostly brown (7.5YR 4/4) mixed peds, very dark brown (10YR 2/2) peds in places; moderate, fine, blocky structure; very firm; few, fine, reddish-brown earthworm casts; moderately alkaline; clear, wavy boundary.

B2—27 to 45 inches, dark reddish-brown (5YR 3/3) clay; moderate, medium and fine, blocky structure; very firm; shiny ped faces and few streaks of very dark brown (10YR 2/2) in cracks from horizon above; moderately alkaline; calcareous spots of soft powdery calcium carbonate; gradual boundary.

C—45 to 90 inches, yellowish-red (5YR 5/6) stratified silty clay loam, fine sandy loam, and clay that averages clay loam; massive; friable; calcareous.

The A1 or Ap horizons are very dark brown, very dark grayish brown, or black. The A horizon is slightly acid through moderately alkaline. The B horizon is dark reddish brown, brown, or reddish brown. The C horizon is yellowish red or reddish brown, and is silty clay loam with strata of clay, loam, fine sandy loam, or very fine sandy loam.

Pledger soils are associated with Caspiana, Gallion, Garton, Kaufman, Redlake, Roebuck, and Tuscumbia soils. They lack the gray mottles that are present in Roebuck soils, and they are redder in the B horizon than Kaufman and Tuscumbia soils. Pledger soils are more clayey than Caspiana, Garton, and Gallion soils and darker in the upper part of the solum than Redlake soils.

Pledger clay (Pg).—This is a nearly level soil on the flood plains of the Red River. It has the profile described as representative of the Pledger series.

Included with this soil in mapping are a few small areas of soils having a dark reddish-brown surface layer, areas of soils having a silty clay loam or clay loam surface layer, and spots of Roebuck clay and Garton silt loam.

This soil is highly suited to tame pasture and trees and to the common crops in the county, such as alfalfa, soybeans, cotton, corn, grain sorghum, and small grains. Pledger clay is used mainly for crops and tame pasture.

Management practices are needed that help to control surface wetness, increase water intake, maintain soil structure and fertility, and reduce surface crusting. This soil is difficult to till because of the clayey material. Tillage should be timely and kept to a minimum. Soil fertility, structure, and water intake can be maintained or improved by seeding legumes and fescue, adding fertilizer, and effectively using crop residue. Low, wet areas often require a surface drainage system. Capability unit IIs–1; woodland suitability group 3w6; pasture and hayland suitability group 1A.

Pledger-Roebuck complex (Pr).—In this mapping unit are nearly level soils on the flood plains of the Red River. About 55 percent of the acreage is Pledger clay, 43 percent is Roebuck clay, and 2 percent is spots of Redlake clay.

The Pledger and Roebuck soils are in an intricate pattern. Pledger soils are on the low ridges and Roebuck soils are in the swales between the low ridges. The Roebuck soil has the profile described as representative of the Roebuck series.

Pledger and Roebuck soils are used mainly for tame pasture and crops. These soils are suited to the common crops in the county, such as alfalfa, soybeans, cotton, corn, grain sorghum, and small grains. They are also suited to tame pasture and trees.

Management practices are needed that help to provide adequate drainage for the wetter Roebuck soils, maintain or improve soil structure and fertility, and increase water intake. The soils are difficult to till because of the clayey material. Tillage should be timely and kept to a minimum. Soil fertility and structure can be maintained by seeding legumes and fescue, adding fertilizer according to soil tests, and effectively using crop residue. In many places water remains on the Roebuck soil after rain, and a drainage system is needed in the areas that include this soil. If row crops are grown, an arrangement that facilitates surface drainage is needed. Capability unit IIIw–1; woodland suitability group 3w6; pasture and hayland suitability group 1A.

Redlake Series

The Redlake series consists of deep, nearly level, moderately well drained soils on the flood plains of the Red River. These soils formed in clayey alkaline sediment under a cover of hardwoods and an understory of mid and tall grasses.

In a representative profile the surface layer is 8 inches of dark reddish-brown clay. The subsoil, to a depth of 42 inches, is a reddish-brown clay. The underlying material is a yellowish-red clay loam.

Permeability is very slow in Redlake soils, and available water capacity is high. These soils crack when dry.

Representative profile of Redlake clay (150 feet north and 50 feet west of the SE. corner of sec. 18, T. 9 S., R. 24 E.):

Ap—0 to 8 inches, dark reddish-brown (5YR 3/3) clay; moderate, medium, subangular blocky structure; firm; common fine roots; few worm casts; moderately alkaline; abrupt, smooth boundary.

B—8 to 42 inches, reddish-brown (5YR 4/4) clay; strong, fine, blocky structure; firm; sticky; common, shiny ped faces; few worm casts; calcareous; moderately alkaline; clear, wavy boundary.

C—42 to 72 inches, yellowish-red (5YR 5/6) clay loam; structureless; firm; stratified with lenses of friable silt loam; calcareous; moderately alkaline.

The A1 or Ap horizon is dusky red, weak red, dark reddish brown, dark reddish gray, or reddish brown. This horizon is mildly alkaline or moderately alkaline and is calcareous in some areas. The B horizon is dark reddish-brown, reddish-brown, dark-red, red, or yellowish-red silty clay or clay. It is calcareous below a depth of 10 inches. The color of the C horizon is similar to that of the B horizon. This horizon is clay loam stratified with silt loam, loam, and clay.

Redlake soils are associated with Coushatta, Idabel, Pledger, Roebuck, and Severn soils. Redlake soils have lighter colors in the upper part of the solum than Pledger soils, and their solum is thicker than that of the similar Latanier soils. Redlake soils are more clayey than Coushatta, Idabel, and Severn soils, and they lack the gray mottles that are present in the lower horizons of Roebuck soils.

Redlake clay (Rd).—This is the only Redlake soil mapped in the county. It is a nearly level soil on the flood plains of the Red River.

Included with this soil in mapping, and making up 10 percent of the mapped areas, are areas of soils that have a dark surface layer more than 10 inches thick and minor areas of Coushatta silty clay loam, Pledger clay, Roebuck clay, and Latanier clay.

Redlake clay is used mainly for crops. It is highly suited to tame pasture and trees and to the common crops in the county, such as alfalfa, soybeans, cotton, corn, grain sorghum, and small grains (fig. 10). Small grains can be used for grazing or can be harvested. They should be followed in the cropping system by a late-season crop, such as soybeans.

Management practices are needed that help to control surface wetness, increase water intake, and maintain soil structure. Flooding occurs for short periods in low areas once in 1 to 5 years late in winter. This soil is difficult to till because of the clayey material. Tillage needs to be timely and kept to a minimum. Soil fertility and structure can be maintained by seeding legumes and fescue, adding fertilizer according to soil tests, and effectively using crop residue. Land smoothing and a surface drainage system with outlets are needed. Capability unit IIw–2; woodland suitability group 3w6; pasture and hayland suitability group 1A.

Rexor Series

The Rexor series consists of deep, nearly level, and very gently sloping, well-drained soils on flood plains other than those along the Red River. These soils formed in loamy sediment under a cover of pines and hardwoods and an understory of mid and tall grasses.

In a representative profile the surface layer is 10 inches of brown loam. The upper part of the subsoil, to a depth of 48 inches, is yellowish-brown and strong-brown clay loam. Mottles in shades of gray are between depths of 36 and 48 inches. The lower part of the subsoil extends to a depth of 70 inches and is brown silt loam with mottles in shades of gray.

Permeability is moderate in Rexor soils, and available water capacity is high. Rexor soils are subject to flooding.

Representative profile of Rexor loam (150 feet north and 50 feet west of the SE. corner of sec. 23, T. 6 S., R. 22 E.):

A1—0 to 10 inches, brown (10YR 4/3) loam; weak, fine, granular structure; friable; many fine roots; medium acid; gradual, smooth boundary.

B21t—10 to 36 inches, yellowish-brown (10YR 5/4) clay loam; moderate, fine and medium, subangular blocky structure; friable; patchy thin clay films on faces of peds; dark-brown (7.5YR 4/4) coatings on faces of peds; strongly acid; gradual, smooth boundary.

B22t—36 to 48 inches, strong-brown (7.5YR 5/6) clay loam; common, fine and medium, distinct, light brownish-gray (10YR 6/2) mottles; weak, medium and fine, subangular blocky structure; friable; thin patchy clay films on faces of peds; strongly acid; gradual, smooth boundary.

B3—48 to 70 inches, brown (7.5YR 5/4) silt loam; many, fine to coarse, distinct, light brownish-gray (10YR 6/2) mottles; weak, coarse and medium, subangular blocky structure; thin patchy clay films on surface of peds; friable; strongly acid.

Figure 10.—Small grains on Redlake clay.

The A1 or Ap horizon is brown, very dark grayish brown, dark grayish brown, or dark brown. It is medium acid or strongly acid.

The B2t horizon is dark-brown, brown, strong-brown, yellowish-brown, or dark yellowish-brown loam, silt loam, clay loam, or silty clay loam. In places a few mottles in shades of brown are in the upper part of this horizon. The lower part has few through many, fine or medium, and distinct mottles in shades of gray or brown. The B2t horizon is medium acid through very strongly acid. The B3 horizon is brown, strong-brown, yellowish-brown, or pale-brown loam or silt loam. Mottles are in the same range as those of the lower B2t horizon.

Rexor soils are associated with areas of Ceda, Frizzell, Guyton, and Ochlockonee soils. They are redder and better drained than Guyton or Frizzell soils and are higher in base saturation than similar Cahaba soils. Rexor soils are more clayey than Ochlockonee soils, and they have fewer coarse fragments than Ceda soils.

Rexor loam (Re).—This is a nearly level soil on flood plains other than those along the Red River. It has the profile described as representative of the Rexor series.

Included with this soil in mapping, and making up 5 percent of the mapped areas, are soils that have a very dark grayish-brown surface layer more than 7 inches thick and spots of Frizzell loam, Sallisaw loam, and Ochlockonee fine sandy loam.

Rexor loam is used mainly for tame pasture. It is well suited to the common crops in the county, such as corn, grain sorghum, soybeans, cotton, and small grains. It is also well suited to tame pasture and trees.

Management practices are needed that help to maintain or improve soil fertility and structure. Most of the

crops generally grown produce large amounts of residue. Such crops can be grown continuously if the residue is returned to the soil along with fertilizer applied according to soil tests. Occasional damage by overflow of streams is a management concern, and this loam is subject to damaging floods that occur once in 5 to 10 years for short periods. Terraces for diverting water that runs off adjacent uplands are needed. Capability unit IIw–3; woodland suitability group 2o7; pasture and hayland suitability group 2A.

Rexor-Guyton complex, 0 to 3 percent slopes (RgB).—In this mapping unit are nearly level and very gently sloping soils on flood plains other than those along the Red River. About 58 percent of this unit is Rexor loam, 35 percent is Guyton silt loam, and 7 percent is small areas of Ochlockonee fine sandy loam, Frizzell loam, and marsh areas more than 2 acres in size.

This complex consists of undulating areas of Rexor and Guyton soils. Rexor soils are on the low ridges, and Guyton soils are in the swales between the low ridges. These soils are used mainly for tame pasture or trees. They are not suited to cultivation because of frequent damaging floods.

The quality of the tame pasture can be maintained or improved by controlling brush, applying fertilizer according to soil tests, and using suitable grazing practices. Wooded areas can be maintained or improved by protecting them from fire, removing or controlling inferior species, planting suitable species, and selectively harvesting trees on a planned schedule. Capability unit Vw–1; woodland suitability group 2o7; Rexor soil in pasture and hayland suitability group 2A; Guyton soil in pasture and hayland suitability group 2B.

Rock Outcrop

Rock outcrop is mapped in this county only as a part of Hector-Rock outcrop complex, 35 to 60 percent slopes. This land type consists of exposures of sandstone bedrock. Hector gravelly fine sandy loam and Rock outcrop occur in such an intricate pattern that it is impractical to map them separately.

Roebuck Series

The Roebuck series consists of deep, nearly level, somewhat poorly to poorly drained soils on the flood plains of the Red River. These soils formed in clayey alkaline sediment under a cover of hardwoods and an understory of mid and tall grasses.

In a representative profile the surface layer is 12 inches of dark-brown clay, and the subsoil is 54 inches or more of reddish-brown clay with mottles in shades of gray.

Permeability is very slow in Roebuck soils, and available water capacity is high. These soils crack when dry. The seasonal water table is at a depth of 2 to 3 feet.

Representative profile of Roebuck clay in an area of Pledger-Roebuck complex (1,250 feet west and 450 feet south of the NE. corner of sec. 14, T. 9 S., R. 24 E.):

Ap—0 to 12 inches, dark-brown (7.5YR 3/2) clay; moderate, fine, blocky structure; firm; common roots; neutral; abrupt, wavy boundary.

B21—12 to 32 inches, reddish-brown (5YR 4/3) clay; few, fine, faint, gray mottles; strong, fine, blocky structure; firm; few peds have shiny pressure faces; mildly alkaline; gradual, wavy boundary.

B22—32 to 66 inches, reddish-brown (5YR 4/3) clay; some peds in upper part coated dark reddish brown (5YR 3/3); few, fine, distinct, dark-gray mottles; strong, fine, blocky structure; firm; few roots; many peds have shiny pressure faces; few distinct slickensides below 40 inches; moderately alkaline; common hard and soft calcium carbonate concretions.

The A1 or Ap horizon is dark reddish brown or dark brown. It is neutral through moderately alkaline. The B horizon is reddish brown, dark reddish brown, dark red, or red. Mottles are few to common, fine or medium, and faint or distinct. They are in shades of gray and brown. The C horizon, where present, is reddish-brown or red clay or silty clay loam. This horizon is moderately alkaline and calcareous.

These soils are outside the defined range for the Roebuck series in being calcareous throughout the solum. They are enough like the Roebuck series in morphology, composition, and behavior so that a new series is not warranted.

Roebuck soils are associated with Kaufman, Pledger, Redlake, and Tuscumbia soils. They have gray mottles that are not present in Redlake and Pledger soils, and they are less gray in the lower part of the solum than Kaufman soils. Roebuck soils are less acid in the upper horizons than Tuscumbia soils and have a thicker solum than the similar Latanier soils.

Roebuck clay, ponded (Rk).—This is the only Roebuck soil mapped in the county. It is a nearly level soil on the flood plains of the Red River. This soil is calcareous throughout the surface layer and subsoil. It is in concave drainageways and is wet more than 6 months of the year. It has ponded water over at least one-half of the acreage during wet seasons. Included in mapping are small areas of a dark-gray soil and spots of Redlake clay.

Use of this soil has been limited to trees and tame pasture because of the ponded surface. It is well suited to wetland wildlife.

Wooded areas can be maintained or improved by removing or controlling inferior species, planting suitable species, and selectively harvesting trees on a planned schedule.

The quality of the tame pasture can be improved by reseeding grasses tolerant to wetness and by using suitable grazing practices. Capability unit Vw–2; woodland suitability group 3w6; pasture and hayland suitability group 1A.

Rubble Land

Rubble land is mapped in this county only as part of Ceda-Rubble land complex. This land type is nearly level and very gently sloping. It consists of boulders, cobblestones and other stones, and gravel of the mountain flood plains. A few thin interstices of loamy soil material make up less than 10 percent, by volume, of this land type. The Rubble land and Ceda gravelly loam are in such an intricate pattern that it is impractical to map them separately. Rubble land is more gravelly than the associated Ceda soil.

Ruston Series

The Ruston series consists of deep, gently sloping through moderately steep, well-drained soils on uplands. These soils formed in loamy sediment under a cover of pines and hardwoods and an understory of mid and tall grasses.

In a representative profile the surface layer is 4 inches of dark grayish-brown fine sandy loam. The subsurface layer, to a depth of 9 inches, is light yellowish-brown fine sandy loam. The upper part of the subsoil, to a depth of 52 inches, is yellowish-red sandy loam and has mottles in shades of red, brown, and gray in the lower part. The lower part of the subsoil, which extends to a depth of 72 inches or more, is mottled, yellowish-red, yellowish-brown, red, and light-gray sandy clay loam.

Permeability is moderate in Ruston soils, and available water capacity is high.

Representative profile of Ruston fine sandy loam, 3 to 8 percent slopes (1,700 feet east and 1,100 feet south of the NW. corner of sec. 20, T. 6 S., R. 27 E.):

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

A2—4 to 9 inches, light yellowish-brown (10YR 6/4) fine sandy loam; weak, fine, granular structure; very friable; few medium roots, a few fine pebbles; medium acid; clear, smooth boundary.

B21t—9 to 35 inches, yellowish-red (5YR 4/8) sandy clay loam; moderate, medium, subangular blocky structure; firm; few fine pores; thick, continuous clay films; few, fine, iron-manganese concretions and a few fine pebbles; strongly acid; gradual, smooth boundary.

B22t—35 to 52 inches, yellowish-red (5YR 5/6) sandy clay loam; many, fine and medium, faint, yellowish-red and distinct strong-brown (10YR 6/1) mottles; coarse, fine and medium, subangular blocky structure; friable to firm; thick, continuous clay films on ped faces; very strongly acid; gradual, smooth boundary.

B23t—52 to 72 inches, coarse, reticulate, mottled, yellowish-red (5YR 5/6), yellowish-brown (10YR 5/6), and red (2.5YR 5/6) sandy clay loam with pockets of light-gray (10YR 7/1) clay loam; weak, medium, subangular blocky structure; firm; thick, continuous clay films; very strongly acid.

The A1 or Ap horizon is dark grayish brown, brown, or grayish brown. The A2 horizon is light yellowish brown, yellowish brown, or pale brown. The A horizon is fine sandy loam, gravelly sandy loam, and gravelly loam. It is medium acid or strongly acid.

The upper part of the B2t horizon is yellowish red, red, or reddish yellow. The lower part of the B2t horizon has these colors and in places has a mottled matrix with few through many, fine through coarse, distinct mottles of red, brown, gray, and yellow. The B2t horizon is loam, sandy clay loam, and clay loam and strongly acid or very strongly acid.

Ruston soils are associated with Blevins, Cahaba, Kullit, Ruston, Sacul, Saffell, and Tiak soils. Ruston soils are less clayey than Tiak and Sacul soils, and their B horizon is redder than that in Blevins soils. Ruston soils have a thicker solum than Cahaba soils and fewer coarse fragments than Saffell soils. They lack gray mottles at depths of less than 30 inches that are present in Kullit soils, and they lack the gravelly substratum of similar Sallisaw soils.

Ruston fine sandy loam, 3 to 8 percent slopes (RuD).—This soil is on uplands. It has the profile described as representative of the Ruston series.

Included with this soil in mapping, and making up 15 percent of the mapped areas, are areas of Blevins fine trees. It is well suited to the common crops in the county, loamy fine sand, and Tiak fine sandy loam.

This Ruston soil is used for tame pasture, crops, and trees. It is well suited to the common crops in the county, such as corn, grain sorghum, soybeans, cotton, peanuts, and wheat. It is also well suited to tame pasture and trees.

Management practices are needed that help to maintain or improve soil fertility and structure and that control erosion. The erosion hazard can be reduced by terraces, contour tillage, and use of crop residue. Crops are needed that produce large amounts of residue. Plant cover is needed during winter and spring to protect the soil from water erosion. Crop residues should be returned to the soil and excessive tillage avoided. Capability unit IVe–4; woodland suitability group 3o1; pasture and hayland suitability group 8B.

Ruston fine sandy loam, 3 to 8 percent slopes, eroded (RuD2).—This soil is on uplands. It is similar to that described as representative of the series, except that the combined thickness of the surface and subsurface layers is about 4 to 8 inches less. The present surface layer, as a result of tillage, is a mixture of material from the subsurface layer and subsoil. The subsoil is exposed in about 15 to 20 percent of the mapped areas. In about 25 percent of the areas are shallow rills and gullies 6 to 20 inches deep and 75 to 300 feet apart.

Included with this soil in mapping are small areas of Blevins fine sandy loam, an occasional uncrossable gully, and spots of Tiak fine sandy loam.

This Ruston soil is best suited to and used mainly for tame pasture or for growing trees. It is suited to common crops in the county, such as corn, cotton, grain sorghum, soybeans, small grains, and peanuts.

Management practices are needed that help to protect cultivated areas from severe rill and gully erosion. The use of terraces, contour farming, and crop residue, and the use of fertilizer according to soil tests helps to improve the suitability of this soil for cultivation and to increase the production of crops. Capability unit IVe–4; woodland suitability group 3o1; pasture and hayland suitability group 8B.

Sacul Series

The Sacul series consists of deep, sloping through steep, moderately well drained soils on uplands. These soils formed under a cover of pines and hardwoods and an understory of mid and tall grasses in material weathered from clays and tilted shale and sandstone.

In a representative profile the surface and subsurface layers are 5 inches of dark grayish-brown and brown loam. The upper part of the subsoil, to a depth of 36 inches, is yellowish-red and red clay with mottles in shades of yellow, red, brown, and gray. The lower part of the subsoil, to a depth of 65 inches or more, is mottled, red, gray, strong-brown, yellowish-red, and brown clay and silty clay loam. Soft, weathered interlaminated shale and sandstone increase in amount with depth.

Permeability is slow in Sacul soils, and available water capacity is high. The seasonal perched water table is at a depth of 2 to 3 feet.

Representative profile of Sacul loam in an area of Goldston-Carnasaw-Sacul association, moderately steep (800 feet east and 2,000 feet south of the NW. corner of sec. 34, T. 2 S., R. 22 E.):

A1—0 to 2 inches, dark grayish-brown (10YR 4/2) loam; weak, fine, granular structure; very friable; few, coarse to medium, angular sandstone and shale fragments on surface and in horizon; medium acid; clear, smooth boundary.

A2—2 to 5 inches, brown (10YR 5/3) loam; weak, fine, granular structure; friable; few, medium and fine, angular sandstone and shale fragments; strongly acid; clear, wavy boundary.

B21t—5 to 12 inches, yellowish-red (5YR 4/8) clay; few, fine, faint, reddish-yellow mottles; moderate, medium and fine, subangular blocky structure; friable; few, fine, soft shale fragments; thick, continuous clay films; strongly acid; gradual, wavy boundary.

B22t—12 to 36 inches, red (2.5YR 4/8) clay; many, coarse, distinct, yellowish-red (5YR 5/6) and common, fine, distinct, pale-brown and gray mottles; strong, medium to coarse, blocky structure (parts easily to fine blocks); firm; few shiny ped faces; continuous clay films; few, fine, soft and hard shale fragments; strongly acid; clear, irregular boundary.

B23t—36 to 44 inches, mottled-red (2.5YR 4/8), gray (10YR 6/1), and strong-brown (7.5YR 5/6) clay; moderate, medium, blocky and medium, fine, subangular blocky structure; firm; many shiny ped faces; thick, continuous clay films; soft pieces of shale crush easily to clay; few, fine, hard pieces of shale; very strongly acid; gradual, irregular boundary.

B3—44 to 65 inches, mottled-gray (10YR 6/1), yellowish-red (5YR 5/6), brown (7.5YR 4/4), and strong-brown (7.5YR 5/6) silty clay loam with interlaminated shale that crushes easily; few stringers of fine-grained hard sandstone; very strongly acid.

The A1 or Ap horizon is dark grayish brown or brown. The A horizon is loam or fine sandy loam and is medium acid or strongly acid.

The B21t and B22t horizons are yellowish-red or red clay or silty clay. They are strongly acid or very strongly acid. The B22t horizon has common, fine through coarse, distinct mottles in shades of red, gray, and brown. The B23t horizon is yellowish red or red, or is mottled in shades of reddish brown and gray. It is clay or silty clay and is strongly acid or very strongly acid. The B3 horizon is mottled and streaked in shades of gray, brown, red, and yellow. It has silty clay loam in interstices between tilted, interlaminated shale and stringers of sandstone.

Sacul soils are associated with Cahaba, Carnasaw, Goldston, Ruston, Sherwood, Tiak, and Zafra soils. These soils have continuous Bt horizons that are not present in Goldston soils and gray mottles in the upper Bt horizons that are lacking in Carnasaw soils. Sacul soils are more clayey than Sherwood, Zafra, Ruston, and Cahaba soils. Unlike Tiak soils, Sacul soils decrease in clay content above a depth of 60 inches.

Sacul fine sandy loam, 5 to 15 percent slopes (SaE).—This is the only Sacul soil mapped in the county. It is on uplands.

Included with this soil in mapping are a few small areas of Tiak fine sandy loam and Cahaba loamy fine sand.

Sacul soil is mainly wooded except for a large acreage that has been cleared for tame pasture and is not suited to cultivation.

The quality of the tame pasture can be maintained or improved by controlling brush, applying fertilizer according to soil tests, and using suitable grazing practices. Wooded areas can be maintained or improved by protecting them from fire, removing or controlling inferior species, planting suitable species, and selectively harvesting trees on a planned schedule. Capability unit VIe–2; woodland suitability group 3c2; pasture and hayland suitability group 8B.

Saffell Series

The Saffell series consists of deep, very gently sloping to strongly sloping, well-drained soils on uplands. These soils formed in loamy and gravelly sediment under a cover of pines and hardwoods and an understory of mid and tall grasses.

In a representative profile the surface layer is 4 inches of dark grayish-brown gravelly fine sandy loam. The subsurface layer, to a depth of 8 inches, is light yellowish-brown gravelly fine sandy loam. The upper part of the subsoil, to a depth of 32 inches, is yellowish-red very gravelly sandy clay loam that is about 50 percent gravel. The lower part of the subsoil, to a depth of 56 inches, is reddish-yellow very gravelly fine sandy loam that is about 65 percent gravel. The underlying material is gravelly sandy loam and gravel.

Permeability is moderate in Saffell soils, and available water capacity is moderate to low.

Representative profile of Saffell gravelly fine sandy loam, 5 to 12 percent slopes (2,640 feet west and 1,320 feet south of the NE. corner of sec. 5, T. 6 S., R. 24 E.):

A1—0 to 4 inches, dark grayish-brown (10YR 4/2) gravelly fine sandy loam; weak, fine granular structure; very friable; 25 percent pebbles up to one inch in diameter; medium acid; clear, wavy boundary.

A2—4 to 8 inches, light yellowish-brown (10YR 6/4) gravelly fine sandy loam; few, fine, faint streaks of dark yellowish brown; weak, fine, granular structure; very friable; 36 percent pebbles up to one inch in diameter; medium acid; clear, smooth boundary.

B2t—8 to 32 inches, yellowish-red (5YR 5/8) very gravelly sandy clay loam; moderate, fine, subangular blocky structure; friable; thin patchy clay films on ped faces; sand grains coated; pebbles up to 2 inches in diameter make up 50 percent of horizon; very strongly acid; gradual, smooth boundary.

B3—32 to 56 inches, reddish-yellow (7.5YR 6/8) very gravelly fine sandy loam; weak, fine, subangular blocky structure; friable; pebbles up to 2 inches in diameter make up 65 percent; sand grains are coated with thin clay films; occasional thin horizontal streaks of yellowish-brown (10YR 5/6) sandy clay loam; very strongly acid; gradual, wavy boundary.

C—56 to 60 inches, very pale brown (10YR 8/3), brownish-yellow (10YR 6/8), and yellowish-red (5YR 5/8) very gravelly sandy loam; 80 percent gravel.

The A1 or Ap horizon is brown or dark grayish brown. The A2 horizon is light yellowish brown, yellowish brown, brown, or pale brown. The A horizon is medium acid or strongly acid.

The B2t and B3 horizons are strong-brown, yellowish-red, reddish-yellow gravelly and very gravelly sandy clay loam and gravelly and very gravelly loam. The B3 horizon is gravelly and very gravelly fine sandy loam. The content of gravel ranges from 36 to 80 percent by volume. The B horizons are strongly acid and very strongly acid.

The C horizon is very pale brown, yellowish-brown, strong-brown, yellowish-red, or red gravelly and very gravelly sandy loam and gravelly and very gravelly loam. It is 20 to 90 percent gravel.

Saffell soils are associated with Ruston and Tiak soils. They contain more coarse fragments than these soils. Saffell soils contain hard gravel, but the similar Zafra soils contain mostly soft sandstone.

Saffell gravelly fine sandy loam, 1 to 5 percent slopes (SeC).—This soil is on uplands. Included in mapping are a few small areas of a soil similar to this Saffell soil except that less than 35 percent of the upper part of the subsoil is gravel. Also included are spots of Ruston fine sandy loam.

Saffell soil is best suited to and is used mainly for tame pasture or growing trees. It is suited to common crops in the county, such as corn, grain sorghum, soybeans, and cotton. Saffell soil has a moderate to low available water

capacity, and; even during periods of normal rainfall, plants are not very productive. This soil is a source of gravel.

Management practices are needed that help to maintain or to improve soil fertility and structure, and that prevent excessive erosion and improve water-holding capacity. Terraces and contour tillage are necessary for the efficient control of erosion. Crops that produce large amounts of residue that can be returned to the soil help to maintain fertility and improve soil structure and water-holding capacity. Capability unit IVe–1; woodland suitability group 4f2; pasture and hayland suitability group 9B.

Saffell gravelly fine sandy loam, 5 to 12 percent slopes (SeE).—This soil is on uplands. It has the profile described as representative of the Saffell series.

Included with this soil in mapping are a few small areas of a soil similar to this soil except the upper part of the subsoil is less than 35 percent gravel. Also included are spots of Tiak gravelly fine sandy loam and Ruston fine sandy loam.

This Saffell soil is mainly wooded, except for a large acreage that has been cleared. The cleared area is not suited to cultivation and is used for tame pasture. This soil is a source of gravel.

The quality of the tame pasture can be maintained or improved by controlling brush, applying fertilizer according to soil tests, and using suitable grazing practices. Wooded areas can be maintained or improved by protecting them from fire, removing or controlling inferior species, planting suitable species, and selectively harvesting trees on a planned schedule. Capability unit VIe–4; woodland suitability group 4f2; pasture and hayland suitability group 9B.

Sallisaw Series

The Sallisaw series consists of deep, nearly level, well-drained soils on terraces other than those along the Red River. These soils formed in loamy sediment under a cover of pines and hardwoods and an understory of mid and tall grasses.

In a representative profile the surface layer is 12 inches of dark-brown loam. The upper part of the subsoil, to a depth of 38 inches, is yellowish-red loam. The middle part of the subsoil, to a depth of 50 inches, is strong-brown sandy clay loam. The lower part of the subsoil, to a depth of 70 inches or more, is yellowish-brown, very gravelly sandy clay loam that is about 72 percent gravel.

Permeability is moderate in Sallisaw soils, and available water capacity is high.

Representative profile of Sallisaw loam (1,600 feet east and 100 feet south of the NW. corner of sec. 25, T. 6 S., R. 24 E.):

A1—0 to 12 inches, dark-brown (10YR 4/3) loam; moderate, fine, granular structure; very friable; occasional very fine gravel; medium acid; gradual, smooth boundary.

B21t—12 to 19 inches, yellowish-red (5YR 5/8) loam; strong, medium, granular structure; friable; thin, discontinuous clay films on ped faces; occasional very fine gravel; medium acid; gradual, smooth boundary.

B22t—19 to 38 inches, yellowish-red (5YR 5/6) loam; weak, medium and fine, subangular blocky structure; friable; thin, continuous clay films on ped faces; strongly acid; gradual, smooth boundary.

B23t—38 to 50 inches, strong-brown (7.5YR 5/6) sandy clay loam; strong, medium and fine, subangular blocky structure; friable; thin patchy clay films on ped faces; strongly acid; clear, wavy boundary.

IIB3—50 to 70 inches, yellowish-brown (19YR 5/4) very gravelly sandy clay loam that is about 72 percent gravel by volume; medium acid.

The A1 or Ap horizon is brown, dark brown, dark grayish brown, or grayish brown. The A horizon is slightly acid to strongly acid.

The B2t horizon is strong brown, yellowish red, or reddish yellow. Texture is loam or clay loam in the B21t and B22t horizons and ranges to sandy clay loam in the B23t horizon. The B2t horizon is medium acid or strongly acid. The IIB3 horizon is yellowish brown through yellowish red. This horizon is gravelly and very gravelly loam, clay loam, or sandy clay loam. Gravel content ranges from 20 to 80 percent. Depth to the gravelly substratum ranges from 30 to 60 inches.

Sallisaw soil has a gravelly substratum that differs from the associated Cahaba and similar Ruston soils.

Sallisaw loam (Sf).—This is the only Sallisaw soil mapped in the county. This is a nearly level soil on terraces other than those along the Red River.

Included with this soil in mapping are a few small areas of Rexor loam and Frizzell loam.

Sallisaw loam is used mainly for tame pasture or for growing trees. This soil is well suited to the common crops in the county, such as corn, grain sorghum, soybeans, cotton, small grains, and peanuts.

Management practices are needed that help to maintain or improve soil fertility and structure. This can be accomplished by seeding legumes, adding fertilizer according to soil tests, effectively using crop residue, and avoiding excessive tillage. Sown crops can be grown continuously if fertilizer is added and adequate crop residues are returned to the soil. Capability unit I–2; woodland suitability group 3o7; pasture and hayland suitability group 8A.

Severn Series

The Severn series consists of deep, nearly level, well-drained soils on the flood plains of the Red River. These soils formed in loamy alkaline sediment under a cover of hardwoods and an understory of mid and tall grasses.

In a representative profile the surface layer is 10 inches of reddish-brown very fine sandy loam. The underlying material is a reddish-brown very fine sandy loam with a few thin strata of loam and loamy fine sand.

Severn soils have moderately rapid permeability, and available water capacity is high.

Representative profile of Severn very fine sandy loam (500 feet east and 200 feet north of the SW. corner of sec. 34, T. 8 S., R. 23 E.):

Ap—0 to 10 inches, reddish-brown (5YR 4/3) very fine sandy loam; weak, medium and fine, granular structure; very friable; moderately alkaline and calcareous; gradual, smooth boundary.

C1—10 to 27 inches, reddish-brown (5YR 4/4) very fine sandy loam; structureless; common bedding planes; moderately alkaline and calcareous; clear, smooth boundary.

C2—27 to 40 inches, reddish-brown (5YR 5/4) very fine sandy loam; structureless; very friable; common bedding planes; moderately alkaline and calcareous; clear, smooth boundary.

C3—40 to 60 inches, reddish-brown (5YR 4/4) very fine sandy loam; structureless; very friable; few thin strata

of loam and loamy fine sand; moderately alkaline and calcareous.

The Ap or A1 horizon is dark brown, dark reddish brown, or reddish brown. It is mildly alkaline and moderately alkaline. The C horizon is strong brown, reddish brown, yellowish red, or reddish yellow. This horizon is mainly very fine sandy loam, very fine sand, and loamy very fine sand with thin strata of fine sandy loam, silt loam, and loam. Layers of silt loam and loam are less than 8 inches thick.

Severn soils are associated with Coushatta, Idabel, Oklared, Latanier, and Redlake soils. Severn soils are less clayey in the upper part than Latanier, Redlake, and Coushatta soils, and they are more silty than Idabel and Oklared soils.

Severn very fine sandy loam (Sg).—This is the only Severn soil mapped in the county. It is nearly level and is on the flood plains of the Red River.

Included with this soil in mapping, and making up 10 percent of the mapped areas, are soils that have a silt loam or loam surface layer, 10 percent areas of a similar soil that is slightly more clayey, and spots of Idabel silt loam and Oklared very sandy loam.

This soil is used mainly for crops. It is highly suited to tame pasture and trees and to the common crops in the county, such as alfalfa, soybeans, cotton, corn, grain sorghum, small grains, and peanuts.

Management practices are needed that help to maintain or improve soil fertility and structure. All crop residue should be returned to the soil and excessive tillage avoided. Land smoothing is needed in many areas to remove irregularities. Capability unit I–1; woodland suitability group 2o4; pasture and hayland suitability group 2A.

Sherwood Series

The Sherwood series consists of deep and moderately deep, very gently sloping through strongly sloping, well-drained soils on uplands. These soils formed in material weathered from tilted sandstone under a cover of pines and hardwoods and an understory of mid and tall grasses.

In a representative profile the surface layer is 5 inches of dark grayish-brown fine sandy loam. The subsurface layer, to a depth of 12 inches, is brown fine sandy loam. The upper part of the subsoil, to a depth of 30 inches, is yellowish-red clay loam. The lower part of the subsoil is yellowish-red gravelly clay loam and gravelly loam. Fractured acid sandstone and thin layers of shale are at a depth of about 50 inches.

Permeability is moderate in Sherwood soils, and available water capacity is high.

Representative profile of Sherwood fine sandy loam, 1 to 3 percent slopes (50 feet east and 100 feet south of the NW corner of sec. 3, T. 3 S., R. 24 E.):

Ap—0 to 5 inches, dark grayish-brown (10YR 4/2) fine sandy loam; weak, fine, granular structure; very friable; many fine and medium roots; strongly acid; clear, smooth boundary.

A2—5 to 12 inches, brown (10YR 5/3) fine sandy loam; weak, fine, granular structure; very friable; many fine and medium roots; strongly acid; clear, wavy boundary.

B21t—12 to 30 inches, yellowish-red (5YR 5/6) clay loam; moderate, medium, subangular blocky structure; friable; common fine and medium roots; common fine pores; nearly continuous red (2.5YR 5/6) clay films on ped faces; few, fine, soft sandstone fragments; strongly acid; gradual, wavy boundary.

B22t—30 to 38 inches, yellowish-red (5YR 5/8) gravelly clay loam; moderate, medium, subangular blocky structure; friable; few fine and medium roots; common fine pores; nearly continuous red (2.5YR 5/6) clay films on some ped faces; about 20 percent by volume ¼-inch to 3-inch diameter hard and soft sandstone fragments; many pieces crush to fine sandy loam; strongly acid; gradual, irregular boundary.

B3—38 to 50 inches, yellowish-red (5YR 5/8) gravelly loam; weak, medium, subangular blocky structure; friable; few fine and medium roots; about 20 percent by volume hard and soft sandstone fragments in shades of red and brown; few thin fragments of brown silty shale; strongly acid; abrupt, irregular boundary.

R—50 inches, fractured acid sandstone bedrock laminated with thin layers of shale tilted 30 degrees from horizontal; brown and reddish coatings along fractures and cleavage planes; occasional thin strata of reddish soft sandstone.

The A1 or Ap horizon is dark grayish brown, brown, or dark brown. The A2 horizon is brown, yellowish brown, pale brown, or light yellowish brown. The A horizon is fine sandy loam and loam.

The B1 horizon, when present, is brown, strong-brown, reddish-brown, or yellowish-red loam or clay loam. The B2t horizon is reddish brown, yellowish red, or red. The B3 horizon has these same colors, and 50 percent or more of it is soil material. The rest is fragments of sandstone and shale. The B horizon is loam, clay loam, sandy clay loam, and their gravelly analogs in the lower part. The B horizons are strongly acid or very strongly acid.

Depth to the R layer is 30 to 60 inches, and this is extremely variable within short distances because of the irregular boundary between the Bt horizon and the underlying bedrock.

Sherwood soils are associated with Alikchi, Carnasaw, Goldston, Sacul, Sherwood, and Zafra soils. Sherwood soils are less clayey than Carnasaw and Sacul soils, and they have profiles similar to Zafra soils but have fewer coarse fragments. Sherwood soils are redder than Alikchi soils. They differ from Goldston soils by having continuous Bt horizons.

Sherwood fine sandy loam, 1 to 3 percent slopes (ShB).—This soil is on uplands. It has the profile described as representative of the Sherwood series.

Included with this soil in mapping, and making up 10 percent of the mapped areas, are soils having yellower colors than typical of the series. Also included, and making up 5 percent of the mapped areas, are areas of Zafra loam and minor areas of Alikchi loam.

Sherwood loam is used mainly for tame pasture and growing trees. This soil is well suited to these uses, and it is well suited to the common crops in the county, such as corn, grain sorghum, soybeans, cotton, small grains, and peanuts.

Management practices are needed that help to maintain or improve soil fertility and structure and control erosion. Terraces and contour tillage are needed unless minimum tillage and large amounts of crop residue and fertilizer are part of management. Crops that produce large amounts of residue are needed, as is plant cover during winter and spring, to protect the soil from water erosion. Sown crops can be grown continuously if fertilizer is added according to soil tests and adequate crop residues are used. Such residues should be returned to the soil and excessive tillage avoided. Capability unit IIe–1; woodland suitability group 3o1; pasture and hayland suitability group 8B.

Sherwood fine sandy loam, 3 to 5 percent slopes (ShC).—This soil is on uplands. Included in mapping, and making up 5 percent of the mapped areas, are Zafra loam, Goldston gravelly loam, and minor areas of a simi-

lar soil that is yellower in the subsoil and has a loam surface layer.

This Sherwood soil is used mainly for tame pasture or trees and is well suited to these uses. It is well suited to the common crops in the county, such as corn, grain sorghum, soybeans, cotton, and small grains.

Management practices are needed that help to maintain or improve soil fertility and structure and control erosion. The hazard of erosion can be reduced by using terraces, contour farming, and crop residue. Plant cover during winter and spring is necessary to protect the soil from water erosion. Crops that produce large amounts of residue are also necessary. Terracing and contour tillage, along with the use of crop residue and fertilizers, also help to control erosion and to maintain or improve soil fertility and structure. Capability unit IIIe–1; woodland suitability group 3o1; pasture and hayland suitability group 8B.

Sherwood soils, 2 to 5 percent slopes, eroded (SlC2).—This moderately eroded soil is on uplands. It has a profile similar to that described as representative of the Sherwood series, except that part of the original surface layer has been removed by erosion in about 40 percent of the areas. In the eroded areas the surface layer and subsoil are mixed. The surface layer is fine sandy loam and loam. About 25 percent of the area is affected by shallow rills and gullies 6 to 20 inches deep and 75 to 300 feet apart.

Included with this soil in mapping are a few small areas of Zafra loam, an occasional uncrossable gully, and minor eroded areas of Carnasaw loam.

This Sherwood soil is used mainly for tame pasture and trees. It is suited to such common crops of the county as corn, cotton, grain sorghum, and soybeans.

Intensive management practices are needed to protect the cultivated areas from severe rill and gully erosion. The use of terraces, contour farming, and the application of crop residue and of fertilizer according to soil tests help to improve the suitability of this soil for cultivation and for an increased growth of crops. Capability unit IIIe–1; woodland suitability group 3o1; pasture and hayland suitability group 8B.

Sherwood-Zafra complex, 1 to 5 percent slopes (SmC).—These soils are on uplands. About 77 percent of this unit is Sherwood fine sandy loam, 20 percent is Zafra loam and fine sandy loam, and 3 percent is minor areas of Carnasaw loam and Goldston gravelly loam.

The Sherwood and Zafra soils are in an intricate pattern. Zafra soils are on the crests and microcrests of the side slopes between areas of Sherwood soils. The soils in this complex are similar to those described as representative of the Sherwood and Zafra series.

These soils are best suited and used mainly for tame pasture and trees. A large acreage has been cultivated and is now in tame pasture or has been planted to trees. These soils are suited to such common crops in the county as corn, grain sorghum, soybeans, and cotton.

Management practices for crops are needed to help to maintain or improve soil fertility and structure and to control erosion. The use of terraces, contour tillage, and crop residue and the application of fertilizer according to soil tests are essential for row crops. Crops that produce a large amount of residue are needed. Such residue should be returned to the soil and excessive tillage avoided. Plant cover during winter and spring to protect the soil from water erosion is also necessary. The quality of the tame pasture can be maintained or improved by controlling brush and by using lime, fertilizer, and suitable grazing practices.

Wooded areas can be maintained or improved by protecting them from fire, removing or controlling inferior species, planting suitable species, and selectively harvesting trees on a planned schedule. Capability unit IVe–2; woodland suitability group 3o1; pasture and hayland suitability group 8B.

Sherwood-Zafra complex, 5 to 12 percent slopes (SmE).—These soils are on uplands. About 65 percent of this unit is Sherwood fine sandy loam and loam, and 25 percent is Zafra loam and fine sandy loam. The remaining 10 percent is small areas of a soil similar to Sherwood fine sandy loam, except that it has sandstone between depths of 20 and 30 inches and areas of Carnasaw loam and Goldston gravelly loam.

The Sherwood and Zafra soils are in an intricate pattern. Zafra soils are on the crests and microcrests of the side slopes and are surrounded by areas of Sherwood soils. Zafra soil is the soil described as representative of the series.

The soils are best suited to tame pasture (fig. 11) and trees.

The quality of the tame pasture can be maintained or improved by controlling brush, applying fertilizer according to soil tests, and using suitable grazing practices. Wooded areas can be maintained or improved by protecting them from fire, removing or controlling inferior species, planting suitable species, and selectively harvesting trees on a planned schedule. Capability unit VIe–2; woodland suitability group 3o1; pasture and hayland suitability group 8B.

Sumter Series

The Sumter series consists of moderately deep and deep, gently sloping through strongly sloping, well-drained soils on uplands. These soils formed under a cover of mid and tall grasses in marly clay or chalk.

In a representative profile the surface layer is 7 inches of dark-gray silty clay loam. The upper part of the subsoil, to a depth of 24 inches, is pale-olive silty clay loam. The lower part of the subsoil, which extends to a depth of 29 inches, is pale-olive silty clay loam with few streaks of yellowish brown. The underlying material is pale-olive and light yellowish-brown chalk and marly silty clay loam.

Permeability is slow in Sumter soils, and available water capacity is high.

Representative profile of Sumter silty clay loam, 3 to 12 percent slopes (600 feet east and 150 feet north of the SW. corner of sec. 28, T. 9 S., R. 27 E.):

A1—0 to 7 inches, dark-gray (10YR 4/1) silty clay loam; moderate, medium and fine, subangular blocky and granular structure; friable; many roots; moderately alkaline; calcareous; clear, wavy boundary.

B2—7 to 24 inches, pale-olive (5Y 6/3) silty clay loam; moderate, very fine, subangular blocky structure; friable; few worm casts; few, fine, soft-white limey spots and hardened lime nodules; moderately alkaline; calcareous; gradual, smooth boundary.

Figure 11.—**Landscape of Sherwood-Zafra complex, 5 to 12 percent slopes. The tame pasture is bahiagrass and legumes.**

B3—24 to 29 inches, pale-olive (5Y 6/4) silty clay loam; a few faint streaks of yellowish brown and light gray; weak, very fine, subangular blocky and common, platy, rock structure; firm; common white calcium carbonate spots; moderately alkaline; calcareous; gradual, irregular boundary.

C—29 to 50 inches, pale-olive (5Y 6/3) streaked and splotched with light yellowish-brown (2.5Y 6/4) chalk and interbedded marly silty clay loam; moderate, medium, blocky to platy, rock structure; calcareous; moderately alkaline.

The A1 horizon is dark gray, gray, very dark grayish brown, or dark brown. The B2 horizon is pale olive, light olive brown, or dark yellowish brown. The B3 horizon has the same color range as the B2 horizon, and it has few to common medium and distinct mottles in shades of gray or brown. Depth to the C horizon ranges from 20 to 50 inches.

Sumter soils contain more calcium carbonate equivalent than associated Hollywood and Cadeville soils.

Sumter silty clay loam, 3 to 12 percent slopes (SuE).—This is the only Sumter soil mapped in the county. It is on uplands.

Included with this soil in mapping are a few small areas of soils that have a silty clay surface layer.

This Sumter soil is best suited to native range or tame pasture. The quality of the native grasses can be maintained or improved by controlling brush, using suitable grazing practices, and protecting them from fire. Capability unit VIe–5; Loamy Prairie range site; woodland suitability group 5o0; pasture and hayland suitability group 7A.

Swink Series

The Swink series consists of shallow and very shallow, sloping through moderately steep, well-drained soils on uplands. These soils formed under a cover of short and mid grasses in material weathered from limestone.

In a representative profile 60 percent of the upper 7 inches of the surface layer is black clay, and 40 percent is limestone fragments. The lower part of the surface layer is 40 percent very dark grayish-brown clay and 60 percent limestone fragments. Fractured limestone is at a depth of about 16 inches.

Permeability is slow in Swink soils, and available water capacity is moderate to low.

Representative profile of Swink clay in an area of Swink-Hollywood complex, 5 to 20 percent slopes (600 feet south of the NW. corner of sec. 22, T. 7 S., R. 23 E.):

A11—0 to 7 inches, black (10YR 2/1) clay; moderate, fine, subangular blocky structure parting to moderate, fine, granular; firm; many roots; about 25 percent by volume limestone fragments more than 10 inches in diameter and 15 percent limestone fragments 3 to 10 inches in diameter; moderately alkaline; calcareous in spots; clear, irregular boundary.

A12—7 to 16 inches, very dark grayish-brown (2.5YR 3/2) clay; moderate, fine, subangular blocky structure parting to moderate, fine, granular; firm; many roots; few noninteresting slickensides; about 35 percent by volume limestone fragments more than 10 inches in diameter and 25 percent fragments 3 to

10 inches in diameter; moderately alkaline; fragments and soil mass are calcareous; abrupt, wavy boundary.

R—16 to 30 inches, fractured limestone bedrock and thin strata of calcareous shale. Tree roots extend between the fractures in the rock to depths of 1 to 3 feet. The fractures are 1 to 4 inches wide and occur regularly at 10-foot intervals.

The A horizon is black, very dark gray, very dark grayish brown, dark-brown, or very dark brown clay, silty clay, or silty clay loam. The amount of fragments ranges from 10 to 60 percent in the A11 horizon and from 55 to 85 percent in the A12 horizon. The A horizon is neutral through moderately alkaline. It is calcareous. Depth to hard limestone ranges from 6 to 20 inches. Fractures in the hard limestone are 1 to 10 feet apart.

Swink soils have a thinner solum than the associated Hollywood, Panola, and Newtonia soils.

Swink-Hollywood complex, 5 to 20 percent slopes (SwE).—In this mapping unit are sloping to moderately steep soils on uplands. About 58 percent of this unit is Swink clay, silty clay, or silty clay loam; 27 percent is Hollywood silty clay; and 15 percent is spots of a soil similar to the Hollywood soil in this complex, except it is silty clay loam throughout, and small areas of Panola silty clay loam.

The Swink and Hollywood soils are in an intricate pattern. Swink soils are on crests and side slopes, and Hollywood soils are between areas of Swink soils. The Swink soils are the soils described as representative of the Swink series.

These soils are suited to native range. The quality of this range can be maintained or improved by controlling brush, using suitable grazing practices, and protecting the range from fire. Capability unit VIIs–3; Swink soil in Shallow Prairie range site, and Hollywood soil in Blackclay Prairie range site; woodland suitability group 5o0.

Tiak Series

The Tiak series consists of deep, very gently sloping through moderately steep, moderately well drained soils on uplands. These soils formed in clayey and loamy sediment under a cover of pines and hardwoods and an understory of mid and tall grasses.

In a representative profile the surface layer is 4 inches of dark grayish-brown fine sandy loam. The subsurface layer, to a depth of 8 inches, is yellowish-brown fine sandy loam. The upper part of the subsoil, to a depth of 38 inches, is red clay with mottles in shades of red in the upper part and mottles in shades of gray, yellow, and brown in the lower part. The lower part of the subsoil, to a depth of 68 inches, is mottled, gray, strong-brown, dark-red, and red clay.

Permeability is slow in Tiak soils, and available water capacity is high. The seasonal perched water table is at a depth of 2 to 3 feet.

Representative profile of Tiak fine sandy loam, 5 to 8 percent slopes (400 feet east and 500 feet south of the NW. corner of sec. 14, T. 6 S., R 25 E.):

A1—0 to 4 inches, dark grayish-brown (10YR 4/2) fine sandy loam; moderate, medium, granular structure; friable; many roots; few fine pebbles; medium acid; clear, wavy boundary.

A2—4 to 8 inches, yellowish-brown (10YR 5/4) fine sandy loam; weak, medium and fine, granular structure; friable; many roots; few worm casts containing material from above; medium acid; clear, smooth boundary.

B21t—8 to 26 inches, red (2.5YR 5/6) clay; common, medium, distinct, yellowish-red (5YR 5/6) mottles; strong, fine and medium, subangular blocky structure; firm; few roots; clay films on ped faces; few soft and hard iron-manganese concretions; occasional fine gravel; very strongly acid; gradual, smooth boundary.

B22t—26 to 38 inches, red (2.5YR 4/6) clay; many, coarse, prominent, light-gray (10YR 7/1) and many, coarse, distinct, reddish-yellow (7.5YR 6/6) and brown (7.5YR 5/2) mottles; strong, fine and medium, blocky structure; firm; thick clay films on ped faces; very strongly acid; gradual, smooth boundary.

B23t—38 to 68 inches, mottled, gray (10YR 6/1), strong-brown (7.5YR 5/6), dark-red (2.5YR 3/6), and red (2.5YR 4/6) clay; clay films on ped faces; very strongly acid; gradual, smooth boundary.

The A1 or Ap horizon is very dark grayish brown, dark brown, or dark grayish brown. This horizon is fine sandy loam and gravelly sandy loam. The A2 horizon is grayish brown, yellowish brown, pale brown, light yellowish brown, or brown. The A horizon is medium acid through very strongly acid.

The B21t horizon is yellowish red or red. Mottles are few or common, fine or medium, and distinct in shades of red or brown. This horizon is clay or clay loam. The B22t horizon has the same colors as the B21t horizon. In the B22t horizon are many, medium or coarse, distinct or prominent mottles in shades of gray, yellow, red, or brown. The B23t horizon is mottled in shades of gray, red, or brown. It has pockets of yellowish-brown sandy clay loam in the lower part.

The C horizon, when present, is mottled in shades of gray, red, or brown. This horizon is clay stratified with sandy clay loam, fine sandy loam, or weathering shale.

Tiak soils are associated with Blevins, Cadeville, Cahaba, Felker, Kinta, Kullit, Ruston, Sacul, and Saffell soils. They are more clayey than Felker, Ruston, Kullit, Cahaba, or Blevins soils, and are similar to Sacul soils but do not decrease in clay above a depth of 60 inches. They are redder in the upper part than Kinta soils. Tiak soils have a thicker solum than Cadeville soils and fewer coarse fragments than Saffell soils.

Tiak fine sandy loam, 1 to 3 percent slopes (TfB).—This soil is on uplands. It has a profile similar to the one described as representative of the Tiak series, except the subsurface layer is absent.

Included with this soil in mapping, and making up 25 percent of the mapped areas, are areas where the surface layer is loam or silt loam. Also included, and making up 10 percent of the mapped areas, are areas of Kinta clay loam, Cadeville loam, Saffell gravelly fine sandy loam, and Ruston fine sandy loam.

This Tiak soil is mostly wooded and is well suited to trees. It is well suited to the common crops in the county, as corn, grain sorghum, soybeans, and cotton, and it is well suited to tame pasture.

Management practices are needed that help to maintain or to improve soil fertility and structure and that control erosion. Erosion can be controlled by terraces, contour farming, and use of crop residue. Plant cover is needed in winter and spring to protect the soil from water erosion. Sown crops can be grown continuously if fertilizer is added according to soil tests and crop residues are returned to the soil. Terracing and contour farming are necessary if row crops are grown. Excessive tillage should be avoided. Capability unit IIe–2; woodland suitability group 3c2; pasture and hayland suitability group 8B.

Tiak fine sandy loam, 3 to 5 percent slopes (TfC).—This soil is on uplands. Included in mapping are small areas of soils that have a loam surface layer, small areas of Sacul fine sandy loam, and spots of Ruston fine sandy loam.

This Tiak soil is best suited to and used mainly for tame pasture and trees. It is well suited to such common crops in the county as corn, grain sorghum, soybeans, and cotton.

Management practices are needed that help to maintain or improve soil fertility and structure and control erosion. Terraces and contour tillage are necessary for the efficient control of erosion. Grassed waterways for terrace outlets and crops that produce large amounts of residue are needed. Plant cover is needed during winter and spring to protect the soil from water erosion. Crop residues should be returned to the soil and excessive tillage avoided. Capability unit IIIe–2; woodland suitability group 3c2; pasture and hayland suitability group 8B.

Tiak fine sandy loam, 5 to 8 percent slopes (TfD).—This soil is on uplands. It has the profile described as representative of the Tiak series.

Included with this soil in mapping are small areas of soils that have a loam or gravelly sandy loam surface layer, small areas of Sacul fine sandy loam, and spots of Ruston fine sandy loam and Muskogee loam.

This soil is best suited to and used mainly for tame pasture and trees. It is better suited to these uses than to crops because of the very severe erosion hazard and the lack of high crop production. It is suited to such common crops in the county as corn, grain sorghum, soybeans, and cotton.

Management practices are needed that help to maintain or to improve soil fertility and structure and that control erosion. The intensive use of crop residue and green manure crops along with lime and fertilizer applied according to soil tests help to control erosion and maintain or improve soil fertility and structure. Terraces and contour tillage for the efficient control of erosion with row crops are needed. Also needed are crops that produce large amounts of residue. Plant cover is necessary during winter and spring to protect the soil from water erosion. Crop residues should be returned to the soil and excessive tillage avoided. Capability unit IVe–3; woodland suitability group 3c2; pasture and hayland suitability group 8B.

Tiak-Ruston complex, 1 to 5 percent slopes (TkC).—These soils are on uplands. About 65 percent of this unit is Tiak gravelly sandy loam and fine sandy loam, 27 percent is Ruston gravelly sandy loam and gravelly loam, and 8 percent is small areas of Blevins fine sandy loam, Muskogee loam, and Saffell gravelly fine sandy loam.

The Tiak and Ruston soils are similar to the soils described as representative of these series, except that the surface layers typically contain gravel. The Tiak and Ruston soils are in an intricate pattern. Tiak soils are on crests and side slopes, and Ruston soils are on side slopes between areas of Tiak soils.

These soils are used mainly for tame pasture. They are suited to such common crops in the county as corn, grain sorghum, soybeans, and cotton. They are suited to tame pasture and trees.

Management practices are needed that help to maintain or improve soil fertility and structure and control erosion. Terraces and contour tillage are necessary for the efficient control of erosion and for growing row crops. Grassed waterways are needed for terrace outlets. Crops that produce large amounts of residue are needed, as is plant cover during winter and spring to protect the soil from water erosion. Crop residue should be returned to the soil and excessive tillage avoided. Capability unit IIIe–2; woodland suitability group 3c2; pasture and hayland suitability group 8B.

Tiak-Ruston complex, 5 to 15 percent slopes (TkE).—These soils are on uplands. About 65 percent of this unit is Tiak gravelly sandy loam and fine sandy loam, 30 percent is Ruston gravelly sandy loam and gravelly loam, and 5 percent is small areas of Saffell gravelly fine sandy loam, Muskogee loam, and Blevins fine sandy loam.

The Tiak and Ruston soils in this mapping unit are similar to the soils described as representative of these series, except the surface layers typically contain gravel. The Tiak and Ruston soils are in an intricate pattern. Tiak soils are on crests and side slopes, and Ruston soils are between areas of Tiak soils.

These soils are best suited for tame pasture and trees. The quality of the grasses can be maintained or improved by controlling brush, using suitable grazing practices, and protecting from fire. Wooded areas can be maintained or improved by protecting them from fire, removing or controlling inferior species, planting suitable species, and selectively harvesting trees on a planned schedule. Capability unit VIe–2; woodland suitability group 3c2; pasture and hayland suitability group 8B.

Tomast Series

The Tomast series consists of deep, nearly level and very gently sloping, somewhat poorly drained soils on uplands. These soils formed in clayey and loamy sediment under a cover of pines and hardwoods and an understory of mid and tall grasses.

In a representative profile the surface and subsurface layers are 6 inches of very dark grayish-brown and grayish-brown silt loam. Mottles are in shades of brown in the lower part. The subsoil, to a depth of 28 inches, is yellowish-red and strong-brown silty clay loam with mottles in shades of gray and red. The lower part of the subsoil, to a depth of 80 inches, is gray and light brownish-gray silty clay loam and silty clay. Mottles are in shades of red and brown. The underlying material is light brownish-gray silty clay loam with mottles in shades of brown.

Permeability is slow in Tomast soil, and available water capacity is high. The seasonal water table is at a depth of 0 to 1 foot.

Representative profile of Tomast silt loam (2,340 feet west and 400 feet north of the SE. corner of sec. 4, T. 9 S., R. 27 E.):

O1—1 inch to 0, decaying forest litter.
A1—0 to 2 inches, very dark grayish-brown (10YR 3/2) silt loam; weak, medium, granular structure; friable; many roots; medium acid; clear, wavy boundary.
A2—2 to 6 inches, grayish-brown (10YR 5/2) silt loam; few, fine, faint, yellowish-brown mottles; weak, fine, granular structure; friable; many roots; strongly acid; clear, wavy boundary.

B1t—6 to 22 inches, yellowish-red (5YR 5/6) silty clay loam; few, fine, distinct, light brownish-gray mottles; weak, medium, subangular blocky structure; friable; patchy clay films on ped faces; very strongly acid; gradual, smooth boundary.

B21t—22 to 28 inches, strong-brown (7.5YR 5/6) silty clay loam; many, medium, prominent mottles of gray (10YR 6/1) and a few, fine and medium, distinct mottles of yellowish red (5YR 4/6); moderate, medium, blocky structure; firm; thin, continuous clay films; very strongly acid; gradual, smooth boundary.

B22tg—28 to 48 inches, gray (10YR 6/1) silty clay loam; many, medium, prominent mottles of red (2.5YR 4/6) and distinct mottles of yellowish brown (10YR 5/6); strong, medium, blocky structure; firm; thin, continuous clay films; very strongly acid; gradual, smooth boundary.

B23tg—48 to 65 inches; gray (10YR 6/1) silty clay; many, medium, prominent mottles of red (2.5YR 4/6) and a few, fine, distinct mottles of yellowish brown; weak, medium, blocky structure; firm; patchy clay films; few silt coatings on some vertical ped faces; very strongly acid; gradual, smooth boundary.

B3g—65 to 80 inches, light brownish-gray (10YR 6/2) silty clay; common, medium, distinct mottles of olive brown (2.5Y 4/3) and a few, fine, distinct mottles of yellowish brown; weak, medium, blocky structure; very firm; few slickensides and shiny ped faces; very strongly acid; gradual, smooth boundary.

Cg—80 to 90 inches, light brownish gray (10YR 6/2) silty clay loam; yellowish-brown (10YR 5/6) laminations; massive; very fine laminations showing rock structure; very strongly acid.

The A1 or Ap horizon is very dark grayish brown or dark grayish brown. The A2 horizon is brown, grayish brown, pale brown, or light yellowish brown with mottles in shades of brown. The A horizon is slightly acid through very strongly acid.

The B1t horizon is yellowish red or strong brown with mottles in shades of gray. This horizon is clay loam or silty clay loam. The B21t horizon is strong brown, brown, or reddish yellow with many distinct or prominent mottles in shades of gray and yellow. This horizon is silty clay loam or clay loam. The Bg horizon is gray or light brownish gray. It has common or many fine through coarse, distinct mottles in shades of red, brown, or yellow. This horizon is silty clay loam, silty clay, or clay. The B horizon is strongly acid or very strongly acid.

Tomast soils are associated with Elysian, Felker, Kinta, and Kullit soils. Tomast soils are grayer in the upper horizons than Felker and Kullit soils, less clayey in the upper part than Kinta soils, and more clayey than Elysian soils.

Tomast silt loam (To).—This is the only Tomast soil mapped in the county. It is a nearly level and very gently sloping soil on uplands.

Included with this soil in mapping, and making up 10 percent of the mapped areas, are areas of Felker loam and Kinta clay loam. Also included, and making up 5 percent of the mapped areas, are areas where the surface layer is loam and spots of Elysian fine sandy loam.

This Tomast soil is mainly wooded. A few areas have been cleared and are used for tame pasture. This soil is suited to cultivation. Management concerns are a seasonal high water table that delays the time of tillage and low natural fertility. The soil is better suited to woodcrops than to cultivated crops or tame pasture. This soil can be used for grain sorghum and soybeans, and in some years it is planted to corn and cotton.

Management practices are needed that maintain or improve soil fertility and structure and remove excess surface water. A suitable cropping system is one that maintains or improves soil fertility and structure and provides crops that produce large amounts of residue that can be returned to the soil. In places the Elysian soils on mounted relief retard runoff. Land smoothing improves surface drainage, and in places crop rows can be arranged so that the furrows help to drain ponded surface water. Capability unit IIw–1; woodland suitability group 2w8; pasture and hayland suitability group 8G.

Tuscumbia Series

The Tuscumbia series consists of deep, nearly level, poorly drained soils on the flood plains of the Red River. These soils formed in clayey alkaline sediment under a cover of hardwoods and an understory of mid and tall grasses.

In a representative profile the surface layer is 7 inches of very dark gray clay. Mottles are in shades of brown. The subsoil, to a depth of 38 inches, is dark-gray clay with mottles in shades of brown. The underlying material is brown clay with mottles in shades of brown and gray.

Permeability is very slow in Tuscumbia soils, and available water capacity is high. These soils are subject to flooding, and they crack when dry. The seasonal water table is at a depth of 0 to 1 foot.

Representative profile of Tuscumbia clay (200 feet west and 1,320 feet south of the NE. corner of sec. 36, T. 9 S., R. 25 E.):

A1—0 to 7 inches, very dark gray (10YR 3/1) clay; few, fine, faint, yellowish-brown mottles; moderate, medium, subangular blocky structure; firm; many roots; strongly acid; clear, smooth boundary.

B2g—7 to 38 inches, dark-gray (N 4/0) clay; common, medium, distinct, yellowish-brown (10YR 5/6) mottles; a few medium iron-manganese stains on ped faces; strong, coarse, blocky structure; firm; few fine roots along structural planes; few slickensides that do not intersect; medium acid in upper part, becoming slightly acid in lower part; gradual, wavy boundary.

C—38 to 70 inches, brown (10YR 4/3) clay; many, medium, distinct, gray (10YR 6/1) mottles and brown (7.5YR 4/4) coatings on ped surfaces; strong, coarse, blocky structure; firm; few medium slickensides; few iron-manganese concretions; slightly acid, becoming neutral in lower part.

The A1 horizon is very dark gray, dark gray, or very dark grayish brown. Reaction is medium acid or strongly acid. The Bg horizon is dark gray or gray. It has common, medium, distinct mottles in shades of brown or yellow. This horizon is clay or silty clay, and is medium acid through moderately alkaline. The C horizon is brown or dark brown. It has many, medium and coarse, distinct mottles in shades of gray or brown.

Tuscumbia soils are associated with Pledger, Roebuck, and Wrightsville soils. Tuscumbia soils are more acid and grayer in the B horizon than Roebuck and Pledger soils. They are similar to Wrightsville soils but are more clayey in the A horizon.

Tuscumbia clay (Tu).—This is the only Tuscumbia soil mapped in the county. It is a nearly level soil on the flood plains of the Red River.

Included with this soil in mapping are minor areas of soils that have a silty clay surface layer and 5 percent areas of Wrightsville silt loam.

This Tuscumbia soil is used mainly for trees and tame pasture and is suited to these uses. It is not suited to cultivated crops, because of the hazard of flooding and wetness. This soil is subject to damaging floods more

than once each year, and low areas are flooded for more than a week. The quality of the tame pasture can be maintained or improved by controlling brush, applying fertilizer according to soil tests, and using suitable grazing practices.

Wooded areas can be maintained or improved by protecting them from fire, removing or controlling inferior species, planting suitable species, and selectively harvesting trees on a planned schedule. Capability unit Vw–2; woodland suitability group 3w6; pasture and hayland suitability group 1A.

Wrightsville Series

The Wrightsville series consists of deep, nearly level, poorly drained soils on terraces. These soils formed in alkaline sediment under a cover of pines and hardwoods and an understory of mid and tall grasses.

In a representative profile the surface and subsurface layers are 7 inches of dark grayish-brown and light brownish-gray silt loam. Mottles are in shades of brown in the lower part. The subsoil, to a depth of 38 inches, is gray silty clay with tongues of gray silt loam and mottles in shades of brown. The lower part of the subsoil, which extends to a depth of 70 inches, is gray silty clay with mottles in shades of gray and brown. The underlying material is a coarsely mottled, strong-brown and light brownish-gray sandy clay loam.

Permeability is slow in Wrightsville soils, and available water capacity is high.

Representative profile of Wrightsville silt loam in an area of Wrightsville-Elysian complex (3,000 feet east and 200 feet south of the NW. corner of sec. 10, T. 10 S., R. 26 E.):

A1—0 to 3 inches, dark grayish-brown (10YR 4/2) silt loam; few, fine, faint, dark-brown organic stains; weak, fine, granular structure; friable; many fine roots; very strongly acid; clear, smooth boundary.

A2g—3 to 7 inches, light brownish-gray (10YR 6/2) silt loam; common, fine and medium, distinct, yellowish-brown (10YR 5/4) and dark-brown (7.5YR 4/4) mottles; weak, medium and fine, subangular blocky and granular structure; friable; few medium roots; common fine pores; few, fine, iron-manganese concretions; very strongly acid; abrupt, irregular boundary that tongues into horizon below.

B21tg & A2g—7 to 14 inches, gray (10YR 5/1) silty clay; tongues of gray (10YR 6/1) silt loam make up 20 percent of the horizon; common, medium, distinct, yellowish-brown (10YR 5/6) mottles; silty clay part is firm and is a compound of weak, medium, blocky and moderate, medium and fine, subangular blocky structure; silt loam part is friable and structureless (massive); common fine pores; clay films are continuous in pores of silty clay part and many peds and voids have silt coatings; few, fine, brown, soft concretions; very strongly acid; gradual, wavy boundary.

B22tg—14 to 38 inches, gray (10YR 5/1) silty clay; common, fine, distinct, yellowish-brown and few, fine, faint, grayish-brown mottles; weak, coarse, blocky and moderate, fine, subangular blocky structure; firm; clay films continuous on ped faces and pores; light-gray silt coatings on structural plane and filling fine voids; strongly acid; gradual, smooth boundary.

B3tg—38 to 70 inches, gray (10YR 5/1) silty clay; many, coarse, distinct, light brownish-gray (2.5Y 6/2) and few, coarse, distinct, yellowish-brown (10YR 5/4) mottles; weak, coarse, blocky structure; firm; thin clay films on ped faces; occasional silt pocket or void filled with light-gray material; mildly alkaline; gradual, smooth boundary.

C—70 inches +, coarsely mottled strong-brown (7.5YR 5/6) and light brownish-gray (2.5Y 6/2) sandy clay loam; massive; firm; few, large, reddish concretions; mildly alkaline.

The A1 or Ap horizon is dark grayish brown, grayish brown, or dark gray. The A2 horizon is gray, light gray, or light brownish gray. The A horizon is silt loam or very fine sandy loam, and it is strongly acid or very strongly acid.

The Btg horizon is dark gray, gray, light gray, or light brownish gray with few to many, fine through coarse, distinct mottles in shades of brown, gray, or yellow. It is silty clay, clay, or silty clay loam. Tongues of silt loam extend into or through the B21tg horizon. The upper part of the Btg horizon is strongly acid or very strongly acid, and the lower part is medium acid through mildly alkaline.

The C horizon is gray or is mottled in shades of gray, brown, and yellow. It is clay, silty clay loam, or sandy clay loam. Reaction is mildly alkaline or moderately alkaline.

Wrightsville soils are less clayey in the A horizon than the associated Tuscumbia soils and more clayey than associated Elysian soils.

Wrightsville-Elysian complex (We).—In this mapping unit are nearly level to gently sloping soils on terraces. Wrightsville silt loam and Wrightsville soils that have a surface layer of very fine sandy loam and loam make up 75 percent of this mapping unit, and Elysian fine sandy loam makes up 25 percent. Included in mapping are spots of Tuscumbia clay.

The Wrightsville and Elysian soils occur in such an intricate pattern that it is impractical to map each soil separately. The Wrightsville silt loam is the soil described as representative of the Wrightsville series, and the Elysian soil is that described as representative of the Elysian series. Elysian soils are in mounds, and Wrightsville soils are in low areas between the mounds.

These soils are used mainly for tame pasture and trees, and they are suited to these uses. A small acreage is cultivated and used to grow soybeans or grain sorghum. These soils are poorly suited to crops because of wetness late in spring and dryness in summer.

Management practices are needed that maintain or improve soil fertility and structure and control surface wetness. A suitable cropping system is one that provides crops that produce large amounts of residue that can be returned to the soil. In places the Elysian soils on mounded relief retard runoff. Land smoothing improves surface drainage. In places an adequate surface-drainage system is needed, and crop rows can be arranged so that the furrows help to drain the ponded surface water. Capability unit IVw–1; woodland suitability group 3w9; Wrightsville soil in pasture and hayland suitability group 8C; Elysian soil in pasture and hayland suitability group 8B.

Zafra Series

The Zafra series consists of moderately deep and deep, very gently sloping through moderately steep, well-drained soils on uplands. These soils formed under a cover of pines and hardwoods and an understory of mid and tall grasses in material weathered from sandstone.

In a representative profile the surface layer is 4 inches of dark grayish-brown loam. The subsurface layer, which extends to a depth of 10 inches, is yellowish-brown loam. The subsoil, to a depth of 15 inches, is strong-brown loam and about 15 percent fragments of sandstone. The lower

part of the subsoil extends to a depth of 38 inches. It is yellowish-red gravelly loam and very gravelly sandy clay loam and 40 to 60 percent fragments of sandstone. The underlying material is alternating layers of brown, red, and yellow sandstone and lenses of reddish shale. Hard sandstone interbedded with soft sandstone and lenses of shale is at a depth of about 45 inches.

Permeability is moderate in Zafra soils, and available water capacity is high.

Representative profile of Zafra loam from an area of Sherwood-Zafra complex, 5 to 12 percent slopes (600 feet west and 200 feet north of the SE. corner of sec. 32, T. 2 S., R. 24 E.):

A1—0 to 4 inches, dark grayish-brown (10YR 4/2) loam; weak, fine, granular structure; friable; many roots; about 5 percent of hard fragments of sandstone ¼ to 2 inches in diameter; medium acid; clear, smooth boundary.

A2—4 to 10 inches, yellowish-brown (10YR 5/4) loam; weak, fine, granular structure; friable; about 5 percent hard fragments of sandstone ¼ to 2 inches in diameter; strongly acid; clear, smooth boundary.

B1—10 to 15 inches, strong-brown (7.5YR 5/6) loam; weak, fine, subangular blocky structure; friable; about 15 percent fragments of sandstone ¼ to 3 inches in diameter; very strongly acid; clear, smooth boundary.

B2t—15 to 26 inches, yellowish-red (5YR 5/6) gravelly loam; weak, medium, subangular blocky structure; friable; thin patchy clay films; about 40 percent hard and soft fragments of sandstone ¼ to 3 inches in diameter; very strongly acid; gradual, irregular boundary.

B3t—26 to 38 inches, yellowish-red (5YR 5/6) very gravelly sandy clay loam; weak, medium, subangular blocky structure; friable; thin patchy clay films; about 60 percent hard and soft sandstone fragments, a few of which crush to fine sandy loam; very strongly acid; gradual, irregular boundary.

C—38 to 45 inches, alternating layers of brown, red, and yellow sandstone and lenses of red shale; sandstone crushes to fine sandy loam, shale crushes to silty clay loam; many hard sandstone fragments ¼ to 4 inches in diameter; very strongly acid; clear, irregular boundary.

R—45 inches, hard sandstone interbedded with soft sandstone and lenses of shale.

The A1 or Ap horizon is dark grayish brown, very dark grayish brown, or dark brown. The A2 horizon is yellowish brown, brown, pale brown, light yellowish brown, reddish yellow, or strong brown. The A horizon is medium or strongly acid loam or fine sandy loam.

The B1 horizon is yellowish-brown, strong-brown, yellowish-red, or reddish-yellow loam and gravelly loam. It is 10 to 30 percent, by volume, angular sandstone fragments. The B2t horizon is strong-brown, yellowish-red, or red gravelly loam and very gravelly analogs of loam, clay loam, or sandy clay loam. It is 40 to 60 percent, by volume, sandstone fragments. The B3t horizon is yellowish-red or strong-brown very gravelly analogs of loam, sandy clay loam, or clay loam and is 60 to 70 percent, by volume, sandstone fragments.

Depth to the C horizon is 20 to 56 inches and is extremely variable within short distances. The C horizon, when present, is alternating tilted beds of soft and hard sandstone, thin lenses of shale, and soil material similar to that of the above horizons.

The R horizon is hard interbedded layers of sandstone and shale fitted at 20 to 60 degrees from the horizontal.

Zafra soils are associated with Carnasaw, Goldston, Sacul, and Sherwood soils. They contain more coarse fragments than Sherwood soils. Zafra soils are similar to Saffell soils but differ in having soft fragments of sandstone and a higher water-holding capacity. They are less clayey than Sacul and Carnasaw soils and have continuous B2t horizons that are absent in Goldston soils.

Zafra soils are not mapped separately but occur with the Carnasaw and Sherwood soils.

Use and Management of the Soils

The system of capability classification used by the Soil Conservation Service is explained in this section and estimated yields of the principal crops grown in the county under two levels of management are given. The capability classification of each soil mapped in the county can be learned by referring to the "Guide to Mapping Units." Information about the management needs of a particular soil is given in the section "Descriptions of the Soils."

This section also contains information about the management of soils for cultivated crops and for tame pasture, the use of soils for woodland and for range, and soil interpretation for wildlife habitat. It contains a table that gives ratings of the soils for several nonfarm uses and a section that provides information about engineering uses of the soils.

Management of the Soils for Cultivated Crops [2]

This section contains information about the use and management of soils for cultivated crops. Alfalfa, cotton, grain sorghum, forage sorghum, small grains, peanuts, and corn are the principal crops grown in McCurtain County. A small percentage of the acreage suitable for cropland is used for tilled crops in this county.

Major management practices that are needed in the production of the preceding crops are the maintenance or improvement of fertilization, the control of erosion, the preservation of good tilth, and the maintenance of adequate surface drainage.

Fertilizers should be applied in accordance with the needs of the crop and of the soil, as determined by soil tests and plant needs.

Effective measures for reducing erosion include management of crop residue or cover crops, terracing, and contour farming. The practices applied depend upon the nature of the soils and on the cropping system used.

Tilth is maintained by managing residue and cover crops, avoiding unnecessary tillage, and tilling only when the soils are within the proper range of moisture content.

An essential of management is a cropping system that provides an ample amount of residue. In McCurtain County at least 3,000 pounds of residue per acre are needed to maintain soil structure and tilth, and to replenish the supply of organic matter. Corn, sorghum, oats, and wheat leave large amounts of residue. Cotton and peanuts leave small amounts of residue, and should be grown in a cropping system with high-residue crops or should be followed by cover crops.

Adequate surface drainage requires a complete drainage system that includes field drains, laterals, main ditches, and outlets. Crop rows should be laid out in a direction that will help in surface drainage. Land smoothing that eliminates irregularities will improve runoff.

[2] Prepared by ERNEST O. HILL, conservation agronomist, Soil Conservation Service.

Capability grouping

Capability grouping shows, in a general way, the suitability of soils for most kinds of field crops. The soils are grouped according to their limitations when used for field crops, the risk of damage when they are so used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to rice, cranberries, horticultural crops, or other crops requiring special management.

Those familiar with the capability classification can infer from it much about the behavior of soils when used for other purposes, but this classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for range, for forest trees, or engineering.

In the capability system, all kinds of soil are grouped at three levels: the capability class, subclass, and unit. These are discussed 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. In class I are soils that have few limitations, the widest range of use, and the least risk of damage when they are used. The soils in the other classes have progressively greater natural limitations. In class VIII are soils and landforms so rough, so shallow, or otherwise so limited that they do not produce worthwhile yields of crops, forage, or wood products.

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

In class I there are no subclasses, because the soils of this class have few limitations. Class V can contain, at the most, only the subclasses indicated by *w*, *s*, and *c*, because the soils in class V are subject to little or no erosion, though they have other limitations that restrict their use largely to pasture, range, woodland, wildlife, or recreation.

Capability Units are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe–4 or IIIe–2. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation; the small letter indicates the subclass, or kind of limitation, as defined in the foregoing paragraph; and the Arabic numeral specifically identifies the capability unit within each subclass.

The eight classes in the capability system and the subclasses and units in McCurtain County are described in the list that follows. The unit designation for each soil in the county can be found in the "Guide to Mapping Units."

Class I. Soils that have few limitations that restrict their use.
- (No subclasses)
  - Unit I–1. Deep, nearly level and very gently sloping, moderately well drained and well drained, loamy soils that have a loamy and clayey subsoil; on flood plains and terraces of Red River.
  - Unit I–2. Deep, nearly level, well-drained, loamy soils that are loamy throughout; on terraces of local streams.

Class II. Soils that have moderate limitations that reduce the choice of plants or that require moderate conservation practices.
- Subclass IIe. Soils that are subject to moderate erosion if not protected.
  - Unit IIe–1. Deep and moderately deep, very gently sloping, well-drained, loamy soils that are loamy throughout; on uplands and terraces.
  - Unit IIe–2. Deep, very gently sloping, moderately well drained, loamy soils that have a loamy and clayey subsoil; on uplands.
  - Unit IIe–3. Deep, very gently sloping, moderately well drained, clayey soils that are clayey throughout; on uplands.
  - Unit IIe–4. Deep, very gently sloping, well-drained, loamy soils that have a loamy and clayey subsoil; on uplands.
- Subclass IIw. Soils that are subject to moderate limitations because of excess water or seasonal overflow.
  - Unit IIw–1. Deep, nearly level and very gently sloping, moderately well drained and somewhat poorly drained, loamy soils that have a loamy and clayey subsoil; on uplands.
  - Unit IIw–2. Deep, nearly level, moderately well drained soils that are clayey throughout; on flood plains.
  - Unit IIw–3. Deep, nearly level, well drained and moderately well drained soils that are loamy throughout; on flood plains of local streams.
  - Unit IIw–4. Deep, nearly level and very gently sloping, well-drained, loamy soils; on flood plains of Red River.
- Subclass IIs. Soils that are subject to moderate limitations because of very slow permeability or droughty conditions.
  - Unit IIs–1. Deep, nearly level, moderately well drained and somewhat poorly drained soils that are clayey throughout; on flood plains.
  - Unit IIs–2. Deep, nearly level and very gently sloping, well-drained, sandy soils that have a loamy subsoil; on uplands.

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

Subclass IIIe. Soils that are subject to severe erosion if they are not protected.
Unit IIIe–1. Deep and moderately deep, very gently sloping and gently sloping, well-drained soils that are loamy throughout; on uplands.
Unit IIIe–2. Deep, very gently sloping and gently sloping, well drained and moderately well drained, loamy soils that have a loamy and clayey subsoil; on uplands.
Unit IIIe–3. Deep, gently sloping and sloping, well-drained sandy soils that have a loamy subsoil; on uplands.
Unit IIIe–4. Deep, nearly level through gently sloping, moderately well drained and somewhat poorly drained, clayey and loamy soils that have a clayey and loamy subsoil; on uplands.
Subclass IIIw. Soils that are subject to severe limitations because of excess water.
Unit IIIw–1. Deep, nearly level, moderately well drained and somewhat poorly drained soils that are clayey throughout; on flood plains of Red River.
Unit IIIw–2. Deep, nearly level and very gently sloping, moderately well drained, clayey soils that have a clayey subsoil; on flood plains of Red River.
Unit IIIw–3. Deep, very gently sloping and nearly level, poorly drained, loamy soils that have a clayey and loamy subsoil; on uplands.
Class IV. Soils that have very severe limitations that reduce the choice of plants, require very careful management, or both.
Subclass IVe. Soils that are subject to very severe erosion if they are cultivated and not protected.
Unit IVe–1. Deep, very gently sloping and gently sloping, well-drained, gravelly soils that are loamy throughout; on uplands.
Unit IVe–2. Deep and moderately deep, very gently sloping through sloping, well-drained, loamy soils that have a clayey and loamy subsoil; on uplands.
Unit IVe–3. Deep, very gently sloping through sloping, moderately well drained, loamy soils that have a clayey and loamy subsoil; on uplands.
Unit IVe–4. Deep, gently sloping and sloping, well-drained soils that are loamy throughout and loamy soils that are moderately eroded; on uplands.
Subclass IVw. Soils that have very severe limitations because of excess water.
Unit IVw–1. Deep, nearly level through gently sloping, mounded, poorly drained to well-drained, loamy soils with a loamy subsoil; on terraces.
Unit IVw–2. Moderately deep, nearly level and very gently sloping, poorly drained soils that are loamy throughout; on uplands.
Class V. Soils that are not likely to erode but have other limitations, impractical to remove, that limit their use largely to pasture, range, woodland, or wildlife.
Subclass Vw. Soils that are subject to frequent flooding.
Unit Vw–1. Deep, nearly level and very gently sloping soils that are well drained throughout; on flood plains of local streams.
Unit Vw–2. Deep, nearly level, poorly drained and somewhat poorly drained soils that are clayey throughout; on flood plains.
Class VI. Soils that have severe limitations that make them generally unsuited to cultivation and limit their use largely to pasture, range, woodland, and wildlife habitat.
Subclass VIe. Soils limited chiefly by risk of erosion if protective cover is not maintained.
Unit VIe–1. Deep and moderately deep, moderately steep, excessively drained, well drained, and moderately well drained, loamy soils (with sandstone and shale fragments) that have a loamy and clayey subsoil; on uplands.
Unit VIe–2. Deep and moderately deep, sloping through moderately steep, well drained, moderately well drained, and excessively drained, loamy soils that have a loamy and clayey subsoil; on uplands.
Unit VIe–3. Deep, very gently sloping through sloping, well drained and moderately well drained, severely eroded, loamy soils that have a loamy and clayey subsoil; on uplands.
Unit VIe–4. Deep, sloping and strongly sloping, well-drained, gravelly soils that are loamy throughout; on uplands.
Unit VIe–5. Moderately deep and deep, gently sloping through strongly sloping, well-drained, loamy soils that have a loamy subsoil; on uplands.
Class VII. Soils that have very severe limitations that make them unsuited to cultivation and that restrict their use largely to pasture, range, woodland, and wildlife habitat.
Subclass VIIs. Soils that are very severely limited by available water capacity, shallowness, stones, or other soil characteristics.
Unit VIIs–1. Deep and moderately deep, steep, excessively drained, well drained and moderately well drained, stony, loamy soils that have a loamy and clayey subsoil; on uplands.
Unit VIIs–2. Shallow and moderately deep, nearly level through very steep, somewhat excessively drained, well-drained and poorly drained soils that are loamy throughout; on uplands.
Unit VIIs–3. Shallow and deep, sloping through moderately steep, well drained and moderately well drained, clayey and loamy soils with limestone fragments; the subsoil, when present, is clayey; on uplands.
Unit VIIs–4. Deep, nearly level and very gently sloping, well-drained, gravelly soils that are gravelly and loamy throughout and Rubble land; on flood plains.
Class VIII. Soils and landforms that have limitations that preclude their use for commercial plants and restrict their use to recreation, wildlife habitat, water

supply, or esthetic purposes. (None in McCurtain County.)

Estimated yields

Table 2 lists estimated yields for important crops in McCurtain County under two levels of management.

The A columns show the estimated yields that can be expected under customary management followed by a substantial number of farmers in the county. This management includes proper rates of seeding and proper dates of planting; efficient harvesting methods; sufficient control of weeds, insects, and diseases to insure normal plant growth; terracing and contour farming where necessary; and use of lime and fertilizer in small amounts.

The B columns show the estimated yields for soils under improved management. This management includes the first three practices listed under customary management plus the following: use of lime and fertilizer in amounts needed for high profitable production; use of adapted and improved varieties of seeds; surface drainage where required; residue management and those tillage practices that control erosion, maintain soil structure, increase water infiltration, and aid seedling emergence; and a cropping system fitted to the operator's goals and the specific needs of soils.

Yields are not listed for soils that are normally considered unsuitable for crops. Crop failures (zero yields) are included in the yield estimates. Yields at specified management levels were estimated by the soil scientists making the survey in the county on the basis of consultations with farmers and observations during the progress of the survey. These estimates were further corroborated by personnel of Oklahoma State University by research information applicable to the crops and soils of McCurtain County.

Management of the Soils for Tame Pasture [3]

This section contains information about the use and management of soils for tame pasture. Tame pasture is grown on a large acreage in this county. The present trend is to clear trees from the area to establish the tame pasture. Abandoned cropland growing poor pasture is also being planted to improved pasture grasses.

The principal grasses used for this purpose are bermudagrass, bahiagrass, lovegrass, fescues, and King Ranch bluestem.

Bermudagrass may be grown alone, but often it is grown in a mixture with such legumes as Kobe lespedeza, white dutch, or yellow hop clover. Improved bermudagrass, such as Coastal bermudagrass, usually produces more forage, under good management, than common bermudagrass.

King Ranch bluestem, bahiagrass, lovegrass, and fescue are not so widely adapted to the soils of the county as bermudagrass.

Tall fescue pasture provides for grazing early in spring and late in fall. It is best suited to clayey soils on the flood plains and wet soils on uplands, such as Roebuck and Kinta. Ladino clover and other legumes are frequently grown with fescue.

Proper use of pasture is necessary if optimum production is desired. It maintains or improves the stand of pastures and helps to provide more palatable forage. Brush control is essential for successful pasture production on soils that grow trees. Fertilizer and lime should be applied according to soil tests, plant needs, and production desired. Legumes such as ladino clover require more phosphate than those such as yellow hop clover and lespedeza. Where grasses are grown without legumes, larger amounts of nitrogen fertilizer are usually needed.

For management of specific soils refer to the section "Descriptions of the Soils." For estimated average per acre yields of tame pasture refer to table 2.

Pasture and hayland suitability groups

Characteristics and type of location of the soils in each of the 14 pasture and hayland suitability groups are presented in the paragraphs that follow:

GROUP 1A

Deep, clayey, nearly level and very gently sloping, very slowly permeable soils on flood plains that are subject to flooding.

GROUP 2A

Deep, loamy, nearly level and very gently sloping, slowly permeable to moderately rapidly permeable soils on flood plains and terraces; soils on flood plains are subject to flooding.

GROUP 2B

Deep, loamy, nearly level and very gently sloping, very slowly permeable and moderately permeable, poorly drained soils on flood plains; low in natural fertility and subject to overflow.

GROUP 3A

Deep, gravelly, loamy, nearly level and very gently sloping, rapidly permeable soils on flood plains; subject to overflow.

GROUP 7A

Deep and moderately deep, clayey and loamy, very gently sloping through strongly sloping, very slowly permeable and slowly permeable soils on uplands.

GROUP 8A

Deep, loamy, nearly level and very gently sloping, moderately permeable soils on terraces and uplands.

GROUP 8B

Deep and moderately deep, loamy, nearly level through moderately steep, moderately and slowly permeable soils that are low in natural fertility. They are on uplands.

GROUP 8C

Deep, loamy, nearly level and very gently sloping, very slowly and slowly permeable soils on uplands and terraces. They have a seasonal high water table near the surface in wet seasons.

GROUP 8F

Deep, loamy, very gently sloping through sloping, very slowly permeable, slowly permeable, and moderately

[3] Prepared by ERNEST O. HILL, conservation agronomist, Soil Conservation Service.

TABLE 2.—*Estimated average yields per*

[Yields in columns A are those to be expected under customary management; yields in columns B are those to be expected under improved

Soil	Corn		Grain sorghum		Soybeans		Cotton (lint)	
	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Lbs.*	*Lbs.*
Adaton loam	------	------	15	30	15	25	------	------
Alikchi loam, 0 to 3 percent slopes	------	------	15	30	12	20	------	------
Alusa loam	------	------	15	30	15	25	------	------
Bibb-Iuka complex	------	------	------	------	------	------	------	------
Blevins fine sandy loam, 1 to 3 percent slopes	35	60	35	60	16	26	300	600
Cadeville loam, 2 to 5 percent slopes	20	40	15	30	15	25	200	400
Cahaba loamy fine sand, 0 to 3 percent slopes	30	55	30	55	12	20	250	500
Cahaba loamy fine sand, 3 to 8 percent slopes	25	50	25	50	11	18	200	400
Cahaba fine sandy loam, 0 to 1 percent slopes	35	70	35	65	18	30	350	700
Cahaba fine sandy loam, 1 to 3 percent slopes	30	60	30	60	16	26	300	600
Cahaba and Tiak soils, 2 to 8 percent slopes, severely eroded	------	------	------	------	------	------	------	------
Carnasaw-Goldston association, moderately steep	------	------	------	------	------	------	------	------
Carnasaw-Zafra complex, 1 to 8 percent slopes	20	40	20	40	10	15	------	------
Caspiana loam	50	85	50	85	25	35	500	800
Ceda-Rubble land complex	------	------	------	------	------	------	------	------
Coushatta silty clay loam	50	85	50	85	28	40	500	800
Felker loam, 0 to 2 percent slopes	20	35	20	35	10	16	200	375
Frizzell loam	35	60	35	60	15	25	250	450
Gallion very fine sandy loam	50	80	50	80	25	35	475	750
Garton silt loam	50	80	50	80	30	40	475	750
Goldston-Carnasaw-Sacul association, moderately steep	------	------	------	------	------	------	------	------
Goldston-Carnasaw-Sacul association, steep	------	------	------	------	------	------	------	------
Guyton silt loam	------	------	------	------	------	------	------	------
Guyton-Elysian complex	------	------	15	30	12	20	------	------
Hector-Rock outcrop, 35 to 60 percent slopes	------	------	------	------	------	------	------	------
Hollywood silty clay, 1 to 3 percent slopes	35	60	35	60	25	35	225	425
Hollywood silty clay, 3 to 5 percent slopes	30	50	30	55	19	30	200	375
Idabel silt loam	55	85	55	85	25	35	400	625
Kaufman clay	35	55	35	60	25	35	300	500
Kaufman clay, frequently flooded	------	------	------	------	------	------	------	------
Kinta clay loam, 0 to 2 percent slopes	------	------	15	30	12	20	------	------
Kullit fine sandy loam, 1 to 3 percent slopes	25	45	25	45	12	20	200	375
Latanier clay	40	70	40	70	25	35	400	600
Muskogee loam, 1 to 3 percent slopes	25	50	25	50	15	25	225	450
Newtonia silt loam, 1 to 3 percent slopes	35	65	30	65	18	30	300	600
Ochlockonee fine sandy loam	40	65	40	65	15	25	275	475
Oklared very fine sandy loam	35	60	35	60	20	30	300	500
Panola silty clay loam	------	------	30	55	18	30	225	400
Pickens shaly silt loam, 5 to 15 percent slopes	------	------	------	------	------	------	------	------
Pickens-Alikchi complex, 0 to 3 percent slopes	------	------	------	------	------	------	------	------
Pledger clay	35	60	35	60	25	35	350	500
Pledger-Roebuck complex	30	50	40	65	25	35	300	450
Redlake clay	40	65	40	65	28	40	400	550
Rexor loam	35	70	35	70	15	25	275	550
Rexor-Guyton complex, 0 to 3 percent slopes	------	------	------	------	------	------	------	------
Roebuck clay, ponded	------	------	------	------	------	------	------	------
Ruston fine sandy loam, 3 to 8 percent slopes	25	50	20	45	12	20	250	450
Ruston fine sandy loam, 3 to 8 percent slopes, eroded	22	45	20	41	12	20	225	400
Sacul fine sandy loam, 5 to 15 percent slopes	------	------	------	------	------	------	------	------
Saffell gravelly fine sandy loam, 1 to 5 percent slopes	20	35	20	35	10	15	125	300
Saffell gravelly fine sandy loam, 5 to 12 percent slopes	------	------	------	------	------	------	------	------
Sallisaw loam	35	70	35	70	18	30	350	650
Severn very fine sandy loam	45	70	45	70	25	35	400	600
Sherwood fine sandy loam, 1 to 3 percent slopes	30	55	30	60	16	26	275	550
Sherwood fine sandy loam, 3 to 5 percent slopes	25	50	25	50	14	23	225	450
Sherwood soils, 2 to 5 percent slopes, eroded	20	40	20	40	11	18	125	300
Sherwood-Zafra complex, 1 to 5 percent slopes	20	40	20	40	11	18	100	275
Sherwood-Zafra complex, 5 to 12 percent slopes	------	------	------	------	------	------	------	------
Sumter silty clay loam, 3 to 12 percent slopes	------	------	------	------	------	------	------	------
Swink-Hollywood complex, 5 to 20 percent slopes	------	------	------	------	------	------	------	------
Tiak fine sandy loam, 1 to 3 percent slopes	25	50	25	50	16	26	250	450
Tiak fine sandy loam, 3 to 5 percent slopes	20	40	20	40	12	19	200	375
Tiak fine sandy loam, 5 to 8 percent slopes	15	30	15	30	10	15	125	300
Tiak-Ruston complex, 1 to 5 percent slopes	25	40	20	40	12	20	200	400
Tiak-Ruston complex, 5 to 15 percent slopes	------	------	------	------	------	------	------	------
Tomast silt loam	20	35	20	35	15	24	200	375
Tuscumbia clay	------	------	------	------	------	------	------	------
Wrightsville-Elysian complex	------	------	15	30	15	24	------	------

[1] A.U.M. stands for animal-unit-month. The figures represent the number of months that 1 acre will provide grazing for one animal

acre of cultivated crops and tame pasture

management. Absence of a yield figure indicates crop is seldom grown on the soil specified, is not suited to the soil, or that the soil is not arable]

Wheat		Peanuts		Alfalfa		Common bermudagrass		Hay		Fescue		Bahiagrass	
A	B	A	B	A	B	A	B	A	B	A	B	A	B
Bu.	*Bu.*	*Lbs.*	*Lbs.*	*Tons*	*Tons*	*A.U.M.*[1]	*A.U.M.*[1]	*Tons*	*Tons*	*A.U.M.*[1]	*A.U.M.*[1]	*A.U.M.*[1]	*A.U.M.*
						3.0	5.0	1.2	2.0	3.5	6.0		
						3.0	5.0	1.2	2.0	3.5	6.0		
						3.5	5.5	1.4	2.0	4.0	5.5		
						4.0	7.0			4.5	7.0	4.5	7.0
18	32	650	1300			4.5	7.5	1.6	2.6	3.0	5.0	4.0	6.0
						3.0	5.0	1.2	1.8	2.5	4.5	3.0	5.0
15	25	800	1600			4.0	6.5	1.6	2.6			3.5	6.0
14	22	600	1200			3.5	6.0	1.6	2.4			3.5	6.0
20	35	700	1400			5.0	8.5	2.0	3.0	3.0	5.0	4.0	6.5
18	32	600	1200			5.0	8.0	1.6	2.8	2.5	4.5	3.5	6.0
						2.5	4.5					3.0	5.0
						3.0	4.5	1.1	1.8	2.0	3.0	3.0	5.5
						3.5	5.5	1.4	2.2	2.5	4.0	3.0	5.5
25	35	1000	1800	4.5	6.0	6.5	8.5	2.6	3.4	4.0	6.0	5.5	7.0
28	40			4.5	6.0	6.5	8.5	2.6	3.4	5.0	7.0	5.5	7.0
						3.0	5.0	1.2	2.0	3.5	5.5	2.5	4.5
						4.5	7.0	1.7	2.8	3.5	6.0	3.5	6.0
28	40	1000	1800	3.7	5.5	6.5	8.5	2.6	3.4	4.5	6.5	5.5	7.0
28	40			4.0	6.0	6.0	8.0	2.6	3.2	5.0	7.0	5.0	6.5
						2.5	4.0	1.0	1.6			3.0	4.5
						3.0	5.0			3.0	5.5		
						3.0	5.0	1.2	2.0	3.5	6.0	3.0	5.0
25	35			1.0	2.0	3.0	5.5	1.2	2.2	4.5	6.0	3.0	5.5
20	30					3.0	5.5	1.2	2.2	3.5	6.0	3.0	5.5
28	40	1000	1800	4.0	6.0	6.5	8.5	2.6	3.4	5.0	7.5	5.5	7.0
25	35			2.3	3.5	4.0	6.0	1.6	2.4	4.0	6.0		
						3.0	5.0			4.0	5.5		
						2.5	4.5	1.0	1.8	3.5	6.0	2.5	4.0
		450	900			5.5	9.0	1.4	2.2	5.5	9.0	5.0	8.0
25	35			3.8	5.5	5.0	7.0	2.0	2.8	4.5	7.0	4.0	6.0
						4.5	7.0	1.2	2.0	4.5	7.0	3.0	5.0
25	40	800	1600	1.8	3.5	4.5	7.5	1.8	3.0	3.0	4.5	4.0	6.5
		750	1500			5.0	7.5	2.0	3.0	3.0	5.5	5.0	7.5
20	35	850	1500	3.0	4.5	5.5	7.5	2.0	3.0	3.0	5.5	5.5	7.0
18	30					3.5	6.0	1.4	2.4	3.5	6.0	3.0	5.0
18	28			3.5	5.0	4.5	6.5	1.4	2.4	5.5	7.0		
18	25			3.0	4.5	3.5	5.0			5.5	7.0		
20	30			3.8	5.5	4.0	6.0	1.6	2.4	5.5	7.0		
20	32					4.5	7.5	1.7	2.8	3.0	5.0	4.5	7.0
						3.5	5.5			2.5	4.0	3.0	5.5
						3.0	4.0			5.0	7.0		
18	28	450	900			4.0	6.0	1.4	2.2	2.5	4.0	3.5	6.0
14	25	400	850			3.5	5.5	1.4	2.2	2.0	3.5	3.0	5.0
						3.0	5.0	1.4	2.0	2.0	3.0	3.0	5.5
						2.5	4.5	1.2	1.8			3.0	5.5
						2.5	4.5	1.2	1.8			3.0	5.5
20	35	700	1400			5.0	7.5	2.0	3.0	3.0	5.0	5.0	7.5
25	35	875	1600	3.5	5.0	6.0	8.0	2.4	3.2	4.0	6.0	5.5	7.0
18	28	500	1000			4.5	7.0	1.4	2.4	3.0	4.5	3.5	6.5
15	24					3.5	6.0	1.4	2.4	2.5	4.0	3.5	6.5
						3.0	5.5	1.2	2.2	2.0	3.0	3.5	6.0
						3.0	5.5	1.2	2.2	2.0	3.0	3.5	6.0
						3.0	5.0	1.2	2.2			3.0	5.0
						3.0	5.0	1.2	2.0	2.5	4.0	3.0	5.0
						3.0	5.0	1.2	2.0	2.5	4.0	3.5	5.5
						3.0	5.0	1.2	2.0	2.5	4.0	3.5	5.5
						3.0	4.5	1.2	1.8			3.5	5.5
						3.0	5.0	1.2	2.0			3.5	5.5
						3.0	4.5	1.2	1.8			3.0	5.5
						3.0	5.0	1.4	2.0	3.0	5.5		
						2.5	4.5			4.0	6.0		
						3.0	5.0	1.2	1.8	3.5	5.5		

unit (one cow, steer, or horse; five hogs; or seven sheep) without injury to the pasture.

permeable soils on uplands. They are low in fertility. Some are severely eroded.

GROUP 8G

Deep, loamy, nearly level and very gently sloping, moderately permeable through slowly permeable soils on uplands. They have a water table at a depth of 0 to 3 feet 2 to 6 months of the year.

GROUP 8H

Deep and moderately deep, loamy, nearly level and very gently sloping, slowly permeable and very slowly permeable, wet, poorly drained soils on uplands and terraces. The water table is at a depth of 0 to 2 feet during wet periods.

GROUP 9A

Deep, sandy, nearly level through sloping, moderately permeable soils on uplands. These soils are low in fertility.

GROUP 9B

Deep, loamy and gravelly, very gently sloping through strongly sloping, moderately permeable through rapidly permeable soils on uplands.

GROUP 14A

Shallow and moderately deep, loamy, nearly level through moderately steep, moderately permeable and moderately rapidly permeable soils on uplands.

Use of the Soils for Range [4]

This section contains information about the use and management of soils for range. Range is land on which the natural plant community is composed principally of grasses, grasslike plants, forbs, and shrubs valuable for grazing and in sufficient quantity to justify grazing use. About seven percent of the areas of soils in McCurtain County are in native range on which domestic animals are raised.

A few large ranches are in the county, but most cattle is raised on small livestock farms. Supplemental feeding of cattle with protein cubes and hay is necessary when grazing is done during the dormant period of the grasses.

Range sites and condition classes

Soils are placed in groups called range sites to classify range resources. A range site is a distinctive kind of range that differs from other kinds in its potential to produce native plants. It is the product of all environmental factors responsible for its development. In the absence of abnormal disturbance and physical site deterioration, it supports a plant community characterized by an association of species different from that of other range sites in terms of kind or proportion of species or in total annual yield.

The plants on a given range site are grouped, according to their response to prolonged heavy grazing, as decreasers, increasers, and invaders. *Decreasers* are plants in the potential plant community that tend to die out if they are heavily grazed. These plants are generally the most palatable and most productive perennials. *Increasers* are plants in the potential plant community that become more abundant as the decreasers decline. These plants are generally the shorter, less productive, less palatable plants. Under prolonged heavy grazing, the increasers become dominant. *Invaders* are plants that are not part of the potential plant community but that become established if both the decreasers and the increasers decline. They may be either woody plants, perennials, or annuals, and they may either come from other nearby sites or from great distances.

Range condition is the present state of vegetation of a range site in relation to the climax plant community for that site. It is expressed in terms of condition classes. The condition class represents the degree to which the existing plant community is different from that of the potential plant community. It is determined by estimating the relative production, by weight, of the species making up the plant community.

A range site is in excellent condition if 76 to 100 percent of the present vegetation is of the same kind as the potential plant community for the site. It is in good condition if the percentage is between 51 and 75, in fair condition if the percentage is between 26 and 50, and in poor condition if the percentage is 25 or less.

A range site in excellent condition is at or near its maximum productivity. It has a plant cover that adequately protects the soil, encourages the absorption of moisture, and helps to maintain fertility. A site in good condition has lost some of its decreaser plants, but it is still productive and can be maintained and improved by good management. A site in fair condition has a severely altered plant community in which increasers are dominant and invaders are becoming prominent. Generally the mulch is inadequate for protection against compaction and erosion. The exclusion of grazing animals for an entire season is usually necessary to bring about rapid improvement in condition of the range. A site in poor condition has lost almost all of the desirable forage plants. Few, if any, of the original range plants are left, and invaders are numerous.

Potential forage production depends upon the soil, kinds and condition of plants, and the current moisture condition.

Conservation treatment of range involves planning and applying range management and conservation practices that occur in three broad groups: plant management practices, accelerating practices, and livestock control practices. Such range practices as proper grazing use, deferred grazing, and planned grazing systems relate to plant management. Range seeding, brush control, and other practices specifically designed to "speed up" improvement of range cover over that obtained through grazing management alone are accelerating practices. The third group, livestock control practices, facilitates handling livestock and includes such practices as fencing, stock watering facilities, and others that may obtain better livestock distribution.

Grazing systems should be scheduled so that enough cover remains to protect the soil and maintain the quantity and quality of desirable plants. Repeated or prolonged overuse of any range site reduces the ability of the plants to produce the deep roots, new shoots, and

[4] Prepared by NEAL STIDHAM, range conservationist, Soil Conservation Service.

seeds necessary for reproduction and maintenance of the stand.

Operators who are familiar with their range sites and the main grasses generally understand signs of improvement or decline in range condition and adjust management to fit the condition.

One of the main objectives of good range management is to maintain the range sites in excellent condition or at least in good condition. When this is done, moisture is conserved, yields are maintained or improved, and the soils are protected from deterioration. A major problem is being able to recognize important changes in the kind of cover on a range site. The changes are so gradual that they are often overlooked or misunderstood. Lush growth, encouraged by heavy rainfall, may lead to the conclusion that the range site is in good condition and improving, when actually this type of cover is often weedy and the long time trend is toward a lower condition that will afford less production.

On the other hand, some range sites in excellent condition that are being closely grazed, but for a short time and under the supervision of a careful manager, may have a degraded appearance that conceals their good quality.

Specific information about the stocking of range sites is not included in this publication. Technical personnel of the local agricultural agencies help ranchers to classify range sites and to estimate the condition of the range and the number of animals to stock.

Descriptions of range sites

These descriptions give the significant soil characteristics pertinent to range productivity, the names of the principal native plants for the sites in good condition, and the species to be expected on sites that have declined to poor condition. Plants have been classified as decreasers, increasers, and invaders, based on their response to continuous grazing by cattle.

The annual total yield of forage species is an estimate based on clippings made near the end of the growing season on sites in excellent condition. The weights given are of air-dry herbage clipped at ground level. Shrub and tree yields are not included.

BLACKCLAY PRAIRIE RANGE SITE

This site consists of deep, very gently sloping to moderately steep soils that are clayey throughout. These soils are on uplands.

If this site is excellent condition, about 80 percent of the vegetation consists of a mixture of species of such decreasers as little bluestem, big bluestem, indiangrass, switchgrass, and eastern gamagrass. A few woody plants, such as leadplant, prairie rose, and osageorange, grow in soils of this site. About 20 percent of the climax vegetation consists of increasers, such as sideoats grama, Texas wintergrass, and buffalograss.

Prolonged overuse generally thins the decreasers and increasers, allowing the invaders to become prominent. Some common invaders are silver bluestem, windmillgrass, tumblegrass, annual three-awn, Japanese brome, western ragweed, common broomweed, basketflower, and leavenworth eryngo.

Annual air-dried herbage yield is about 7,000 pounds per acre in favorable years and 3,500 pounds per acre in unfavorable years.

LOAMY PRAIRIE RANGE SITE

This site consists of deep and moderately deep, nearly level to strongly sloping soils that have a loamy surface layer and loamy or clayey subsoil. These soils are on uplands.

If this site is in excellent condition (fig. 12), about 80 percent of the vegetation consists of a mixture of such decreasers as big bluestem, little bluestem, indiangrass, eastern gamagrass, and switchgrass.

About 15 percent of the vegetation consists of such increasers as tall dropseed, purpletop, jointtail, sideoats grama, wild indigo, goldenrod, and heath aster. Legumes and forbs, such as tickclover, leadplant, gayfeather, and blacksamson, make up the other 5 percent.

Invaders that become common following prolonged overuse are broomsedge, splitbeard bluestem, annual three-awn, ragweeds, common broomweed, hawthorn, prairie crabapple, and winged elm. Annual air-dried herbage production is about 6,500 pounds per acre in favorable years, and about 4,000 pounds per acre in unfavorable years.

SAVANNAH BREAKS RANGE SITE

This site consists of shallow, steep and very steep, loamy soils on uplands. Sandstone rock crops out on these soils, escarpments are present, and stones and boulders are common on the surface. Runoff is common during intense rainfall or prolonged rainy periods.

If this site is in excellent condition, about 50 percent of the vegetation consists of grasses, legumes, and other forbs and 50 percent is woody species. Forage species are little bluestem, big bluestem, indiangrass, and switchgrass. The primary wood species are post oak, blackjack oak, and shortleaf pine.

Figure 12.—**A Loamy Prairie range site in excellent condition, as indicated by presence of eastern gamagrass, big bluestem, indiangrass, and little bluestem. Soil is Panola silty clay loam.**

Prolonged heavy grazing use, or fire and heavy use, has thinned out the grasses and released the space for sprouts. Where this has occurred, the condition has declined to "poor," and the plant cover is almost a solid stand of scrubby post oak, blackjack oak, winged elm, and scattered shortleaf pine. This overstory of woody plants shades the grasses and contributes to the development of a thin weak stand of little bluestem, broomsedge, annual three-awns, poverty oatgrass, ragweeds, and croton. Herbage production estimates are about 2,800 pounds per acre in favorable years and about 1,400 pounds in unfavorable years.

SHALLOW PRAIRIE RANGE SITE

This site consists of very shallow and shallow, sloping, moderately steep soils that are clayey and loamy throughout. These soils are on uplands.

If this site is in excellent condition, decreaser plants make up about 70 percent of the vegetation. They are little bluestem, big bluestem, indiangrass, tephrosia, sensitivebrier, and perennial sunflowers. The increaser plants are about 30 percent of the mixture. They are meadow dropseed, silver bluestem, purpletop, jointtail, ashy sunflower, heath aster, sticky goldenrod, pricklypear, hawthorn, and winged elm.

Overuse weakens the decreaser plants and allows other species to invade the vacant areas. When poor conditions develop, those plants that are abundant are annual brome, annual three-awn, and increasers such as hawthorn, winged elm, sticky goldenrod, hairy grama, and silver bluestem.

Annual air-dried herbage is about 4,000 pounds in favorable years and about 2,000 pounds in unfavorable years.

SHALLOW SAVANNAH RANGE SITE

This site consists of shallow, nearly level to moderately steep soils that are loamy throughout. These soils are on uplands.

If this site is in excellent condition, about 50 percent of the vegetation consists of a mixture of grasses and forbs and about 50 percent is woody species. Decreasers are little bluestem, big bluestem, indiangrass, and switchgrass, and increasers are tall dropseed, scribner panicum, prairieclovers, Elliott bluestem, and virginia tephrosia. The primary wood species are winged elm, hawthorn, and scrubby post oak.

Proper grazing use, deferred grazing, range seeding, and fire control are generally needed to restore a productive cover of the native grasses.

If heavy grazing is prolonged, the decreaser plants lose their vigor and allow such invader plants as broomsedge, splitbeard bluestem, annual three-awn, showy partridgepea, ragweeds, camphorweed, and white snakeroot to become common. Such woody species as scrubby post oak, winged elm, and hawthorn become prominent where prolonged heavy grazing use or fire and heavy use has thinned out the grasses.

Annual air-dried herbage yields are about 4,000 pounds per acre in favorable years, and about 2,000 pounds per acre in unfavorable years.

Use of the Soils as Woodland [5]

This section contains information concerning the relationship between soils and trees. The information presented will make the survey more useful to woodland owners and operators in developing and carrying out plans for establishing and maintaining tree resources.

Natural stands of commercial woodland occupy 70 percent of McCurtain County. Soils capable of supporting commercial forest species constitute about 96 percent of the county land area.

The principal commercial species are loblolly pine and shortleaf pine. The following species are harvested in lesser amounts: ash, black walnut, cottonwood, cypress, eastern redcedar, hackberry, hickory, pecan, southern red oak, sycamore, sweetgum, water oak, and willow oak.

Refer to table 3 for potential productivity by tree species of a given soil.

The soils of McCurtain County have been rated on the basis of their performance when used to produce wood crops. The ratings are a means of expressing information useful in managing wood crops according to kinds of soils. Items rated in this soil survey and their importance to woodland use and management in McCurtain County are discussed in the following paragraphs.

Potential productivity is expressed as the site index for a given tree species. This is the average height in feet of dominant trees, at age 30 for cottonwood, at age 35 for sycamore, and at age 50 for all other species.

Species suitability is shown by listing the principal commercial tree species that should be favored in existing stands, and by denoting the tree species that are suitable for planting. The selection of preferred species is influenced by their growth rates, and by the quality, value, and general marketability of the products obtained from each species.

Important soil-related hazards or limitations in woodland use and management are a part of the definition of each woodland suitability group. The limitations or hazards are potential erosion hazard, equipment limitations, and seedling mortality. The evaluation of these management items for the soils of each woodland suitability group is rated according to the severity of the problems they impose on management. The rating classes are slight, moderate, and severe.

Erosion hazard is the potential erodibility of the soil and the hazard it causes when the area is managed according to currently recognized acceptable standards. Significances of each of the rating classes for erosion are:

Slight. No special techniques in management are required.

Moderate. Some provision in management must be made to prevent accelerated erosion. Roads, skid trails, fire lanes, land construction, and maintenance require some special techniques.

[5] NORMAN E. SMOLA, woodland conservationist, and Ernest Snook, range conservationist, Soil Conservation Service, assisted in the preparation of this section. Field information was gathered by teams of woodland conservationists, foresters, and soil scientists. Representatives of federal and State agencies, the wood processing industry, and others cooperated in gathering field data.

Severe. Special techniques in management and special attention to roads, skid trails, fire lanes, land construction, and maintenance are necessary to minimize accelerated erosion.

Equipment limitation ratings are based on the mechanical equipment that is normally used for woodland operation. The dominant factors that limit the use of equipment are steepness of slope, wetness of the soil, rough terrain, unfavorable texture, and obstacles such as rocks.

A soil rating of *slight* indicates that there are no particular problems in the use of equipment.

The rating of *moderate* indicates that not all types of equipment can be used, that there are periods not in excess of three months when equipment cannot be used because of soil wetness, or that the soils are unstable.

A rating of *severe* indicates that some kinds of equipment use may be limited and special equipment may be needed, that the soil is wet more than three months, or that the soil's texture limits equipment use.

Seedling mortality ratings refer to the expected degree of mortality of naturally occurring or planted tree seedlings, as influenced by the kinds of soils when plant competition is not a factor.

The rating is *slight* if seedling survival ordinarily will exceed 75 percent, and natural regeneration is suitable or an original planting may be expected to produce a satisfactory stand.

The rating is *moderate* if seedling survival will be 50 to 75 percent. In this case, natural regeneration cannot always be relied upon for adequate and immediate restocking, and planting may be a desirable alternative.

The rating is *severe* if the seedling survival is less than 50 percent, and adequate restocking is not expected without additional management attention. For instance, superior planting techniques, superior planting stock, and replanting may be required to assure adequate stands.

Woodland suitability groups

The preceding ratings of individual soils provide a basis for grouping soils according to their suitability for woodland use and management. Groupings simplify the presentation of information. A woodland suitability group consists of soils that have comparable potential productivity and comparable problems, produce similar wood crops, and require similar management practices or treatment.

Each group symbol consists of three elements. The first element in the symbol indicates the relative production potential of the soils in the group for growing wood crops. It expresses the site quality, based on the site index of one or more important forest types or species.

The numeral *1* indicates very high potential productivity.

The numeral *2* indicates high potential productivity.

The numeral *3* indicates moderately high potential productivity.

The numeral *4* indicates moderate potential productivity.

The numeral *5* indicates a low potential productivity.

The numeral *1* is not applicable in McCurtain County.

The second element in the symbol indicates the soil or physiographic characteristic that is the primary cause of hazards, limitations, or restrictions of the soils for woodland use or management. The elements and their significance are as follows:

x—stoniness or rockiness
w—excessive wetness
d—restricted rooting depth
c—limitations because of kind or amount of clay in the upper part of the soil.
f—fragmental or skeletal soils
o—no significant soil-related problem

Some soils have more than one limiting characteristic; in this case, priority was assigned in the order that the characteristics are listed.

The third element in the symbol indicates the degree of hazards or limitations, and the general suitability of the soils for certain kinds of trees, as follows:

Trees for which best suited:			
Needleleaf	*Broadleaf*	*Needleleaf or broadleaf*	*Management concerns*
1	4	7	None to slight.
2	5	8	One or more moderate.
3	6	9	One or more severe.

The third numeral *0* indicates the soils are not suitable for the production of major commercial wood products.

A fourth letter *e* has been added to the three-element symbol to designate severely eroded soils. The fourth element *a* separates groups of soils that differ in their suitability to hardwood species.

The woodland suitability group to which each mapping unit is assigned can be determined by referring to the "Guide to Mapping Units" at the back of this publication, or by referring to the description of the mapping unit itself.

Understory vegetation for grazing

The kind and amount of understory vegetation that can be produced on an area is related to the soils, climate, and amount of tree overstory. In many woodlands, grazing by cattle can be a compatible secondary use. The grasses, legumes, forbs, and many of the woody browse species in the understory are grazable and may be utilized by cattle, with proper management to supplement a woodland enterprise without damage to the woodland crop. On most piney woodlands grazing is beneficial to the woodland program. It helps to reduce the accumulation of litter, thus reducing the hazard of fires, and it helps in the control of undesirable woody plants.

The success of a combined woodland and livestock program depends primarily upon the time of grazing and the degree of use of the forage plants. Intensity of grazing must be such that it maintains adequate cover for soil protection and maintains or improves the quantity of trees and forage vegetation.

Forage production varies according to the type of woodland and the amount of sunlight that reaches the understory vegetation during the growing season.

As pointed out previously, the soils within a woodland suitability group have the potential for producing about the same kind and amount of understory vegetation.

The understory vegetation has a distinctive potential plant community that grows on these soils under the trees. It is generally the most productive and most suitable vegetable community for the soils and will reproduce itself as long as the environment does not change. The forage species are classified as *decreasers*, *increasers*, or *invaders*. These three groupings of plants are defined in the range section under "Range Sites and Condition Classes."

Research has proven that there is a close correlation between the total potential yield of grasses, legumes, and forbs in a woodland suitability group and the amount of sunlight reaching the ground at midday in the forest. Herbage production continues to decline as the forest canopy becomes denser. For this reason, percentage of tree canopy is used to reflect the effect a particular age and density of trees has on the potential production of the understory vegetation of the soils. Four canopy classes are used to reflect the differences in forage production. They are *open*, *sparse*, *medium*, and *dense*.

Open canopy is where 6 to 20 percent of the understory vegetation is shaded at midday. Sparse canopy is where 21 to 35 percent is shaded, medium canopy is where 36 to 55 percent is shaded, and dense canopy is where 56 to 70 percent of the vegetation is shaded at midday.

Forage condition classes are used to indicate the degree of departure from the potential understory vegetation that has been brought about by grazing or other uses. These classes are defined in the section "Use of the Soils for Range."

Potential forage production depends on the woodland suitability group and canopy classes. Current forage production depends upon the forage condition class and the moisture that the plants get during their growth season.

One of the main objectives in good woodland grazing management is to keep the woodland forage in either excellent or good condition. If this is done, water is conserved, yields are improved, and the soils are protected.

Table 3 includes a brief description of each woodland suitability group of soils in McCurtain County. The table also includes a summary of information concerning potential productivity, tree species suitable for planting, and principal forage plants that are climax for the group and estimated total yield of forage species by canopy class. The estimated yields are for normal years and the woodland forage class is in good condition.

Use of the Soils for Wildlife Habitat [6]

The wildlife population of any area depends upon the availability of food, cover, and water in a suitable combination. Habitats are created, improved, or maintained by establishing desirable vegetation and developing water supplies in suitable places.

In Table 4 each of the soils in McCurtain County is rated as to its suitability for the elements of wildlife habitat and also for three classes of wildlife. These ratings refer only to the suitability of the soil and do not take into account the climate, the present use of the soil, or the distribution of wildlife and human populations. The suitability of individual sites has to be determined by onsite inspection.

The meanings of the ratings used in table 4 are as follows: *Well suited* means that habitats generally are easily created, improved, or maintained; that the soil has few or no limitations that affect management; and that satisfactory results can be expected. *Suited* means that habitats can be created, improved, or maintained in most places; that the soil has moderate limitations that affect management; and that moderate intensity of management and fairly frequent attention may be required for satisfactory results. *Poorly suited* indicates that habitats can be created, improved, or maintained in most places; that the soil has rather severe limitations; that habitat management is difficult and expensive and requires intensive effort; and that results are not always satisfactory. *Unsuited* indicates that it is impractical or impossible to create, improve, or maintain habitats and that unsatisfactory results are probable.

The column heading "Grain and seed crops" refers to grain-producing or seed-producing annual plants, such as corn, sorghums, millets, and soybeans.

"Grasses and legumes" refers to domestic grasses and legumes that will be established by planting and that furnish food and cover for wildlife. The grasses include bahiagrass, dallisgrass, johnsongrass, ryegrass, panicgrass, and fescue. Legumes include clovers, annual lespedezas, and brush lespedezas.

"Wild herbaceous plants" refers to native or introduced perennial grasses, forbs, and weeds that provide food and cover for upland wildlife. Examples of these are beggarweed, perennial lespedezas, wild bean, pokeberry, cheat, sunflower, and ragweed.

"Hardwood woody plants" refers to nonconiferous trees, shrubs, and woody vines that produce fruits, nuts, buds, catkins, or foliage (browse) used extensively as food by wildlife. These plants commonly become established by natural processes but also can be planted. They include such species as oak, beech, cherry, dogwood, viburnum, black locust, sand plum, sumac, osageorange, grape, honeysuckle, greenbrier, eleagnus, mulberry, hackberry, pecan, and hickory.

"Coniferous woody plants" are cone-bearing trees and shrubs that are used mainly as cover but may furnish food in the form of browse, seeds, or fruitlike cones. They become established by natural processes or can be planted. Included are pines, cedars, and ornamentals.

"Wetland food and cover plants" are annual and perennial wild herbaceous plants that grow on moist to wet sites. (They do not include submersed or floating aquatics.) These plants furnish food or cover mostly for wetland wildlife. Some examples are smartweed, wild millet-spikerush and other rushes, sedges, and burreed.

"Shallow-water developments" are those where low dikes and water-control structures are established to create habitat principally for waterfowl. They may be designed so that they can be drained, planted, and flooded, or they may be used as permanent impoundments to grow submersed aquatics. Both freshwater and brackish water are included.

In the column "Ponds" soils are rated in terms of locations where water of suitable depth and quality can be

[6] Prepared by JEROME F. SYKORA, biologist, Soil Conservation Service.

impounded for fish production as one of the primary uses.

"Openland wildlife" includes quail, doves, cottontail rabbit, fox, meadowlark, field sparrow, and other birds and mammals that normally live on cropland, pasture, meadow, lawn, and in other openland areas where grasses, herbs, and shrubby plants grow.

"Woodland wildlife" includes woodcock, thrush, vireo, squirrel, deer, swamp rabbit, raccoon, wild turkey, and other birds and mammals that normally live in wooded areas where hardwood trees and shrubs and coniferous trees grow.

"Wetland wildlife" includes ducks, geese, rail, heron, shore birds, mink, muskrat, beaver, and other birds and mammals that normally live in wet areas, marshes, and swamps.

Engineering Uses of the Soils [7]

This section is useful to those who need information about soils used as structural material or as foundation upon which structures are built. Among those who can benefit from this section are planning commissions, town and city managers, land developers, engineers, contractors, and farmers.

Among the properties of soils highly important in engineering are permeability, strength, compaction characteristics, soil drainage condition, shrink-swell potential, grain size, plasticity, and soil reaction. Also important are depth to the water table, depth to bedrock, and soil slope. These properties, in various degrees and combinations, affect construction and maintenance of roads, airports, pipelines, foundations for small buildings, irrigation systems, ponds and small dams, and systems for disposal of sewage and refuse.

Information in this section of the soil survey can be helpful to those who—

1. Select potential residential, industrial, commercial, and recreational areas.
2. Evaluate alternate routes for roads, highways, pipelines, and underground cables.
3. Seek sources of gravel, sand, or clay.
4. Plan farm drainage systems, irrigation systems, ponds, terraces, and other structures for controlling water and conserving soil.
5. Correlate performance of structures already built with properties of the kinds of soil on which they are built, for the purpose of predicting performance of structures on the same or similar kinds of soil in other locations.
6. Predict the trafficability of soils for cross-country movement of vehicles and construction equipment.
7. Develop preliminary estimates pertinent to construction in a particular area.

Most of the information in this section is presented in tables 5, 6, and 7, which show, respectively, several estimated soil properties significant to engineering, interpretations for various engineering uses, and results of engineering laboratory tests on soil samples.

This information, along with the soil map and other parts of this publication, can be used to make interpretations in addition to those given in tables 5 and 6, and it also can be used to make other useful maps.

This information, however, does not eliminate the need for further investigations at sites selected for engineering works, especially those that involve heavy loads or that require excavations to depths greater than those shown in the tables, generally depths greater than 6 feet. Also, inspection of sites, especially the small ones, is needed because many delineated areas of a given soil mapping unit may contain small areas of other kinds of soil that have strongly contrasting properties and different suitabilities or limitations for soil engineering.

Some of the terms used in this soil survey have special meanings to soil scientists that are not known to all engineers. The Glossary defines many of these terms commonly used in soil science.

Engineering soil classification systems

The two systems most commonly used in classifying samples of soils for engineering are the Unified system (*8*) used by the SCS engineers, Department of Defense, and others, and the AASHO system (*1*) adopted by the American Association of State Highway Officials.

In the Unified system soils are classified according to particle-size distribution, plasticity, liquid limit, and organic matter. Soils are grouped in 15 classes. There are eight classes of coarse-grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; six classes of fine-grained soils, identified as ML, CL, OL, MH, CH, and OH; and one class of highly organic soils, identified as Pt. Soils on the borderline between two classes are designated by symbols for both classes; for example, ML–CL.

The AASHO system is used to classify soils according to those properties that affect use in highway construction and maintenance. In this system, a soil is placed in one of seven basic groups ranging from A–1 through A–7 on the basis of grain-size distribution, liquid limit, and plasticity index. In group A–1 are gravelly soils of high bearing strength, or the best soils for subgrade (foundation). At the other extreme, in group A–7, are clay soils that have low strength when wet and that are the poorest soils for subgrade. Where laboratory data are available to justify a further breakdown, the A–1, A–2, and A–7 groups are divided as follows: A–1–a, A–1–b, A–2–4, A–2–5, A–2–6, A–2–7, A–7–5, and A–7–6. As additional refinement, the engineering value of a soil material can be indicated by a group index number. Group indexes range from 0 for the best material to 20 or more for the poorest. The AASHO classification for tested soils, with group index numbers in parentheses, is shown in table 7; the estimated classification, without group index numbers, is given in table 5 for all soils mapped in the survey area.

The U.S. Department of Agriculture system of classifying soils according to texture is mainly for farm use, but the textural classification is useful in engineering also. In this system soils are classified according to the proportional amounts of different sizes of mineral particles.

[7] Prepared by GEORGE ENSMINGER, area engineer, and W. E. HARDESTY, civil engineer, Soil Conservation Service.

TABLE 3.—*Woodland suitability groups and factors in woodland management*

[Absence of an entry in a column means information is not available]

Woodland suitability group, mapping units, and general description and suitability	Potential productivity		Species suitable for planting	Principal forage plants	Estimated total yield of forage species by canopy class
	Species	Site index			
					Lbs. of air-dry forage per acre
Group 2o4: Cp, Cs, Ga, Gr, Id, Ok, Sg. Deep, nearly level and very gently sloping, loamy soils on flood plains and terraces of Red River. High potential productivity. None to slight limitations. Suited to southern hardwoods.	Cottonwood Sycamore Black walnut Hackberry Pecan Sweetgum	100	Cottonwood, sycamore, sweetgum, green ash, black walnut, cherrybark oak.	Grazing is not recommended.	Grazing is not recommended.
Group 2o7: BlB, ChA, ChB, Oc, Re, RgB. Deep, nearly level and very gently sloping, loamy soils on uplands, flood plains, and terraces. High potential productivity. None to slight limitations. Suited to southern pines or hardwoods.	Loblolly pine Shortleaf pine Southern red oak White oak Black walnut Sweetgum	90 80	Loblolly pine, sweetgum, cherrybark oak, black walnut, sycamore.	Little bluestem, big bluestem, indiangrass, uniolas, low panicums, carex, purpletop. *Common invaders* Broomsedge, splitbeard, bluestem, annuals.	Open—4,000 Sparse—2,000 Medium—1,000 Dense—500.
Group 2w5: La. Deep, nearly level and very gently sloping, slightly wet clayey soils on flood plains of Red River. High potential productivity. Moderate equipment limitations and slight to moderate seedling mortality. Best suited to southern hardwoods.	Green ash Hackberry Pecan	90	Cottonwood, sycamore, green ash, sweetgum.	Grazing is not recommended.	Grazing is not recommended.
Group 2w6a: Bk, Gu. Deep, nearly level, excessively wet, loamy soils on flood plains. High potential productivity. Severe equipment limitations and seedling mortality. Best suited to water-tolerant hardwoods.	Water oak Willow oak Sweetgum Cypress	90 90	Willow oak, water oak, sweetgum, shumard oak.	Grazing is not recommended.	Grazing is not recommended.
Group 2w6: Ka, Kc. Deep, nearly level, clayey soils that are subject to flooding; on uplands and flood plains. High potential productivity. Severe equipment limitations and seedling mortality. Best suited to southern hardwoods.	Cottonwood Green ash Hackberry Pecan	100	Cottonwood, green ash, cherrybark oak, sweetgum, sycamore.	Grazing is not recommended.	Grazing is not recommended.
Group 2w8: FeA, Fr, KuB, To. Deep, nearly level and very gently sloping, loamy, seasonally wet soils on uplands and flood plains. High potential productivity. Moderate equipment limitations and slight to moderate seedling mortality. Suited to southern hardwoods or southern pines.	Loblolly pine Southern red oak White oak Sweetgum	90	Loblolly pine, sweetgum, cherrybark oak.	Little bluestem, scribner panicum, beaked panicum, purpletop, carex, uniolas. *Common invaders* Broomsedge, annuals.	Open—3,000. Sparse—1,500. Medium—1,000. Dense—500.

Group 2w9: Ad, Gy. Deep, nearly level to gently sloping, loamy, excessively wet soils on uplands and terraces. High potential productivity. Severe equipment limitations and moderate to severe seedling mortality. Suited to water-tolerant hardwoods and southern pines.	Loblolly pine Water oak Willow oak Sweetgum	90 --- --- ---	Loblolly pine, cherry-bark oak, sweetgum.	Little bluestem, scribner panicum, beaked panicum, uniolas, purpletop, carex. *Common invaders* Broomsedge, annuals.	Open—3,000. Sparse—1,500. Medium—1,000. Dense—500.
Group 3c2: CaC, GsE (Sacul part), SaE, TfB, TfC, TfD, TkC, TkE. Deep, very gently sloping to moderately steep, loamy soils on uplands. Moderately high potential productivity. Moderate equipment limitations and slight to moderate seedling mortality. Best suited to southern pines.	Loblolly pine Shortleaf pine	80 70	Loblolly pine, shortleaf pine.	Little bluestem, big bluestem, uniolas, low panicums, beaked panicum, carex. *Common invaders* Broomsedge, annuals.	Open—2,000. Sparse—1,400. Medium—800. Dense—400.
Group 3o1: CbB, CbD, CmE (Carnasaw part), CnD, GsE (Carnasaw part), RuD RuD2, ShB, ShC, SlC2, SmC, SmE. Deep and moderately deep, nearly level to moderately steep, loamy and sandy soils on uplands. Moderately high potential productivity. None to slight management problems. Best suited to southern pines.	Loblolly pine Shortleaf pine	80 70	Loblolly pine, shortleaf pine.	Little bluestem, big bluestem, indiangrass, purpletop, low panicums, native lespedezas, beaked panicum, uniolas. *Common invaders* Broomsedge, splitbeard bluestem, annuals.	Open—4,000. Sparse—2,000. Medium—1,000. Dense—500.
Group 3o7: Sf. Deep, nearly l el, loamy soils on terraces. Mod ately high potential productivity. one to slight management prob ms. Suited to southern pines or b rdwoods.	Shortleaf pine Southern red oak White oak	70 --- ---	Not recommended for planting.	Little bluestem, big bluestem, indiangrass, uniolas, low panicums, carex, purpletop. *Common invaders* Broomsedge, splitbeard bluestem, annuals.	Open—4,000. Sparse—2,000. Medium—1,000. Dense—500.
Group 3w6: Pg, Pr, Rd, Rk, Tu. Deep, nearly level, clayey, seasonally wet soils on flood plains of Red River. Moderately high potential productivity. Severe seedling mortality and equipment limitations. Best suited to southern hardwoods.	Cottonwood Sycamore Green ash Pecan Black walnut	90 --- --- --- ---	Cottonwood, sycamore, green ash.	Grazing is not recommended.	Grazing is not recommended.
Group 3w8: MuB. Deep, very gently sloping, loamy, seasonally wet soils on uplands. Moderately high potential productivity. Moderate equipment limitations and slight to moderate seedling mortality. Suited to southern pines or hardwoods.	Shortleaf pine Sweetgum Green ash	70 --- ---	Loblolly pine, sweetgum	Little bluestem, big bluestem, indiangrass, carex, uniolas, low panicums. *Common invaders* Broomsedge, annuals.	Open—2,500. Sparse—1,500. Medium—1,000. Dense—500.

See footnote at end of table.

TABLE 3.—*Woodland suitability groups and factors in woodland management*—Continued

Woodland suitability group, mapping units, and general description and suitability	Potential productivity		Species suitable for planting	Principal forage plants	Estimated total yield of forage species by canopy class
	Species	Site index			
Group 3w9: As, KnA, We. Deep, nearly level to gently sloping, loamy, excessively wet soils on uplands and terraces. Moderately high potential productivity. Severe equipment limitations and moderate to severe seedling mortality. Suited to southern hardwoods or southern pines.	Loblolly pine Sweetgum Willow oak Water oak	80 --- --- ---	Loblolly pine, sweetgum, green ash.	Carex, low panicums, longspike tridens, native forbs. *Common invaders* Broomsedge, annuals.	*Lbs. of air-dry forage per acre* Open—2,400. Sparse—1,500. Medium—800. Dense—500.
Group 3x3: GsF (Carnasaw and Sacul parts). Deep, steep, loamy stony soils on uplands. Moderately high potential productivity. Moderate to severe equipment limitations, seedling mortality, and erosion hazard. Best suited to southern pines.	Shortleaf pine	70	Loblolly pine, shortleaf pine.	Little bluestem, big bluestem, indiangrass, low panicums, native forbs. *Common invaders* Broomsedge, annuals.	Open—1,200. Sparse—900. Medium—600. Dense—300.
Group 3x9: Cr [1]. Deep, nearly level and very gently sloping, loamy, stony, cobbly, and gravelly soils on flood plains. Moderately high potential productivity. Severe equipment limitations and seedling mortality. Suited to southern pines or hardwoods.	Shortleaf pine Southern red oak White oak Sycamore	70 --- --- ---	Loblolly pine, shortleaf pine, sycamore, sweetgum.	Little bluestem, low panicums, paspalums, carex. *Common invaders* Broomsedge, annuals	Open—2,000. Sparse—1,500. Medium—1,000. Dense—500.
Group 4c3e: CkD3. Deep, very gently sloping to sloping, severely eroded, loamy soils on uplands. Moderate potential productivity. Moderate to severe equipment limitations, erosion hazard, and seedling mortality. Best suited to needleleaf trees.	Loblolly pine	70	Shortleaf pine, loblolly pine.	Little bluestem, skeletongrass, big bluestem, low panicum. *Common invaders* Broomsedge, splitbeard bluestem, annuals.	Open—2,000. Sparse—1,700. Medium—1,000. Dense—300.
Group 4f2: CmE (Goldston part), GsE (Goldston part), SeC, SeE. Deep and moderately deep, very gently sloping to moderately steep, loamy soils that have sandstone and shale fragments or gravel, on uplands. Moderate potential productivity. Moderate seedling mortality and slight to moderate equipment limitations. Best suited to southern pines.	Shortleaf pine	60	Loblolly pine, shortleaf pine.	Little bluestem, big bluestem, uniolas, scribner panicum, perennial sunflower, low panicum, purpletop. *Common invaders* Broomsedge, annuals.	Open—3,500. Sparse—2,500. Medium—1,500. Dense—1,000.

Group 4w9: AkB Moderately deep, nearly level and very gently sloping, loamy, excessively wet soils on uplands. Moderate potential productivity. Severe equipment limitations and moderate to severe seedling mortality. Suited to southern pines and hardwoods.	Loblolly pine Shortleaf pine Willow oak	70 60	Loblolly pine, sweetgum	Carex, low panicums, longspike tridens, native forbs. *Common invaders* Broomsedge, annuals.	Open—2,200. Sparse—1,400. Medium—800. Dense—400.
Group 4x3: GsF (Goldston part) Moderately deep, steep, loamy and stony soils that have shale and sandstone fragments, on uplands. Moderate potential productivity. Moderate to severe equipment limitations, seedling mortality, and erosion hazard. Best suited to southern pines.	Shortleaf pine	60	Loblolly pine, shortleaf pine.	Little bluestem, big bluestem, indiangrass, low panicums, native forbs. *Common invaders* Broomsedge, danthonia, annuals.	Open—1,000. Sparse—800. Medium—400. Dense—200.
Group 5d3: PcE, PeB Shallow and moderately deep, nearly level to moderately steep, loamy soils on uplands. Low potential productivity. Moderate to severe erosion hazard and equipment limitations and severe seedling mortality. Suited to southern pines and redcedar.	Shortleaf pine Eastern redcedar	55 35	Not recommended for planting.	Panicums, native forbs, little bluestem, big bluestem, indiangrass. *Common invaders* Broomsedge, annuals.	Open—2,000. Sparse—1,500. Medium—800. Dense—300.
Group 5o0: HoB, HoC, NeB, Pa, SuE, SwE. Soils that are not suitable for the production of major commercial wood products.					
Group 5x9: HkF [1] Shallow, steep, and very steep, loamy soils on uplands. Low potential productivity. Severe equipment limitations and slight to severe seedling mortality and erosion hazards. Suited to southern pines or upland hardwoods.	Shortleaf pine	55	Not recommended for planting.	Little bluestem, low panicums, paspalums, carex, big bluestem, indiangrass, perennial legumes. *Common invaders* Broomsedge, annuals.	Open—2,800. Sparse—2,400. Medium—1,200. Dense—400.

[1] Rubble land in unit Cr and Rock outcrop in unit HkF were not rated.

TABLE 4.—*Suitability of the soils for elements*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil, which may listed in the first

Soil series and map symbols	Elements of wildlife habitat				
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood woody plants	Coniferous woody plants
Adaton: Ad	Poorly suited	Suited	Suited	Well suited	Poorly suited
Alikchi: AkB	Poorly suited	Suited	Suited	Well suited	Poorly suited
Alusa: As	Poorly suited	Suited	Suited	Suited	Poorly suited
*Bibb: Bk For Iuka part of Bk, see Iuka series.	Poorly suited	Poorly suited	Suited	Suited	Poorly suited
Blevins: BlB	Well suited	Well suited	Well suited	Suited	Poorly suited
Cadeville: CaC	Suited	Suited	Well suited	Suited	Poorly suited
*Cahaba: CbB, CbD, ChA, ChB, CkD3. For Tiak part of CkD3, see Tiak series.	Well suited where slopes are 0 to 5 percent; suited where slopes are 5 to 8 percent.	Well suited	Well suited	Well suited	Poorly suited
*Carnasaw: CmE, CnD For Goldston part of CmE and Zafra part of CnD, see Goldston and Zafra series.	Well suited where slopes are 1 to 5 percent; suited where slopes are 5 to 15 percent; poorly suited where slopes are 15 to 25 percent; unsuited where slopes are 25 to 45 percent.	Well suited where slopes are 1 to 15 percent; suited where slopes are 15 to 25 percent; poorly suited where slopes are 25 to 35 percent; unsuited where slopes are 35 to 45 percent.	Well suited	Well suited	Poorly suited
Caspiana: Cp	Well suited	Well suited	Well suited	Well suited	Poorly suited
Ceda: Cr Rubble land part of Cr not rated.	Unsuited	Poorly suited	Poorly suited	Suited	Poorly suited
Coushatta: Cs	Well suited	Well suited	Well suited	Well suited	Poorly suited
Elysian Mapped only in complex with Guyton and Wrightsville soils.	Well suited	Well suited	Well suited	Well suited	Poorly suited
Felker: FeA	Suited	Well suited	Well suited	Well suited	Poorly suited
Frizzell: Fr	Suited	Suited	Well suited	Well suited	Poorly suited
Gallion: Ga	Well suited	Well suited	Well suited	Well suited	Poorly suited
Garton: Gr	Well suited	Well suited	Well suited	Well suited	Poorly suited
*Goldston: GsE, GsF For Carnasaw and Sacul parts of GsE and GsF, see Carnasaw and Sacul series.	Unsuited	Poorly suited where slopes are 12 to 35 percent; unsuited where slopes are 35 to 45 percent.	Poorly suited	Suited	Suited

See footnote at end of table.

of wildlife habitat and kinds of wildlife

have different suitabilities for wildlife. For this reason the reader should follow carefully the instructions for referring to another series column of this table]

Elements of wildlife habitat—Continued			Kinds of wildlife		
Wetland food and cover plants	Shallow-water developments	Ponds	Openland	Woodland	Wetland
Well suited	Well suited where slopes are 0 to 1 percent; suited where slopes are 1 to 2 percent.	Suited [1]	Suited	Well suited	Well suited.
Well suited	Suited	Poorly suited	Suited	Well suited	Suited.
Well suited	Suited	Suited	Suited	Suited	Suited.
Well suited	Suited	Poorly suited.[1]	Poorly suited	Suited	Well suited.
Unsuited	Suited where slopes are 1 to 2 percent; poorly suited where slopes are 2 to 3 percent.	Suited	Well suited	Suited	Poorly suited.
Poorly suited where slopes are 2 to 3 percent; unsuited where slopes are 3 to 5 percent.	Unsuited	Suited	Suited	Suited	Unsuited.
Unsuited	Suited where slopes are 0 to 2 percent; poorly suited where slopes are 2 to 3 percent; unsuited where slopes are 3 to 8 percent.	Unsuited	Well suited	Well suited	Unsuited.
Unsuited	Suited where slopes are 1 to 2 percent; poorly suited where slopes are 2 to 3 percent; unsuited where slopes are 3 to 45 percent.	Suited	Suited where slopes are 1 to 15 percent; poorly suited where slopes are 15 to 25 percent; unsuited where slopes are 25 to 35 percent.	Well suited	Unsuited.
Unsuited	Suited	Suited	Well suited	Well suited	Poorly suited.
Unsuited	Unsuited	Unsuited	Poorly suited	Suited	Unsuited.
Unsuited	Suited	Suited	Well suited	Well suited	Poorly suited.
Unsuited	Unsuited	Suited	Well suited	Well suited	Unsuited.
Suited	Suited where slopes are 0 to 2 percent; poorly suited where slopes are 2 to 3 percent.	Suited	Well suited	Well suited	Suited.
Poorly suited	Suited	Well suited [1]	Suited	Well suited	Poorly suited.
Unsuited	Suited	Suited	Well suited	Well suited	Unsuited.
Poorly suited	Suited	Well suited	Well suited	Well suited	Poorly suited.
Unsuited	Unsuited	Unsuited	Poorly suited	Suited	Unsuited.

TABLE 4.—*Suitability of the soils for elements*

Soil series and map symbols	Elements of wildlife habitat				
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood woody plants	Coniferous woody plants
*Guyton: Gu, Gy. For Elysian part of Gy, see Elysian series.	Poorly suited	Poorly suited	Suited	Well suited	Poorly suited
Hector: HkF. Rock outcrop part of HkF not rated.	Unsuited	Poorly suited	Poorly suited	Suited	Suited
Hollywood: HoB, HoC	Suited	Suited	Suited	Well suited	Poorly suited
Idabel: Id	Well suited	Well suited	Well suited	Well suited	Poorly suited
Iuka. Mapped only in complex with Bibb soils.	Poorly suited	Suited	Suited	Well suited	Poorly suited
Kaufman: Ka, Kc	Ka suited; Kc poorly suited.	Poorly suited	Suited	Suited	Poorly suited
Kinta: KnA	Suited	Well suited	Well suited	Suited	Poorly suited
Kullit: KuB	Suited	Suited	Well suited	Well suited	Poorly suited
Latanier: La	Suited	Suited	Suited	Well suited	Poorly suited
Muskogee: MuB	Well suited	Well suited	Well suited	Well suited	Poorly suited
Newtonia: NeB	Well suited	Well suited	Well suited	Suited	Poorly suited
Ochlockonee: Oc	Suited	Suited	Well suited	Suited	Poorly suited
Oklared: Ok	Suited	Well suited	Well suited	Poorly suited	Poorly suited
Panola: Pa	Suited	Well suited	Well suited	Poorly suited	Poorly suited
*Pickens: PcE, PeB. For Alikchi part of PeB, see Alikchi series.	Poorly suited	Poorly suited	Suited	Suited	Suited
*Pledger: Pg, Pr. For Roebuck part of Pr, see Roebuck series.	Suited	Suited	Suited	Suited	Poorly suited
Redlake: Rd	Suited	Suited	Suited	Well suited	Poorly suited
*Rexor: Re, RgB. For Guyton part of RgB, see Guyton series.	Suited	Well suited	Well suited	Well suited	Poorly suited

See footnote at end of table.

of wildlife habitat and kinds of wildlife—Continued

Elements of wildlife habitat—Continued			Kinds of wildlife		
Wetland food and cover plants	Shallow-water developments	Ponds	Openland	Woodland	Wetland
Well suited	Gu poorly suited; Gy well suited	Suited [1]	Poorly suited	Well suited	Suited.
Unsuited	Unsuited	Unsuited	Poorly suited	Suited	Unsuited.
Poorly suited where slopes are 1 to 3 percent; unsuited where slopes are 3 to 5 percent.	Suited where slopes are 1 to 2 percent; poorly suited where slopes are 2 to 5 percent.	Suited	Suited	Well suited	Suited where slopes are 1 to 2 percent; poorly suited where slopes are 2 to 5 percent.
Unsuited	Poorly suited	Poorly suited [1]	Well suited	Well suited	Unsuited.
Poorly suited	Suited	Poorly suited [1]	Suited	Well suited	Suited.
Suited	Ka suited; Kc poorly suited	Ka suited [1]; Kc poorly suited.	Poorly suited	Suited	Suited.
Suited	Well suited where slopes are 0 to 1 percent; suited where slopes are 1 to 2 percent.	Well suited	Well suited	Suited	Suited.
Poorly suited	Unsuited	Well suited	Suited	Well suited	Unsuited.
Poorly suited	Suited	Suited [1]	Suited	Well suited	Suited.
Poorly suited	Suited where slopes are 1 to 2 percent; poorly suited where slopes are 2 to 5 percent.	Well suited	Well suited	Well suited	Poorly suited.
Unsuited	Suited where slopes are 1 to 2 percent; poorly suited where slopes are 2 to 5 percent.	Suited	Well suited	Suited	Unsuited.
Unsuited	Poorly suited	Unsuited	Suited	Suited	Poorly suited.
Unsuited	Poorly suited	Unsuited	Well suited	Poorly suited	Unsuited.
Unsuited	Well suited where slopes are 0 to 1 percent; suited where slopes are 1 to 2 percent.	Well suited	Well suited	Poorly suited	Unsuited.
Unsuited	Unsuited	Unsuited	Suited where slopes are 2 to 12 percent; poorly suited where slopes are 12 to 15 percent.	Suited	Unsuited.
Suited	Well suited	Well suited [1]	Suited	Suited	Suited.
Poorly suited	Unsuited	Well suited [1]	Suited	Well suited	Unsuited.
Unsuited	Suited	Suited [1]	Well suited	Well suited	Unsuited.

TABLE 4.—*Suitability of the soils for elements*

Soil series and map symbols	Elements of wildlife habitat				
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood woody plants	Coniferous woody plants
Roebuck: Rk	Rk poorly suited; Roebuck part of Pr suited.	Poorly suited	Suited	Rk suited; Roebuck part of Pr well suited.	Poorly suited.
Ruston: RuD, RuD2	Well suited where slopes are 3 to 5 percent; suited where slopes are 5 to 15 percent.	Well suited	Well suited	Suited	Poorly suited.
Sacul: SaE	Suited where slopes are 5 to 15 percent; poorly suited where slopes are 15 to 25 percent; unsuited where slopes are 25 to to 45 percent.	Well suited where slopes are 5 to 15 percent; suited where slopes are 15 to 25 percent; poorly suited where slopes are 25 to 35 percent; unsuited where slopes are 35 to 45 percent.	Well suited	Well suited	Poorly suited.
Saffell: SeC, SeE	Well suited where slopes are 1 to 5 percent; suited where slopes are 5 to 12 percent.	Well suited	Well suited	Well suited	Poorly suited.
Sallisaw: Sf	Well suited	Well suited	Well suited	Well suited	Poorly suited.
Severn: Sg	Well suited	Well suited	Well suited	Well suited	Poorly suited.
*Sherwood: ShB, ShC, SlC2, SmC, SmE. For Zafra part of SmC and SmE, see Zafra series.	Well suited where slopes are 1 to 5 percent; suited where slopes are 5 to 12 percent.	Well suited	Well suited	Well suited	Poorly suited.
Sumter: SuE	Well suited where slopes are 3 to 5 percent; suited where slopes are 5 to 12 percent.	Suited	Suited	Unsuited	Poorly suited.
*Swink: SwE For Hollywood part of SwE, see Hollywood series.	Unsuited	Suited	Poorly suited.	Poorly suited.	Poorly suited.
*Tiak: TfB, TfC, TfD, TkC, TkE. For Ruston part of TkC and TkE, see Ruston series.	Well suited where slopes are 1 to 5 percent; suited where slopes are 5 to 15 percent.	Well suited	Well suited	Well suited	Poorly suited.
Tomast: To	Suited	Suited	Well suited	Well suited	Poorly suited.
Tuscumbia: Tu	Poorly suited	Suited	Suited	Well suited	Poorly suited.
*Wrightsville: We For Elysian part of We, see Elysian series.	Poorly suited	Suited	Suited	Well suited	Poorly suited.
Zafra Mapped only in complex with Sherwood and Carnasaw soils.	Well suited where slopes are 1 to 5 percent; suited where slopes are 5 to 12 percent.	Suited	Well suited	Well suited	Poorly suited.

[1] Pond reservoir.

of wildlife habitat and kinds of wildlife—Continued

Elements of wildlife habitat—Continued			Kinds of wildlife		
Wetland food and cover plants	Shallow-water developments	Ponds	Openland	Woodland	Wetland
Rk well suited; Roebuck part of Pr suited.	Well suited	Well suited [1]	Rk poorly suited; Roebuck part of Pr suited.	Rk suited; Roebuck part of Pr well suited.	Rk well suited; Roebuck part of Pr suited.
Unsuited	Unsuited	Suited	Well suited	Suited	Unsuited.
Unsuited	Unsuited	Well suited	Well suited	Well suited	Unsuited.
Unsuited	Unsuited	Poorly suited	Well suited	Well suited	Unsuited.
Unsuited	Suited	Poorly suited [1]	Well suited	Well suited	Unsuited.
Unsuited	Poorly suited	Poorly suited [1]	Well suited	Well suited	Unsuited.
Unsuited	Suited where slopes are 1 to 2 percent; poorly suited where slopes are 2 to 3 percent; unsuited where slopes are more than 3 percent.	Suited	Well suited	Well suited	Unsuited.
Unsuited	Unsuited	Suited	Suited	Unsuited	Unsuited.
Unsuited	Unsuited	Unsuited	Poorly suited	Poorly suited	Unsuited.
Unsuited	Suited where slopes are 1 to 2 percent; poorly suited where slopes are 2 to 3 percent; unsuited where slopes are more than 3 percent.	Well suited	Well suited	Well suited	Unsuited.
Poorly suited	Well suited where slopes are 0 to 1 percent; suited where slopes are 1 to 2 percent.	Well suited	Suited	Well suited	Poorly suited.
Well suited	Well suited	Well suited [1]	Suited	Well suited	Well suited.
Suited	Well suited	Well suited [1]	Suited	Well suited	Suited.
Unsuited	Unsuited	Poorly suited	Suited	Well suited	Unsuited.

A soil that is 40 percent clay particles, for example, is called clay. Beginning with the largest, the particle sizes are designated as cobblestones, gravel, sand, silt, and clay. Rarely does a soil consist of particles of only one size, but in many places particles of one size are dominant. Soil texture is a characteristic closely associated with workability, fertility, permeability, erodibility, and other important soil characteristics.

Estimated soil properties significant to engineering

In table 5 the soil series of the county and their map symbols are listed and certain properties significant in engineering are described. Estimates in table 5 for the soils in the county that were tested are based on the test data listed in table 7. For the other soils, estimates are based on test data obtained from similar soils in the county and in other counties, and on past experience in engineering. Explanations of pertinent columns in table 5 are given in the following paragraphs.

In the column "Hydrologic soil group," the entire thickness of the soil profile shown in the table is considered. The soils are classified in four hydrologic groups—A, B, C, and D. The basis of the grouping is intake of water at the end of a long-duration storm, after prior wetting and opportunity for swelling, without consideration of the protective effect of vegetation. Group A consists of soils that have the lowest runoff potential. Group D consists of soils that have the highest runoff potential.

"Soil corrosivity, untreated steel pipe," pertains to potential soil-induced chemical action that dissolves or weakens uncoated steel. Rate of corrosion of uncoated steel is related to soil properties such as drainage, texture, total acidity, and electrical conductivity of the soil material. Installations of uncoated steel that intersect soil boundaries or soil horizons are more susceptible to corrosion than installations entirely in one kind of soil or in one soil horizon. A corrosivity rating of *low* means that there is a low probability of soil-induced corrosion damage. A rating of *high* means that there is a high probability of damage, so that protective measures for steel should be used to avoid or minimize damage. The shrink-swell potential indicates the change in volume to be expected when the moisture content changes. It is estimated primarily on the basis of the amount and kind of clay in a soil.

"Permeability," as used in the table, refers only to the downward movement of water through undisturbed soil material. The estimates are based on structure and porosity of the soil as it occurs in place. Such features as plowpans and surface crust were not considered.

"Available water capacity," given in terms of inches per inch of soil, is the approximate amount of capillary water in the soil when it is wet to field capacity. When the amount of moisture in the soil is at the wilting point of plants, the amount of water shown in the table will wet the soil material described to a depth of 1 inch without further percolation.

"Reaction" is expressed in terms of pH values. A pH of 4.5 to 5.0 indicates very strong acidity, and a pH of 9.1 or higher indicates very strong alkalinity.

Engineering interpretations of the soils

Table 6 gives engineering interpretations of the soils and estimates of their suitability for engineering uses. The data apply to the soil considered representative of the series. A detailed profile typical of each series is described in the section "Descriptions of the Soils." Some soil features are favorable for certain kinds of engineering work but unfavorable for others. Among the soil features for which suitability ratings are given are the following:

"Topsoil" is a term used to designate a fertile soil or soil material, ordinarily rich in organic matter, used as a topdressing for lawns, gardens, roadbanks, and the like. The ratings indicate suitability for such use.

"Sand and gravel" ratings are based on the probability that delineated areas of the soil contain deposits of sand and gravel. The ratings do not indicate quality or size of the deposits.

"Road fill," or subgrade, is the soil material on which a subbase is laid and the pavement is built. Suitability ratings are based on the performance of the soil material as subgrade when excavated and compacted or compacted in place.

Engineering test data

Table 7 gives test data for samples of four of the soil series of the county. Selected layers of the soils were sampled, and the samples were tested by the Oklahoma Department of Highways according to standard procedures. The samples tested were taken from profiles considered modal for the series. They do not represent all of the soils of McCurtain County, or even the maximum range of characteristics of each series sampled.

"Volume change from field moisture equivalent" is the volume change expressed as a percentage of the dry volume of the soil mass when the moisture content is reduced from the moisture equivalent to the shrinkage limit. The field moisture equivalent is the minimum moisture content at which a smooth soil surface will absorb no more water within 30 seconds when the water is added in individual drops. This is the moisture content required to fill all the pores in sands and to approach saturation in cohesive soils.

"Shrinkage limit" is the percent moisture at which a soil ceases to decrease in volume, even though additional moisture is removed.

"Shrinkage ratio" is the volume change expressed as the percentage of the volume of dry material divided by the loss of moisture caused by drying.

"Mechanical analyses data" show the percentages, by weight, of soil particles that would pass through sieves of specified sizes. Sand and other coarser materials do not pass through the No. 200 sieve. Silt and clay pass through the No. 200 sieve. Silt is that material larger than 0.002 millimeter in diameter that passes through the No. 200 sieve, and clay is that fraction passing through the No. 200 sieve that is smaller than 0.002 millimeter in diameter. The clay fraction was determined by the hydrometer method, rather than the pipette method that most soil scientists use in determining the clay in soil samples.

"Liquid limit" and "Plasticity index" indicate the ef-

fect of water on the strength and consistence of soil material. As the moisture content of a clayey soil is increased from a dry state, the material changes from a solid to a plastic state. If the moisture content is further increased, the material changes from a plastic to a liquid state. The plastic limit is the moisture content at which the soil material passes from solid to plastic. The liquid limit is the moisture content at which the material changes from plastic to liquid. The plasticity index is the numerical difference between the liquid limit and the plastic limit. It indicates the range of moisture content within which a soil material is plastic.

Town and country planning

In table 8 the soils of the county are rated for several uses for town and country planning. The terms *slight*, *moderate*, and *severe* express the degree of difficulty to be expected in overcoming the limitations. The rating is *slight* if there are no serious limitations. It is *moderate* if the difficulty needs to be recognized but it can be either overcome or corrected. It is *severe* if the limitations present serious problems and the use of the soils for a particular purpose is questionable.

Formation and Classification of Soils

Discussed in this section are the five major factors of soil formation, some of the active processes that take place in soils of the county, and the classification of the soils by higher categories.

Formation of Soils

Soil is the product of five major factors of soil formation—climate, plants and animals (especially plants), parent material, relief, and time. If a factor such as climate vegetation differs in one area from the same factor in another area but the other four factors are the same, the soil formed in one area differs from that formed in the other area.

Climate

McCurtain County has a humid, warm, moist, subtropical climate that is characterized by rains of high intensity. The summers are hot, and the humidity is generally high. Winters are mild but well defined. Seasonal changes are gradual. The greatest amount of rain is in spring. Autumn is the driest season. The warm, humid climate has caused most of the soils on terraces and uplands to be strongly weathered, leached, and acid. Differences in normal soils cannot be attributed to climate, however, because the climate is uniform throughout the county.

Detailed information about the average temperatures and distribution of rainfall are given in the section "General Nature of the County."

Plants and animals

Plants, burrowing animals, insects, and soil microorganisms have a direct influence on the formation of soils. The trees and native grasses have had different effects on the losses and gains of organic matter and plant nutrients, and on soil structure and porosity.

Before the settlement of the county, the native vegetation was most important in the complex of living organisms that affect soil development. Trees, grasses, or a combination of both have a bearing on the amount of organic matter and on the amounts and kinds of plant nutrients as well as the type of soil structure and consistence. The principal native vegetation on the soils on uplands, such as those in the Felker series, was a mixture of southern pines and hardwoods. The soils on flood plains of the Red River, such as those of the Idabel series, had native vegetation consisting of southern hardwoods.

The acid, well-drained soils on flood plains, such as Rexor and Ochlockonee, had native vegetation consisting of a mixture of southern pines and hardwoods. Water-tolerant hardwoods were present on the poorly drained Guyton soils. Soils that formed in material weathered from limestone and calcareous shales, such as the Newtonia and Panola, are referred to as prairie areas. They were covered with native, mid, and tall grasses, mostly bluestem, indiangrass, legumes, and scattered clumps of elm and osageorange, and various shrubs. McCurtain County has more soils that formed under trees than soils that formed under grasses. The Ruston, Tiak, and Felker soils formed under trees and are lower in plant nutrients and organic matter than those that formed under grasses, such as the Hollywood soils.

The different types of native vegetation are generally associated with differences in soil properties. The early settlers used native vegetation as an indicator of soil capability and suitability for farm uses.

During the past 140 years, man has altered this soil-forming process by removing the native vegetation over part of the county. Lack of adequate conservation measures on these soils cleared of native vegetation have resulted in soil loss through sheet and gully erosion. Where most of the surface layer has been removed or many gullies formed, eroded phases of soils are mapped. Also, the soils have been depleted of organic matter and soil nutrients. An example is Cahaba and Tiak soils, 2 to 8 percent slopes, severely eroded.

Parent material

Parent material is the material that we presume to be like that from which a given soil was formed. It is one of the influential factors of soil formation in McCurtain County. It sets the limits of the chemical and mineralogical composition of the soil and influences the rate of soil development.

McCurtain County has many kinds of parent materials, all producing different soils but not to the exclusion of the other soil-forming factors. Soils that formed from shale, such as Carnasaw, have a clayey subsoil. Those that formed from sandstone, such as Sherwood, have a loamy subsoil.

A large area of the county is made up of soils such as Kinta and Ruston that formed in clayey and loamy marine sediment.

TABLE 5.—*Estimated soil properties*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil, which may
column of this table. > means

Soil series and map symbols	Hydrologic soil group	Soil corrosivity untreated steel pipe	Depth to—		Depth from surface in representative profile	Classification
			Bedrock	Seasonal high water table		USDA texture
			Inches	*Feet*	*Inches*	
Adaton: Ad	D	High	>72	0–1	0–12	Loam
					12–47	Clay loam, silty clay loam
					47–79	Clay, clay loam
Alikchi: AkB	B	High	20–40	0–1	0–12	Loam
					12–31	Silty clay loam, silt loam
					31	Shale.
Alusa: As	D	High	>72	0–1	0–9	Loam
					9–54	Clay, silty clay, clay loam, silty clay loam.
					54–72	Clay
*Bibb: Bk For Iuka part of Bk, see Iuka series.	B/D	High	>72	0–1	0–68	Fine sandy loam is average texture of stratified layers.
Blevins: BlB	B	Moderate.	>72	3–6	0–12	Fine sandy loam
					12–70	Loam, sandy clay loam, clay loam.
Cadeville: CaC	D	High	>60	2–3	0–7	Loam
					7–43	Clay, silty clay
					43–68	Clay
*Cahaba: CbB, CbD	B	Moderate.	>72	>6	0–16	Loamy fine sand
					16–54	Loam, sandy clay loam, clay loam.
					54–72	Fine sandy loam
ChA, ChB, CkD3 For Tiak part of CkD3, see Tiak series.	B	Moderate.	>72	>6	0–12	Fine sandy loam
					12–42	Clay loam, loam, sandy clay loam.
					42–65	Fine sandy loam
*Carnasaw: CmE, CnD For Goldston part of unit CmE, see Goldston series; for Zafra part of unit CnD, see Zafra series.	C	High	40–60	>6	0–9	Loam, fine sandy loam, silt loam
					9–15	Silty clay loam, clay, clay loam
					15–42	Silty clay, clay
					42	Shale.
Caspiana: Cp	B	Moderate.	>72	>6	0–18	Loam
					18–32	Silty clay loam, silt loam
					32–48	Loam
					48–70	Very fine sandy loam, loam, silty clay loam.
Ceda: Cr Properties not estimated for Rubble land part of Cr.	B	Low	>72	>6	0–9	Loam, gravelly loam
					9–65	Gravelly and very gravelly counterparts of loam, silt loam, clay loam, fine sandy loam.
Coushatta: Cs	B	Moderate.	>72	>6	0–8	Silty clay loam
					8–27	Silty clay loam, silt loam
					27–60	Silt loam, very fine sandy loam
Elysian Mapped only in complex with Guyton and Wrightsville soils.	B	Low	>72	2–3	0–29	Fine sandy loam
					29–72	Loam

significant to engineering

have different properties. For this reason the reader should follow carefully the instructions for referring to another series listed in the first more than, < means less than]

Classification—Continued		Coarse fraction greater than 3 inches	Percentage less than 3 inches passing sieve—				Permeability	Available water capacity	Reaction	Shrink-swell potential
Unified	AASHO		No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)				
		Percent					*Inches/hour*	*Inches/inch of soil*	*pH*	
ML-CL, CL	A-4	0	100	100	90-100	65-85	0. 6-2. 0	0. 15-0. 19	5. 1-6. 5	Low.
CL	A-6, A-7	0	100	100	96-100	75-95	0. 06-0. 2	0. 18-0. 22	5. 1-6. 5	Moderate.
CL, CH	A-7	0	100	100	94-100	75-98	0. 06-0. 2	0. 14-0. 22	5. 1-6. 5	High.
ML-CL, CL	A-4	0	100	100	90-100	65-85	0. 6-2. 0	0. 15-0. 19	5. 1-6. 0	Low.
CL, ML	A-6, A-4	0	100	100	97-100	85-95	0. 06-0. 2	0. 17-0. 22	5. 1-7. 3	Moderate.
ML-CL, CL	A-4	0	100	100	90-100	65-85	0. 6-2. 0	0. 15-0. 19	5. 1-6. 0	Low.
CL, CH	A-7	0	100	100	94-100	75-98	<0. 06	0. 14-0. 22	4. 5-7. 3	High.
CL, CH	A-7	0	100	100	94-100	90-98	<0. 06	0. 14-0. 18	7. 4-8. 4	High.
SM, ML	A-4	0	100	100	85-98	36-60	0. 6-2. 0	0. 10-0. 14	4. 5-5. 5	Low.
SM, ML	A-4	0	100	100	85-100	36-60	0. 6-2. 0	0. 10-0. 14	5. 1-6. 0	Low.
CL, ML-CL	A-4, A-6	0	100	100	90-100	55-90	0. 6-2. 0	0. 15-0. 22	4. 5-6. 0	Low and moderate.
ML-CL, CL	A-4	0	100	100	90-100	65-85	0. 6-2. 0	0. 15-0. 19	4. 5-6. 0	Low.
CH, MH	A-7	0	100	100	96-100	90-95	<0. 06	0. 14-0. 18	4. 5-8. 4	High.
CH, MH	A-7	0	100	100	94-100	90-98	<0. 06	0. 14-0. 18	5. 6-8. 4	High.
SM	A-2	0	100	100	90-98	13-30	2. 0-6. 0	0. 06-0. 10	5. 1-6. 0	Low.
CL, SC	A-4	0	100	100	90-100	45-85	0. 6-2. 0	0. 15-0. 22	4. 5-6. 0	Low.
SM, ML	A-4	0	100	100	85-95	36-60	2. 0-6. 0	0. 10-0. 14	4. 5-5. 0	Low.
SM, ML	A-4	0	100	100	85-100	36-71	0. 6-2. 0	0. 10-0. 14	5. 1-6. 0	Low.
CL, ML-CL	A-4, A-6	0	100	100	90-100	55-85	0. 6-2. 0	0. 15-0. 22	4. 5-6. 0	Moderate and low.
SM, ML	A-4	0	100	100	85-100	36-60	2. 0-6. 0	0. 10-0. 14	4. 5-5. 0	Low.
SM, ML	A-4	0	100	100	90-100	45-85	0. 6-2. 0	0. 10-0. 21	5. 1-6. 0	Low.
CL	A-6, A-7	0	100	100	97-100	80-95	0. 20-0. 6	0. 14-0. 22	4. 5-5. 5	Moderate.
CL, CH	A-7	0-5	95-100	80-100	75-100	70-98	0. 06-0. 2	0. 14-0. 18	4. 5-5. 5	High.
CL, ML-CL	A-4	0	100	100	90-100	75-90	0. 6-2. 0	0. 15-0. 19	6. 1-7. 3	Low.
CL, ML	A-6, A-4	0	100	100	97-100	80-95	0. 2-0. 6	0. 17-0. 22	6. 1-8. 4	Moderate and low.
ML-CL	A-4	0	100	100	90-100	65-85	0. 6-2. 0	0. 15-0. 19	6. 1-8. 4	Low.
ML, ML-CL, CL	A-4, A-6	0	100	100	90-100	60-90	0. 6-2. 0	0. 13-0. 22	6. 6-8. 4	Low and moderate.
SM, GM, ML	A-2, A-4	0-10	55-95	50-90	50-70	30-60	6. 0-20. 0	0. 06-0. 08	5. 6-6. 5	Low.
GM, GC	A-2	5-25	30-50	30-50	30-50	20-35	6. 0-20. 0	0. 06-0. 07	5. 6-6. 5	Low.
CL	A-6	0	100	100	98-100	90-98	0. 2-0. 6	0. 18-0. 22	6. 1-7. 3	Moderate.
CL, ML	A-6, A-4	0	100	100	97-100	80-95	0. 2-0. 6	0. 17-0. 22	7. 9-8. 4	Moderate and low.
ML, CL	A-4	0	100	100	94-100	60-90	0. 6-2. 0	0. 13-0. 21	7. 9-8. 4	Low.
SM, ML	A-4	0	100	100	85-95	36-60	0. 6-2. 0	0. 10-0. 14	4. 5-6. 5	Low.
ML-CL	A-4	0	100	100	90-100	55-85	0. 6-2. 0	0. 15-0. 19	4. 5-6. 0	Low.

TABLE 5.—*Estimated soil properties*

Soil series and map symbols	Hydrologic soil group	Soil corrosivity untreated steel pipe	Depth to—		Depth from surface in representative profile	Classification
			Bedrock	Seasonal high water table		USDA texture
			Inches	*Feet*	*Inches*	
Felker: FeA	D	High	>72	2-3	0-10 10-70	Loam Silty clay loam, silt loam, loam, clay loam.
Frizzell: Fr	C	High	>72	2-3	0-10 10-45 45-70	Loam Silt loam, loam Loam, silt loam, silty clay loam, clay loam
Gallion: Ga	B	Moderate.	>72	>6	0-18 18-40 40-80	Very fine sandy loam Loam, sandy clay loam Very fine sandy loam, loam, clay loam.
Garton: Gr	C	High	>72	2-3	0-6 6-17 17-42 42-75	Silt loam Silty clay loam, clay loam Silty clay loam, clay loam, silty clay, clay. Loam, clay loam
*Goldston: GsE, GsF For Carnasaw and Sacul parts of units GsE and GsF, see Carnasaw and Sacul series.	C	Moderate.	20-40	>6	0-4 4-24 24	Gravelly counterparts of loam, silt loam. Gravelly and very gravelly counterparts of loam, silt loam. Shale.
*Guyton: Gu, Gy For Elysian part of unit Gy, see Elysian series.	D	High High	>72	0-1	0-4 4-16 16-70	Silt loam Silt loam, very fine sandy loam Silty clay loam, silt loam, clay loam.
Hector: HkF Properties not estimated for Rock outcrop part of HkF	D	Low	8-20	>6	0-12 12	Gravelly fine sandy loam Sandstone.
Hollywood: HoB, HoC	D	High	>72	>6	0-30 30-68	Silty clay Silty clay, clay
Idabel: Id	B	Low	>72	>6	0-6 6-20 20-60	Silt loam Loam, silt loam, very fine sandy loam. Very fine sandy loam is average of strata.
Iuka Mapped only in complex with Bibb soils.	C	Moderate.	>72	1-3	0-65	Fine sandy loam is average of strata.
Kaufman: Ka, Kc	D	High	>72	3-5	0-18 18-65	Clay Clay, silty clay
Kinta: KnA	D	High	>72	1-2	0-8 8-72	Clay loam Clay, silty clay, clay loam, silty clay loam.
Kullit: KuB	B	Moderate.	>72	2-3	0-16 16-54 54-72	Fine sandy loam Sandy clay loam, loam, clay loam. Sandy clay, clay
Latanier: La	D	High	>72	1-2	0-28 28-70	Clay, silty clay Very fine sandy loam, fine sandy loam.

significant to engineering—Continued

Classification—Continued		Coarse fraction greater than 3 inches	Percentage less than 3 inches passing sieve—				Permeability	Available water capacity	Reaction	Shrink-swell potential
Unified	AASHO		No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)				
		Percent					*Inches/hour*	*Inches/inch of soil*	*pH*	
ML-CL, CL	A-4	0	100	100	96-100	65-85	0. 6-2. 0	0. 15-0. 19	4. 5-6. 0	Low.
CL, ML-CL	A-6, A-4	0	100	100	97-100	70-95	0. 2-0. 6	0. 15-0. 22	4. 5-5. 5	Moderate and low.
CL, ML-CL	A-4	0	100	100	96-100	65-85	0. 2-0. 6	0. 15-0. 19	4. 5-5. 5	Low.
CL, ML	A-4	0	100	100	96-100	65-90	0. 06-0. 2	0. 15-0. 21	4. 5-5. 5	Low.
CL, ML-CL	A-4, A-6	0	100	100	96-100	65-95	0. 06-0. 2	0. 15-0. 22	4. 5-5. 5	Low and moderate.
ML	A-4	0	100	100	96-100	50-75	0. 6-2. 0	0. 13-0. 17	5. 6-7. 3	Low.
ML-CL, SC	A-4	0	100	100	90-100	40-80	0. 6-2. 0	0. 15-0. 19	5. 6-7. 3	Low.
ML, CL	A-4, A-6	0	100	100	90-100	50-85	0. 6-2. 0	0. 13-0. 22	6. 1-7. 8	Low and moderate.
ML, CL	A-4, A-6	0	100	100	96-100	75-90	0. 6-2. 0	0. 17-0. 21	6. 1-7. 3	Low.
CL	A-6, A-7	0	100	100	97-100	85-95	0. 06-0. 2	0. 18-0. 22	6. 1-7. 3	Moderate and high.
CL, CH	A-6, A-7	0	100	100	97-100	75-95	0. 06-0. 2	0. 14-0. 22	6. 1-7. 8	Moderate and high.
ML-CL, CL	A-4, A-6	0	100	100	90-100	65-90	0. 6-2. 0	0. 15-0. 22	6. 6-7. 8	Low and moderate.
SM	A-2	0-5	50-65	50-65	30-40	20-35	2. 0-6. 0	0. 09-0. 13	5. 1-6. 0	Low.
GM, GC	A-2	0-10	30-50	25-40	25-40	15-30	2. 0-6. 0	0. 06-0. 10	4. 5-5. 5	Low.
CL, ML-CL	A-4	0	100	100	96-100	80-95	0. 2-0. 6	0. 17-0. 21	5. 1-6. 0	Low.
CL, ML	A-4	0	100	100	96-100	65-90	0. 2-0. 6	0. 13-0. 21	4. 5-5. 5	Low.
CL, ML, ML-CL	A-4, A-6	0	100	100	97-100	75-95	<0. 06	0. 17-0. 22	4. 5-5. 5	Moderate and low.
SM	A-2	0-5	75-85	70-85	60-80	15-35	6. 0-20. 0	0. 7-0. 11	4. 5-6. 0	Low.
CL, CH	A-7	0	100	100	97-100	93-98	<0. 06	0. 14-0. 18	6. 1-8. 4	High.
CL, CH	A-7	0	100	100	96-100	90-99	<0. 06	0. 14-0. 18	7. 4-8. 4	High.
ML, CL	A-4	0	100	100	95-100	75-90	2. 0-6. 0	0. 17-0. 21	6. 6-7. 8	Low.
ML, CL	A-4	0	100	100	94-100	60-90	2. 0-6. 0	0. 13-0. 21	7. 4-8. 4	Low.
ML	A-4	0	100	100	94-100	50-80	2. 0-6. 0	0. 13-0. 17	7. 4-8. 4	Low.
SM, ML	A-4	0	100	100	90-98	36-60	0. 6-2. 0	0. 10-0. 14	4. 5-6. 0	Low.
MH, CH	A-7	0	100	100	97-100	90-98	<0. 06	0. 14-0. 18	6. 1-8. 4	High.
MH, CH	A-7	0	100	100	97-100	93-98	<0. 06	0. 14-0. 18	6. 1-8. 4	High.
CL	A-6, A-7	0	100	100	97-100	75-95	0. 2-0. 6	0. 18-0. 22	4. 5-5. 5	Moderate.
CL, CH	A-7	0	100	100	94-100	85-98	<0. 06	0. 14-0. 22	4. 5-5. 5	High.
SM, ML, CL, SC	A-4	0	100	100	90-98	36-60	0. 6-2. 0	0. 10-0. 14	5. 1-6. 5	Low.
SC, CL	A-4, A-6	0	100	100	96-100	55-80	0. 6-2. 0	0. 15-0. 22	4. 5-5. 5	Low and moderate.
CL, CH	A-7	0	100	100	90-100	55-90	0. 2-0. 6	0. 14-0. 19	4. 5-5. 5	Moderate and low.
CH	A-7	0	100	100	96-100	90-98	<0. 06	0. 14-0. 18	7. 4-8. 4	High.
ML, SM	A-4	0	100	100	94-100	40-70	0. 6-2. 0	0. 10-0. 17	7. 9-8. 4	Low.

TABLE 5.—*Estimated soil properties*

Soil series and map symbols	Hydrologic soil group	Soil corrosivity untreated steel pipe	Depth to—		Depth from surface in representative profile	Classification
			Bedrock	Seasonal high water table		USDA texture
			Inches	*Feet*	*Inches*	
Muskogee: MuB	C	High	>72	1–2	0–8	Loam
					8–26	Loam, clay loam
					26–36	Clay loam, clay
					36–80	Clay
Newtonia: NeB	B	Moderate.	>72	>6	0–9	Silt loam
					9–16	Silty clay loam, loam
					16–65	Silty clay loam, silty clay
					65–72	Silty clay, clay
Ochlockonee: Oc	B	Low	>72	>6	0–70	Fine sandy loam
Oklared: Ok	B	Low	>72	4–6	0–14	Very fine sandy loam
					14–60	Fine sandy loam is stratified average.
Panola: Pa	D	High	>72	0–1	0–8	Silty clay loam
					8–20	Silty clay loam, clay, silty clay
					20–72	Clay
*Pickens: PcE, PeB For Alikchi part of unit PeB, see Alikchi series.	D	Low	10–20	>6	0–10	Shaly silt loam, shaly loam
					10–17	Very shaly and shaly counterparts of silt loam, loam, clay loam, silty clay loam.
					17	Hard shale.
*Pledger: Pg, Pr For Roebuck part of unit Pr, see Roebuck series.	D	High	>72	3–6	0–45	Clay
					45–72	Clay loam is stratified average
Redlake: Rd	D	High	>72	3–6	0–8	Clay
					8–42	Clay, silty clay
					42–72	Clay loam is stratified average
*Rexor: Re, RgB For Guyton part of unit RgB, see Guyton series.	A	Moderate.	>72	>6	0–10	Loam
					10–48	Clay loam, silty clay loam, loam, silt loam.
					48–70	Silt loam, loam
Roebuck: Rk	D	High	>72	2–3	0–66	Clay
Ruston: RuD, RuD2	B	Moderate.	>72	>6	0–9	Fine sandy loam, gravelly sandy loam, gravelly loam.
					9–72	Loam, sandy clay loam, clay loam.
Sacul: SaE	D	High	>72	2–3	0–5	Loam, fine sandy loam
					5–44	Clay, silty clay
					44–65	Silty clay loam and shale
					65	Shale.
Saffell: SeC, SeE	B	Low	>60	>6	0–8	Gravelly fine sandy loam
					8–32	Gravelly and very gravelly counterparts of sandy clay loam and loam.
					32–60	Gravelly and very gravelly counterparts of fine sandy loam, loam, sandy clay loam.

significant to engineering—Continued

Classification—Continued		Coarse fraction greater than 3 inches	Percentage less than 3 inches passing sieve—				Permeability	Available water capacity	Reaction	Shrink-swell potential
Unified	AASHO		No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)				
		Percent					*Inches/hour*	*Inches/inch of soil*	*pH*	
ML-CL	A-4	0	100	100	96-100	65-85	0. 6-2. 0	0. 15-0. 19	5. 1-6. 0	Low.
ML-CL, CL	A-4, A-6	0	100	100	96-100	65-85	0. 2-0. 6	0. 15-0. 22	5. 1-6. 0	Low and moderate.
CL, CH	A-6, A-7	0	100	100	97-100	75-95	0. 06-0. 2	0. 14-0. 22	5. 1-6. 0	Moderate and high.
CL, CH	A-7	0	100	100	94-100	90-98	0. 06-0. 2	0. 14-0. 18	5. 1-7. 8	High.
ML, CL	A-4	0	100	100	96-100	75-90	0. 6-2. 0	0. 17-0. 21	5. 6-6. 5	Low.
CL, ML-CL	A-4, A-6	0	100	100	96-100	80-95	0. 6-2. 0	0. 15-0. 22	5. 1-6. 5	Moderate.
CL, CH	A-7, A-6	0	100	100	94-100	80-98	0. 6-2. 0	0. 14-0. 22	5. 1-6. 5	High.
CL, CH	A-7	0	100	100	96-100	90-98	0. 6-2. 0	0. 14-0. 18	5. 6-7. 8	High.
SM, ML	A-4	0	100	100	90-98	36-60	2. 0-6. 0	0. 10-0. 14	4. 5-5. 5	Low.
ML	A-4	0	100	100	90-98	50-75	2. 0-6. 0	0. 13-0. 17	7. 4-8. 4	Low.
SM, ML	A-4	0	100	100	90-98	36-60	2. 0-6. 0	0. 10-0. 14	7. 4-8. 4	Low.
CL	A-6	0	100	100	97-100	90-98	0. 2-0. 6	0. 10-0. 22	5. 1-6. 5	Moderate.
CL, CH	A-6, A-7	0	100	100	97-100	85-95	0. 2-0. 6	0. 14-0. 22	4. 5-6. 5	Moderate and high.
CL, CH	A-7	0	100	100	94-100	90-98	<0. 06	0. 14-0. 18	5. 1-7. 8	High.
SM, ML	A-4	0-10	50-70	50-70	45-65	36-60	0. 6-2. 0	0. 10-0. 14	5. 1-6. 5	Low.
GM, SM	A-2	5-25	20-70	15-65	10-60	10-35	0. 6-2. 0	0. 06-0. 10	4. 5-6. 0	Low.
MH, CH	A-7	0	100	100	94-100	90-98	<0. 06	0. 14-0. 18	6. 1-8. 4	High.
CL	A-6, A-7	0	100	100	97-100	75-95	0. 2-0. 6	0. 18-0. 22	7. 8-8. 4	Moderate.
CL, CH	A-7	0	100	100	94-100	90-98	<0. 06	0. 14-0. 18	7. 4-8. 4	High.
CL, CH	A-7	0	100	100	94-100	93-98	<0. 06	0. 14-0. 18	7. 4-8. 4	High.
CL	A-6, A-7	0	100	100	97-100	75-95	0. 2-0. 6	0. 18-0. 22	7. 4-8. 4	Moderate.
ML-CL	A-4	0	100	100	90-100	65-85	0. 6-2. 0	0. 15-0. 19	5. 1-6. 0	Low.
CL, ML-CL	A-6, A-4	0	100	100	97-100	75-95	0. 6-2. 0	0. 15-0. 22	4. 5-6. 0	Moderate and low.
ML, CL-ML	A-4	0	100	100	96-100	75-90	0. 6-2. 0	0. 15-0. 21	4. 5-6. 0	Low.
CL, CH	A-7	0	100	100	94-100	90-98	<0. 06	0. 14-0. 18	6. 6-8. 4	High.
SM, ML	A-4	0	95-100	80-100	80-98	36-60	0. 6-2. 0	0. 08-0. 14	5. 1-6. 0	Low.
SC, CL	A-4, A-6	0	95-100	90-100	90-100	40-75	0. 6-2. 0	0. 15-0. 22	4. 5-5. 5	Low and moderate.
ML	A-4	0-2	90-100	85-100	80-100	50-70	0. 6-2. 0	0. 10-0. 19	5. 1-6. 0	Low.
MH, CH	A-7	0-5	95-100	90-100	90-100	85-98	0. 06-0. 2	0. 14-0. 22	4. 5-5. 5	High.
CL	A-6	0-10	75-95	70-90	70-85	65-80	0. 6-2. 0	0. 11-0. 15	4. 5-5. 5	Moderate and low.
SM, ML	A-2, A-4	0-2	75-90	75-85	40-60	20-55	2. 0-6. 0	0. 08-0. 12	5. 1-6. 0	Low.
GC, SC	A-1, A-2	0-5	30-70	20-65	20-60	15-35	0. 6-2. 0	0. 08-0. 12	4. 5-5. 5	Low.
GM, SC, GC	A-1, A-2	0-5	20-70	10-65	10-60	5-35	6. 0-20. 0	0. 05-0. 09	4. 5-5. 0	Low.

TABLE 5.—*Estimated soil properties*

Soil series and map symbols	Hydrologic soil group	Soil corrosivity untreated steel pipe	Depth to—		Depth from surface in representative profile	Classification
			Bedrock	Seasonal high water table		USDA texture
			Inches	*Feet*	*Inches*	
Sallisaw: Sf	B	Low	>72	>6	0–12	Loam
					12–38	Loam, clay loam
					38–50	Sandy clay loam, clay loam, loam.
					50–72	Gravelly and very gravelly counterparts of sandy clay loam, loam, clay loam.
Severn: Sg	B	Low	>72	>6	0–60	Very fine sandy loam is stratified average.
*Sherwood: ShB, ShC, SIC2, SmC, SmE. For Zafra part of units SmC and SmE, see Zafra series.	B	Low	30–60	>6	0–12	Fine sandy loam, loam
					12–30	Clay loam, loam, sandy clay loam.
					30–50	Loam, clay loam, sandy clay loam and their gravelly counterparts.
					50	Sandstone.
Sumter: SuE	C	High	20–40	>6	0–7	Silty clay loam
					7–29	Silty clay loam, silty clay
					29–50	Chalk and marly clay.
*Swink: SwE. For Hollywood part of unit SwE, see Hollywood series.	D	High	6–20	>6	0–16	Clay, silty clay, silty clay loam
					16	Limestone.
*Tiak: TfB, TfC, TfD, TkC, TkE. For Ruston part of units TkC and TkE, see Ruston series.	C	High	>60	2–3	0–8	Fine sandy loam, gravelly sandy loam.
					8–26	Clay, clay loam
					26–68	Clay
Tomast: To	C	High	72	0–1	0–6	Silt loam
					6–28	Silty clay loam, clay loam
					28–80	Silty clay, silty clay loam, clay
Tuscumbia: Tu	D	High	>72	0–1	0–7	Clay
					7–38	Clay, silty clay
					38–70	Clay
*Wrightsville: We. Mapped only in complex with Elysian soils.	D	High	>72	0–1	0–7	Silt loam, very fine sandy loam
					7–70	Silty clay, clay, silty clay loam
					70	Sandy clay loam, clay, silty clay loam.
*Zafra. Mapped only in complex with Carnasaw and Sherwood soils.	B	Low	20–56	>6	0–10	Loam, fine sandy loam
					10–15	Loam, gravelly loam
					15–38	Gravelly and very gravelly counterparts of loam, sandy clay loam, clay loam.
					38	Sandstone.

significant to engineering—Continued

Classification—Continued		Coarse fraction greater than 3 inches	Percentage less than 3 inches passing sieve—				Permeability	Available water capacity	Reaction	Shrink-swell potential
Unified	AASHO		No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)				
		Percent					*Inches/hour*	*Inches/inch of soil*	*pH*	
CL, ML–CL	A–4	0	100	100	90–100	65–85	0. 6–2. 0	0. 15–0. 19	5. 1–6. 5	Low.
ML–CL, CL	A–4, A–6	0	100	100	90–100	65–90	0. 6–2. 0	0. 15–0. 22	5. 1–6. 0	Low and moderate.
SC, CL	A–4, A–6	0	100	100	90–100	40–80	0. 6–2. 0	0. 15–0. 22	5. 1–6. 0	Low and moderate.
GC, GP–GC	A–1, A–2	0–5	20–50	10–65	10–50	5–35	6. 0–20. 0	0. 08–0. 12	5. 1–6. 0	Low.
ML	A–4	0	100	100	90–100	50–75	2. 0–6. 0	0. 13–0. 17	7. 4–8. 4	Low.
SM, ML	A–4	0	100	100	90–100	36–70	2. 0–6. 0	0. 10–0. 19	4. 5–6. 0	Low.
CL, ML, SC	A–6, A–4	0	100	100	90–100	45–85	0. 6–2. 0	0. 15–0. 22	4. 5–5. 5	Moderate and low.
SM, ML	A–2, A–4	0–5	75–95	75–90	65–80	30–65	0. 6–2. 0	0. 10–0. 22	4. 5–5. 5	Low.
CL	A–6	0	100	100	97–100	90–98	0. 06–0. 2	0. 18–0. 22	7. 9–8. 4	Moderate.
CL	A–6, A–7	0	100	100	97–100	85–95	0. 06–0. 2	0. 14–0. 22	7. 9–8. 4	Moderate and high.
CH, CL	A–7	0	100	100	94–100	90–98	0. 06–0. 2	0. 07–0. 12	6. 6–8. 4	High.
SM, ML	A–4	0	85–100	80–100	80–98	36–60	0. 6–2. 0	0. 07–0. 14	4. 5–6. 0	Low.
CL, CH	A–7	0	100	100	90–100	90–98	0. 06–0. 2	0. 14–0. 22	4. 5–5. 0	High.
CH	A–7	0	100	100	96–100	83–98	0. 06–0. 2	0. 14–0. 18	4. 5–5. 0	High.
ML, CL	A–4	0	100	100	96–100	80–95	0. 6–2. 0	0. 17–0. 21	4. 5–6. 5	Low.
CL	A–6, A–7	0	100	100	97–100	71–95	0. 06–0. 2	0. 18–0. 22	4. 5–5. 5	Moderate.
CL, CH, MH–CH	A–7	0	100	100	97–100	74–98	0. 06–0. 2	0. 14–0. 22	4. 5–5. 5	High.
MH, CH	A–7	0	100	100	94–100	90–98	<0. 06	0. 14–0. 18	5. 1–6. 0	High.
MH, CH	A–7	0	100	100	94–100	93–98	<0. 06	0. 14–0. 18	5. 6–8. 4	High.
MH, CH	A–7	0	100	100	94–100	90–98	<0. 06	0. 14–0. 18	6. 1–8. 4	High.
ML, CL	A–4	0	100	100	96–100	65–90	0. 06–0. 2	0. 13–0. 21	4. 5–5. 5	Low.
CL, CH, MH	A–7	0	100	100	97–100	90–98	0. 06–0. 2	0. 14–0. 22	4. 5–7. 8	High.
SC, CL	A–4, A–6, A–7	0	100	100	90–100	40–90	0. 2–0. 6	0. 14–0. 22	7. 4–8. 4	Low, moderate and high.
SM, ML	A–4	0–2	85–95	80–95	75–90	36–75	0. 6–2. 0	0. 10–0. 19	5. 1–6. 0	Low.
ML–CL	A–4	0–2	70–90	70–90	65–85	50–75	0. 6–2. 0	0. 10–0. 19	4. 5–6. 0	Low.
GM, GC, SM	A–1, A–2	0–5	35–65	30–60	20–50	10–35	0. 6–2. 0	0. 10–0. 15	4. 5–5. 5	Low.

TABLE 6.—*Interpretations of*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil, which may to another series listed in

Soil series and map symbols	Suitability as a source of—			Soil features affecting—
	Topsoil	Sand and gravel	Road fill	Highway location
Adaton: Ad	Fair: limited quantity of suitable material; poorly drained.	Poor: fine-grained material.	Poor: poorly drained.	Seasonal water table at a depth of 0 to 1 foot.
Alikchi: AkB	Fair: limited quantity of suitable material; poorly drained.	Poor: fine-grained material.	Poor: poorly drained.	Seasonal water table at a depth of 0 to 1 foot; bedrock at a depth of 20 to 40 inches.
Alusa: As	Fair: limited quantity of suitable material.	Poor: fine-grained material.	Poor: poorly drained.	Low traffic-supporting capacity; seasonal water table at a depth of 0 to 1 foot.
*Bibb: Bk For Iuka part of Bk, see Iuka series.	Fair: poorly drained.	Fair for sand, poor for gravel; fine-grained material.	Poor: poorly drained.	Seasonal water table at a depth of 0 to 1 foot; flooding hazard.
Blevins: BlB	Good	Poor: fine-grained material.	Fair: moderate shrink-swell potential.	Moderate traffic-supporting capacity.
Cadeville: CaC	Poor: limited quantity of suitable material.	Poor: fine-grained material.	Poor: high shrink-swell potential.	Seasonal water table at a depth of 2 to 3 feet; low traffic-supporting capacity.
*Cahaba: CbB, CbD	Poor: sandy texture.	Poor: fine-grained material.	Fair: low traffic-supporting capacity.	Features favorable where slopes are 0 to 6 percent; moderate erosion potential where slopes are 6 to 8 percent.
ChA, ChB, CkD3 For Tiak part of CkD3, see Tiak series.	Fair: limited quantity of suitable material.	Poor: fine-grained material.	Fair: low traffic-supporting capacity.	Features favorable where slopes are 0 to 6 percent; moderate erosion potential where slopes are 6 to 8 percent.
*Carnasaw: CmE, CnD For Goldston part of CmE, see the Goldston series; for the Zafra part of CnD, see the Zafra series.	Fair: limited quantity of suitable material.	Poor: fine-grained material.	Poor: high shrink-swell potential.	Highly erodible on embankments; slopes 1 to 45 percent.
Caspiana: Cp	Good	Poor: fine-grained material.	Fair: moderate to low shrink-swell potential.	Moderate traffic-supporting capacity.
Ceda: Cr No interpretations were made for Rubble land part of Cr.	Poor: coarse fragments.	Fair to good: fine-grained material.	Good	Flooding hazard
Coushatta: Cs	Good	Poor: fine-grained material.	Fair: moderate to low shrink-swell potential.	Moderate traffic-supporting capacity.

engineering properties of the soils

have different interpretations for engineering purposes. For this reason the reader should follow carefully the instructions for referring the first column of this table]

Soil features affecting—					
Farm ponds		Drainage for crops and pasture	Irrigation	Terraces and diversions	Grassed waterways
Reservoir area	Embankment				
Features favorable	Medium compressibility; fair resistance to piping and erosion.	Poorly drained; seasonal water table at a depth of 0 to 1 foot.	Poorly drained; slow permeability.	Slow permeability	Features favorable.
Bedrock at a depth of 20 to 40 inches.	Bedrock at a depth of 20 to 40 inches; medium compressibility.	Poorly drained; seasonal water table at a depth of 0 to 1 foot; bedrock at a depth of 20 to 40 inches.	Poorly drained; bedrock at a depth of 20 to 40 inches.	Slow permeability	Bedrock at a depth of 20 to 40 inches.
Features favorable	Fair slope stability; high compressibility.	Poorly drained; seasonal water table at a depth of 0 to 1 foot.	Poorly drained; very slow permeability.	Slopes 0 to 1 percent; very slow permeability.	Features favorable.
Flooding hazard; moderate seepage potential.	Flooding hazard; poor resistance to piping and erosion.	Poorly drained; flooding hazard; seasonal water table at a depth of 0 to 1 foot.	Poorly drained; flooding hazard.	Slopes 0 to 1 percent; flooding hazard.	Flooding hazard.
Moderate seepage potential.	Medium compressibility; fair resistance to piping and erosion.	Well drained	Features favorable	Features favorable	Features favorable.
Features favorable	High compressibility; fair resistance to piping and erosion.	Moderately well drained.	Very slow permeability; slopes 2 to 5 percent.	Very slow permeability.	Vegetation difficult to establish in clayey subsoil.
High seepage potential.	Fair resistance to piping and erosion; medium compressibility.	Well drained	Sandy surface layer; slopes 0 to 8 percent.	Sandy surface layer.	Sandy texture.
High seepage potential.	Fair resistance to piping and erosion; medium compressibility.	Well drained	Features favorable except slopes 0 to 8 percent.	Features favorable	Features favorable.
Bedrock at a depth of 40 to 60 inches.	Stony; fair slope stability.	Well drained	Slopes 1 to 45 percent; slow permeability.	Slopes 1 to 45 percent; slow permeability.	Slopes 1 to 45 percent.
Moderate seepage potential; slopes 0 to 1 percent.	Fair slope stability; medium compressibility.	Well drained	Features favorable	Slopes 0 to 1 percent.	Features favorable.
High seepage potential; flooding hazard.	Rapid seepage rate; stoniness.	Flooding hazard; well drained.	Flooding hazard; low to moderate available water capacity.	Flooding hazard; gravelly material.	Flooding hazard; low to moderate available water capacity.
Moderate seepage potential; slopes 0 to 1 percent.	Fair stability; medium compressibility.	Well drained	Features favorable	Slopes 0 to 1 percent.	Features favorable.

TABLE 6.—*Interpretations of*

Soil series and map symbols	Suitability as a source of—			Soil features affecting—
	Topsoil	Sand and gravel	Road fill	Highway location
Elysian Mapped only in complex with Guyton and Wrightsville soils.	Good	Poor: fine-grained material.	Fair: moderate traffic-supporting capacity.	Moderate traffic-supporting capacity; seasonal water table at a depth of 2 to 3 feet.
Felker: FeA	Good	Poor: fine-grained material.	Fair: moderate traffic-supporting capacity.	Seasonal water table at a depth of 2 to 3 feet; moderate traffic-supporting capacity.
Frizzell: Fr	Good	Poor: fine-grained material.	Fair: moderate traffic-supporting capacity.	Flooding hazard; seasonal water table at a deptn of 2 to 3 feet.
Gallion: Ga	Good	Poor: fine-grained material.	Fair: moderate traffic-supporting capacity.	Moderate traffic-supporting capacity.
Garton: Gr	Fair: limited quantity of suitable material.	Poor: fine-grained material.	Fair: moderate to high shrink-swell potential.	Moderate traffic-supporting capacity; seasonal water table at a depth of 2 to 3 feet.
*Goldston: GsE, GsF For Carnasaw and Sacul part of GsE, GsF, see Carnasaw and Sacul series.	Poor: coarse fragments and limited quantity of suitable material.	Poor: fine-grained material and stones.	Poor: slopes 12 to 45 percent.	Slopes 12 to 45 percent; bedrock at a depth of 20 to 40 inches.
*Guyton: Gu, Gy For Elysian part of Gy, see the Elysian series.	Fair to poor: poorly drained.	Poor: fine-grained material.	Poor: poorly drained.	Flooding hazard in some areas; seasonal water table at a depth of 0 to 1 foot.
Hector: HkF No interpretations were made for Rock outcrop part of HkF.	Poor: coarse fragments and limited quantity of suitable material.	Poor: fine-grained material.	Poor: slopes 35 to 60 percent.	Slopes 35 to 60 percent; bedrock at a depth of 8 to 20 inches.
Hollywood: HoB, HoC	Poor: clayey texture.	Poor: fine-grained material.	Poor: high shrink-swell potential.	Low traffic-supporting capacity.
Idabel: Id	Good	Poor: fine-grained material.	Fair: moderate traffic-supporting capacity.	Moderate traffic-supporting capacity.
Iuka Mapped only in complex with Bibb soils.	Good	Poor: fine-grained material.	Fair: moderate traffic-supporting capacity.	Flooding hazard; seasonal water table at a depth of 1 to 3 feet.

engineering properties of the soils—Continued

Soil features affecting—					
Farm ponds		Drainage for crops and pasture	Irrigation	Terraces and diversions	Grassed waterways
Reservoir area	Embankment				
Moderate seepage potential; mound.	Fair slope stability and resistance to piping.	Moderately well drained.	Features favorable but occurs as a mound.	Moundy topography.	Moundy topography.
Moderate seepage potential.	Fair slope stability and resistance to piping and erosion.	Somewhat poorly drained; seasonal water table at a depth of 2 to 3 feet.	Seasonal water table at a depth of 2 to 3 feet; somewhat poorly drained.	Moundy topography.	Moundy topography.
Moderate seepage potential.	Fair resistance to piping and erosion; medium compressibility.	Moderately well drained; flooding hazard; seasonal water table at a depth of 2 to 3 feet.	Slow permeability; flooding hazard.	Slopes 0 to 1 percent; flooding hazard.	Flooding hazard.
Moderate seepage potential.	Fair slope stability and resistance to piping and erosion.	Well drained	Features favorable	Features favorable	Features favorable.
Features favorable except slopes 0 to 1 percent.	Fair slope stability and resistance to piping and erosion.	Moderately well drained; ponding in places; seasonal water table at a depth of 2 to 3 feet.	Features favorable except slow permeability.	Slopes 0 to 1 percent; slow permeability.	Features favorable.
Bedrock at a depth of 20 to 40 inches; slopes 12 to 45 percent.	Medium compressibility; bedrock at a depth of 20 to 40 inches.	Well drained to excessively drained.	Slopes 12 to 45 percent; low available water capacity.	Slopes 12 to 45 percent.	Slopes 12 to 45 percent; low available water capacity.
Flooding hazard in some areas.	Poor resistance to piping and erosion; medium compressibility.	Poorly drained; flooding hazard in some areas; seasonal water table at a depth of 0 to 1 foot.	Very slow permeability; flooding hazard in some areas; poorly drained.	Slopes 0 to 2 percent; flooding hazard in some areas; very slow permeability.	Flooding hazard in some areas.
Bedrock at a depth of 8 to 20 inches; slopes 35 to 60 percent.	Bedrock at a depth of 8 to 20 inches; poor resistance to piping and erosion.	Well drained	Slopes 35 to 60 percent; bedrock at a depth of 8 to 20 inches; low available water capacity.	Slopes 35 to 60 percent; bedrock at a depth of 8 to 20 inches; stones.	Slopes 35 to 60 percent; bedrock at a depth of 8 to 20 inches.
Features favorable	High compressibility; good to fair slope stability.	Moderately well drained.	Very slow permeability; slopes 1 to 5 percent.	Clayey texture; very slow permeability.	Clayey texture.
High seepage potential; 0 to 1 percent slopes.	Fair slope stability and resistance to piping and erosion.	Well drained	Features favorable except moderately rapid permeability.	Slopes 0 to 1 percent; moderately rapid permeability.	Features favorable.
Moderate seepage potential; severe flooding hazard.	Flooding hazard; fair slope stability and resistance to piping.	Moderately well drained; flooding hazard; seasonal water table at a depth of 1 to 3 feet.	Flooding hazard; moderately well drained.	Slopes 0 to 1 percent; flooding hazard.	Flooding hazard.

TABLE 6.—*Interpretations of*

Soil series and map symbols	Suitability as a source of—			Soil features affecting—
	Topsoil	Sand and gravel	Road fill	Highway location
Kaufman: Ka, Kc	Poor: clayey texture.	Poor: fine-grained material.	Poor: high shrink-swell potential.	Low traffic-supporting capacity.
Kinta: KnA	Fair: limited quantity of suitable material.	Poor: fine-grained material.	Poor: high shrink-swell potential.	Seasonal water table at a depth of 1 to 2 feet; high shrink-swell potential.
Kullit: KuB	Fair: limited quantity of suitable material.	Poor: fine-grained material.	Poor: moderate traffic-supporting capacity.	Seasonal water table at a depth of 2 to 3 feet; moderate traffic-supporting capacity.
Latanier: La	Poor: clayey texture.	Poor: fine-grained material.	Poor: 0 to 28-inch thickness; high shrink-swell potential.	Low traffic-supporting capacity.
Muskogee: MuB	Fair: limited quantity of suitable material.	Poor: fine-grained material.	Poor: moderate traffic-supporting capacity.	Seasonal water table at a depth of 1 to 2 feet; moderate traffic-supporting capacity.
Newtonia: NeB	Fair to good: limited quantity of suitable material.	Poor: fine-grained material.	Poor: moderate to high shrink-swell potential.	Moderate traffic-supporting capacity.
Ochlockonee: Oc	Good	Fair to poor for sand: poor for gravel: fine-grained material.	Good	Flooding hazard
Oklared: Ok	Good	Poor to a depth of 6 feet: fair for sand below a depth of 6 feet; fine-grained material.	Fair: moderate traffic-supporting capacity.	Flooding hazard
Panola: Pa	Fair: wetness; limited quantity of suitable material.	Poor: fine-grained material.	Poor: high shrink-swell potential.	Seasonal water table at a depth of 0 to 1 foot; low traffic-supporting capacity.
*Pickens: PcE, PeB For Alikchi part of PeB, see the Alikchi series.	Poor: shale fragments and limited quantity of suitable material.	Poor: fine-grained material mixed with shale.	Poor: limited quantity of suitable material.	Slopes 0 to 15 percent; bedrock at a depth of 10 to 20 inches.
*Pledger: Pg, Pr For Roebuck part of Pr, see the Roebuck series.	Poor: clayey texture.	Poor: fine-grained material.	Poor: high shrink-swell potential.	Low traffic-supporting capacity.
Redlake: Rd	Poor: clayey texture.	Poor: fine-grained material.	Poor: high shrink-swell potential.	Low traffic-supporting capacity.
*Rexor: Re, RgB For Guyton part of RgB, see the Guyton series.	Good	Poor: fine-grained material.	Fair: low to moderate shrink-swell potential.	Flooding hazard; moderate traffic-supporting capacity.

engineering properties of the soils—Continued

Soil features affecting—					
Farm ponds		Drainage for crops and pasture	Irrigation	Terraces and diversions	Grassed waterways
Reservoir area	Embankment				
Features favorable except flooding hazard.	High compressibility; fair slope stability.	Somewhat poorly drained; flooding hazard.	Very slow permeability; flooding hazard.	Slopes 0 to 1 percent; flooding hazard.	Flooding hazard.
Features favorable	High compressibility; fair slope stability.	Somewhat poorly drained; seasonal water table at a depth of 1 to 2 feet.	Very slow permeability; seasonal water table at a depth of 1 to 2 feet.	Very slow permeability.	Features favorable.
Moderate seepage potential.	Medium compressibility; fair resistance to piping and erosion.	Moderately well drained; seasonal water table at a depth of 2 to 3 feet.	Moderately well drained; seasonal water table at a depth of 2 to 3 feet.	Short irregular slopes.	Features favorable.
Moderate seepage potential; flooding hazard.	Medium to high compressibility.	Moderately well drained; flooding hazard.	Very slow permeability; moderately well drained.	Slopes 0 to 1 percent; very slow permeability.	Flooding hazard; clayey surface layer.
Features favorable	Medium to high compressibility; fair resistance to piping and erosion.	Moderately well drained; seasonal water table at a depth of 1 to 2 feet.	Slow permeability; seasonal water table at a depth of 1 to 2 feet.	Slow permeability	Features favorable.
Moderate seepage potential.	Fair resistance to piping and erosion; medium compressibility.	Well drained	Features favorable	Features favorable	Features favorable.
High seepage potential; flooding hazard.	Poor resistance to piping and erosion; flooding hazard.	Well drained; flooding hazard.	Moderately rapid permeability; flooding hazard.	Slopes 0 to 1 percent; flooding hazard.	Flooding hazard.
High seepage potential; flooding hazard.	Poor resistance to piping and erosion; flooding hazard.	Well drained; flooding hazard.	Moderate available water capacity; moderately rapid permeability; flooding hazard.	Short irregular slopes; flooding hazard.	Flooding hazard.
Features favorable	Medium to high compressibility.	Somewhat poorly drained; seasonal water table at a depth of 0 to 1 foot.	Very slow permeability; seasonal water table at a depth of 0 to 1 foot.	Very slow permeability.	Features favorable.
Bedrock at a depth of 10 to 20 inches; moderate seepage potential.	Bedrock at a depth of 10 to 20 inches; medium compressibility.	Somewhat excessively drained.	Bedrock at a depth of 10 to 20 inches; slopes 0 to 15 percent.	Bedrock at a depth of 10 to 20 inches; slopes 0 to 15 percent.	Slopes 0 to 15 percent; bedrock at a depth of 10 to 20 inches.
Features favorable except slopes 0 to 1 percent.	High compressibility; fair slope stability.	Moderately well drained to somewhat poorly drained.	Very slow permeability.	Slopes 0 to 1 percent; very slow permeability.	Clayey texture.
Features favorable except slopes 0 to 1 percent and flooding hazard.	High compressibility; fair slope stability.	Moderately well drained; flooding hazard in low areas.	Very slow permeability; flooding hazard in low areas.	Slopes 0 to 1 percent; very slow permeability.	Clayey texture; flooding hazard.
Moderate seepage potential; flooding hazard.	Fair slope stability; flooding hazard; medium compressibility.	Well drained; flooding hazard.	Features favorable except flooding hazard.	Slopes 0 to 2 percent; flooding hazard.	Flooding hazard.

TABLE 6.—*Interpretations of*

Soil series and map symbols	Suitability as a source of—			Soil features affecting—
	Topsoil	Sand and gravel	Road fill	Highway location
Roebuck: Rk	Poor: clayey texture.	Poor: fine-grained material.	Poor: high shrink-swell potential.	Flooding hazard; low traffic-supporting capacity.
Ruston: RuD, RuD2	Fair: limited quantity of suitable material.	Poor: fine-grained material.	Fair: moderate traffic-supporting capacity.	Slopes 3 to 15 percent; moderate traffic-supporting capacity.
Sacul: SaE	Fair: limited quantity of suitable material.	Poor: fine-grained material.	Poor: high shrink-swell potential.	Slopes 5 to 45 percent; low traffic-supporting capacity.
Saffell: SeC, SeE	Poor: coarse fragments.	Fair to poor for sand: fine-grained material and coarse fragments. Fair for gravel: fine-grained material.	Good	Slopes 1 to 12 percent; high to moderate traffic-supporting capacity.
Sallisaw: Sf	Good	Poor above a depth of 50 inches. Fair below a depth of 50 inches; fine-grained material.	Fair: low to moderate shrink-swell potential; moderate to high traffic-supporting capacity.	Moderate to high traffic-supporting capacity.
Severn: Sg	Good	Poor: fine-grained material.	Fair: moderate traffic-supporting capacity.	Moderate traffic-supporting capacity.
*Sherwood: ShB, ShC, SlC2, SmC, SmE. For Zafra part of SmC, SmE, see the Zafra series.	Fair: limited quantity of suitable material.	Poor: fine-grained material.	Fair: moderate to low shrink-swell potential.	Slopes 1 to 12 percent; bedrock at a depth of 30 to 60 inches.
Sumter: SuE	Poor: limited quantity of suitable material.	Poor: fine-grained material.	Poor: moderate to high shrink-swell potential.	Chalk at a depth of 20 to 40 inches; low traffic-supporting capacity.
*Swink: SwE For Hollywood part of SwE, see the Hollywood series.	Poor: clayey and coarse fragments.	Poor: fine-grained material.	Poor: high shrink-swell potential.	Bedrock at a depth of 6 to 20 inches; slopes 5 to 20 percent.
*Tiak: TfB, TfC, TfD, TkC, TkE For the Ruston part of TkC, TkE, see the Ruston series.	Fair: limited quantity of suitable material.	Poor: fine-grained material.	Poor: high shrink-swell potential.	Slopes 1 to 15 percent; low traffic-supporting capacity.
Tomast: To	Fair: seasonal water table at a depth of 0 to 1 foot.	Poor: fine-grained material.	Poor: low traffic-supporting capacity.	Seasonal water table at a depth of 0 to 1 foot.
Tuscumbia: Tu	Poor: clayey texture.	Poor: fine-grained material.	Poor: high shrink-swell potential.	Flooding hazard; seasonal water table at a depth of 0 to 1 foot.

engineering properties of the soils—Continued

Soil features affecting—					
Farm ponds		Drainage for crops and pasture	Irrigation	Terraces and diversions	Grassed waterways
Reservoir area	Embankment				
Features favorable except slopes 0 to 1 percent and flooding hazard.	High compressibility; fair slope stability.	Somewhat poorly drained to poorly drained; flooding ing hazard.	Very slow permeability; flooding hazard.	Slopes 0 to 1 percent; flooding hazard; very slow permeability.	Clayey texture; flooding hazard.
Moderate seepage rate.	Fair resistance to piping and erosion; slight to medium compressibility.	Well drained	Features favorable except slopes 3 to 15 percent.	Slopes 3 to 15 percent.	Slopes 3 to 15 percent.
Slopes 5 to 45 percent.	Fair resistance to piping and erosion; high compressibility.	Moderately well drained.	Slopes 5 to 45 percent; slow permeability.	Slopes 5 to 45 percent; slow permeability.	Slopes 5 to 45 percent.
High seepage potential.	Good to fair slope stability; high seepage potential.	Well drained	Moderate permeability; moderate to low available water capacity.	Slopes 1 to 12 percent; gravelly material; moderate permeability.	Slopes 1 to 12 percent; moderate to low available water capacity.
High seepage potential; 0 to 1 percent slopes.	Medium compressibility; fair resistance to piping and erosion.	Well drained	Features favorable	Slopes 0 to 1 percent.	Features favorable.
High seepage potential; slopes 0 to 1 percent.	Fair slope stability and resistance to piping and erosion.	Well drained	Features favorable except moderately rapid permeability.	Slopes 0 to 1 percent.	Features favorable.
Bedrock at a depth of 30 to 60 inches; moderate seepage potential.	Bedrock at a depth of 30 to 60 inches; fair resistance to piping and erosion.	Well drained	Bedrock at a depth of 30 to 60 inches; slopes 1 to 12 percent.	Slopes 1 to 12 percent.	Slopes 1 to 12 percent; bedrock at a depth of 30 to 60 inches.
Chalk at a depth of 20 to 40 inches.	Chalk at a depth of 20 to 40 inches; medium to high compressibility.	Well drained	Slow permeability; chalk at a depth of 20 to 40 inches.	Slopes 3 to 12 percent; slow permeability.	Slopes 3 to 12 percent.
Bedrock at a depth of 6 to 20 inches.	Bedrock at a depth of 6 to 20 inches.	Well drained	Bedrock at a depth of 6 to 20 inches; slopes 5 to 20 percent; slow permeability.	Bedrock at a depth of 6 to 20 inches; stones; slopes 5 to 20 percent; slow permeability.	Bedrock at a depth of 6 to 20 inches; moderate to low available water capacity.
Features favorable	Medium to high compressibility.	Moderately well drained.	Slow permeability; slopes 1 to 15 percent.	Slow permeability; slopes 1 to 15 percent.	Slopes 1 to 15 percent.
Features favorable	Medium to high compressibility.	Somewhat poorly drained; seasonal water table at a depth of 0 to 1 foot.	Slow permeability; seasonal water table at a depth of 0 to 1 foot.	Slow permeability	Features favorable.
Features favorable except flooding hazard; slopes 0 to 1 percent.	Fair slope stability; high compressibility; flooding hazard.	Poorly drained; flooding hazard.	Very slow permeability; flooding hazard; very slow permeability.	0 to 1 percent slopes; flooding hazard.	Clayey texture; flooding hazard.

TABLE 6.—*Interpretations of*

Soil series and map symbols	Suitability as a source of—			Soil features affecting—
	Topsoil	Sand and gravel	Road fill	Highway location
*Wrightsville: We For the Elysian part of We, see the Elysian series.	Fair: poorly drained.	Poor: fine-grained material.	Poor: high shrink-swell potential.	Seasonal water table at a depth of 0 to 1 foot; low traffic-supporting capacity.
Zafra Mapped only in complex with Carnasaw and Sherwood soils.	Fair: limited quantity of suitable material.	Poor for sand. Fair to poor for gravel: fine-grained material and soft fragments.	Fair: moderate to high traffic-supporting capacity.	Slopes 1 to 12 percent; bedrock at a depth of 20 to 56 inches.

TABLE 7.—*Engineering*

[Tests performed by the Oklahoma Department of Highways in accordance with

Soil name and location	Parent material	Report No.	Depth from surface	Shrinkage	
				Limit	Ratio
			Inches	*Percent*	*Percent*
Cahaba fine sandy loam, 0 to 1 percent slopes: 670 feet E. and 2,640 feet N. of the SW. corner of sec. 16, T. 6 S., R. 23 E.	Loamy sediment.	2, 686 2, 687	5–12 22–34	[6] NP 13	NP 1. 91
Guyton silt loam: 1,640 feet S. and 100 feet E. of the NW. corner of sec. 22, T. 8 S., R. 25 E.	Loamy sediment.	2, 689 2, 690	18–25 32–38	6 12 1	1. 82 1. 93
Tiak fine sandy loam from an area of Tiak-Ruston complex, 5 to 15 percent slopes: 1,520 feet S. and 1,420 feet W. of the NE. corner of sec. 6, T. 5 S., R. 24 E.	Clayey and loamy sediment.	2, 711 2, 712	15–25 52–65	3 13 1	1. 89 1. 90
Tomast silt loam: 200 feet E. and 150 feet N. of the SW. corner of sec. 29, T. 8 S., R. 27 E.	Clayey and loamy sediment.	2, 692 2, 693 2, 694	14–21 32–42 52–58	3 12 12 1	1. 90 1. 95 1. 94

[1] Mechanical analyses according to AASHO Designation T 88–57 (*1*). Results by this procedure frequently may differ somewhat from results that would have been obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHO procedure, the fine material is analyzed by the hydrometer method and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method and the material coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions.

[2] Based on AASHO Designation T 89–60 (*1*).

[3] Based on AASHO Designation T 90–56 and AASHO Designation T 91–54 (*1*).

engineering properties of the soils—Continued

Soil features affecting—					
Farm ponds		Drainage for crops and pasture	Irrigation	Terraces and diversions	Grassed waterways
Reservoir area	Embankment				
Features favorable except 0 to 1 percent slopes.	Fair slope stability; high compressibility.	Poorly drained; seasonal water table at a depth of 0 to 1 foot.	Slow permeability; seasonal water table at a depth of 0 to 1 foot.	Slopes 0 to 1 percent; slow permeability.	Features favorable.
Bedrock at a depth of 20 to 56 inches; moderate seepage potential.	Bedrock at a depth of 20 to 56 inches; medium compressibility.	Well drained	Slopes 1 to 12 percent; bedrock at a depth of 20 to 56 inches.	Slopes 1 to 12 percent.	Slopes 1 to 12 percent; bedrock at a depth of 20 to 56 inches.

test data

standard procedures of the American Association of State Highway Officials (AASHO) (*1*)]

Volume change from field moisture equivalent	Mechanical analyses data [1] Percentage less than 3 inches passing sieve—			Percentage smaller than—			Liquid limit [2]	Plasticity index [3]	Classification	
	No. 10 (2.0)	No. 40 (0.42)	No. 200 (0.074)	0.05 mm.	0.005 mm.	0.002 mm.			AASHO [4]	Unified [5]
Percent							*Percent*			
NP	100	100	71	49	12	7	NP	NP	A-4(7)	ML
30	100	99	83	72	36	31	31	15	A-6(10)	CL
14	100	100	84	75	30	17	26	7	A-4(8)	ML-CL
27	100	100	87	77	43	30	33	16	A-6(10)	CL
55	100	100	92	77	38	35	55	31	A-7-6(19)	CH
47	100	100	96	83	42	40	61	38	A-7-6(20)	CH
56	100	99	71	57	37	31	43	18	A-7-6(11)	CL
82	100	100	76	64	47	41	56	26	A-7-5(17)	MH-CH
53	100	100	74	62	42	37	50	25	A-7-6(16)	CL

[4] Based on standard specifications for highway material and methods of sampling and testing: The classification of soils and soil-aggregate mixtures for highway construction purposes, AASHO designation M 145-49. Oklahoma Department of Highways classification procedure further subdivides the AASHO A-2-4 subgroup in the following: A-2-3(0) when PI=nonplastic; A-2(0) when PI=NP to 5; and A-2-4(0) when PI=5 to 10.

[5] Based on ASTM Designation D 2487-66 T (*2*).

[6] Nonplastic.

TABLE 8.—*Limitations of the soils for*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil, which may column of

Soil series and map symbols	Septic tank filter fields	Sewage lagoons	Sites for nonindustrial buildings
Adaton: Ad	Severe: seasonal water table at a depth of 0 to 1 foot; slow permeability.	Severe: seasonal water table at a depth of 0 to 1 foot.	Severe: seasonal water table at a depth of 0 to 1 foot.
Alikchi: AkB	Severe: bedrock at a depth of 20 to 40 inches; slow permeability; seasonal water table at a depth of 0 to 1 foot.	Severe: bedrock at a depth of 20 to 40 inches.	Severe: seasonal water table at a depth of 0 to 1 foot.
Alusa: As	Severe: very slow permeability; seasonal water table at a depth of 0 to 1 foot.	Severe: seasonal water table at a depth of 0 to 1 foot.	Severe: high shrink-swell potential; seasonal water table at a depth of 0 to 1 foot.
*Bibb: Bk For Iuka part of Bk, see Iuka series.	Severe: subject to flooding; seasonal water table at a depth of 0 to 1 foot.	Severe: subject to flooding; moderate if protected from flooding.	Severe: subject to flooding; seasonal water table at a depth of 0 to 1 foot.
Blevins: BlB	Moderate: moderate permeability.	Moderate: moderate permeability.	Moderate: low to moderate shrink-swell potential.
Cadeville: CaC	Severe: very slow permeability.	Moderate: water table at a depth of 2 to 3 feet; slopes 2 to 5 percent.	Severe: high shrink-swell potential.
*Cahaba: CbB, CbD, ChA, ChB, CkD3. For Tiak part of CkD3, see Tiak series.	Slight where slopes are 0 to 5 percent; moderate where slopes are 5 to 8 percent.	Severe: moderately rapid permeability at depth of 4 to 5 feet.	Moderate: moderate to low shrink-swell potential.
*Carnasaw: CmE, CnD For Goldston part of CmE, see Goldston series; for Zafra part of CnD, see Zafra series.	Severe: slow permeability	Moderate where slopes are 1 to 7 percent; bedrock at a depth of 40 to 60 inches; severe where slopes are 7 to 45 percent.	Severe: high shrink-swell potential.
Caspiana: Cp	Severe: moderately slow permeability.	Slight	Moderate: moderate shrink-swell potential.
Ceda: Cr Interpretations were not made for Rubble land part of Cr.	Severe: subject to flooding	Severe: rapid permeability; subject to flooding.	Severe: subject to flooding
Coushatta: Cs	Severe: moderately slow permeability.	Slight	Moderate: moderate shrink-swell potential.
Elysian: Mapped only in complex with Guyton and Wrightsville soils.	Moderate: seasonal water table at a depth of 2 to 3 feet.	Moderate: seasonal water table at a depth of 2 to 3 feet; moderate permeability.	Moderate: seasonal water table at a depth of 2 to 3 feet.
Felker: FeA	Severe: moderately slow permeability.	Moderate: seasonal water table at a depth of 2 to 3 feet.	Moderate: seasonal water table at a depth of 2 to 3 feet.
Frizzell: Fr	Severe: slow permeability; subject to flooding.	Moderate: seasonal water table at a depth of 2 to 3 feet.	Moderate if protected from flooding; seasonal water table at a depth of 2 to 3 feet.
Gallion: Ga	Moderate: moderate permeability.	Slight	Moderate: low to moderate shrink-swell potential.
Garton: Gr	Severe: slow permeability	Moderate: seasonal water table at a depth of 2 to 3 feet.	Moderate: seasonal water table at a depth of 2 to 3 feet; moderate to high shrink-swell potential.

stated uses in town and country planning.

have different limitations. For this reason the reader should follow carefully the instructions for referring to another series listed in the first this table]

Picnic areas	Camp areas	Paths and trails	Trees and shrubs
Severe: seasonal water table at a depth of 0 to 1 foot; poorly drained.	Severe: seasonal water table at a depth of 0 to 1 foot; poorly drained.	Severe: seasonal water table at a depth of 0 to 1 foot.	Severe: seasonal water table at a depth of 0 to 1 foot.
Severe: seasonal water table at a depth of 0 to 1 foot; poorly drained.	Severe: seasonal water table at a depth of 0 to 1 foot; poorly drained.	Severe: seasonal water table at a depth of 0 to 1 foot.	Severe: seasonal water table at a depth of 0 to 1 foot.
Severe: seasonal water table at a depth of 0 to 1 foot; poorly drained.	Severe: seasonal water table at a depth of 0 to 1 foot; very slow permeability.	Severe: seasonal water table at a depth of 0 to 1 foot.	Severe: seasonal water table at a depth of 0 to 1 foot.
Severe: subject to flooding; seasonal water table at a depth of 0 to 1 foot.	Severe: subject to flooding; seasonal water table at a depth of 0 to 1 foot.	Severe: subject to flooding; seasonal water table at a depth of 0 to 1 foot.	Severe: seasonal water table at a depth of 0 to 1 foot.
Slight	Slight	Slight	Slight.
Moderate: moderately well drained.	Severe: very slow permeability.	Slight	Moderate: root growth restricted in the subsoil.
Slight	Slight	Slight	Slight.
Slight where slopes are less than 8 percent; moderate where slopes are 8 to 15 percent; severe where slopes are 15 to 45 percent.	Moderate where slopes are 1 to 15 percent; slow permeability; severe where slopes are 15 to 45 percent.	Slight where slopes are 1 to 15 percent; moderate where slopes are 15 to 25 percent; severe where slopes are 25 to 45 percent.	Slight.
Slight	Slight	Slight	Slight.
Moderate: subject to flooding; stones on the surface.	Severe: subject to flooding	Moderate: subject to flooding; stones on the surface.	Moderate: low to moderate available water capacity.
Moderate: silty clay loam surface layer.	Moderate: silty clay loam surface layer; moderately slow permeability.	Moderate: silty clay loam surface layer.	Slight.
Slight	Slight	Slight	Slight.
Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained; moderately slow permeability.	Moderate: somewhat poorly drained.	Slight.
Slight to moderate; subject to flooding.	Moderate: slow permeability	Slight	Slight.
Slight	Slight	Slight	Slight.
Slight	Moderate: slow permeability	Slight	Slight.

TABLE 8.—*Limitations of the soils for stated*

Soil series and map symbols	Septic tank filter fields	Sewage lagoons	Sites for nonindustrial buildings
*Goldston: GsE, GsF—For Carnasaw and Sacul parts of GsE and GsF, see Carnasaw and Sacul series.	Severe: bedrock at a depth of 20 to 40 inches; slopes 12 to 45 percent.	Severe: bedrock at a depth of 20 to 40 inches; slopes 12 to 45 percent.	Severe: bedrock at a depth of 20 to 40 inches; slopes 12 to 45 percent.
*Guyton: Gu, Gy—For Elysian part of Gy, see Elysian series.	Severe: seasonal water table at a depth of 0 to 1 foot; very slow permeability.	Severe: seasonal water table at a depth of 0 to 1 foot; subject to flooding in some areas.	Severe: seasonal water table at a depth of 0 to 1 foot.
Hector: HkF—Interpretations were not made for Rock outcrop part of HkF.	Severe: bedrock at a depth of 8 to 20 inches; slopes 35 to 60 percent.	Severe: bedrock at a depth of 8 to 20 inches; slopes 35 to 60 percent.	Severe: bedrock at a depth of 8 to 20 inches; slopes 35 to 60 percent.
Hollywood: Hob, HoC	Severe: very slow permeability.	Slight where slopes are 1 to 2 percent; moderate where slopes are 2 to 5 percent.	Severe: high shrink-swell potential.
Idabel: Id	Slight	Severe: moderately rapid permeability.	Severe: subject to flooding
Iuka—Mapped only in complex with Bibb soils.	Severe: subject to flooding	Severe: subject to flooding	Severe: subject to flooding
Kaufman: Ka, Kc	Severe: very slow permeability.	Slight where not subject to flooding; severe where subject to flooding.	Severe: high shrink-swell potential.
Kinta: KnA	Severe: seasonal water table at a depth of 1 to 2 feet; very slow permeability.	Severe: seasonal water table at a depth of 1 to 2 feet.	Severe: seasonal water table at a depth of 1 to 2 feet; high shrink-swell potential.
Kullit: KuB	Moderate: seasonal water table at a depth of 2 to 3 feet.	Moderate: moderate permeability; seasonal water table at a depth of 2 to 3 feet.	Moderate: seasonal water table at a depth of 2 to 3 feet.
Latanier: La	Severe: very slow permeability above a depth of 28 inches.	Slight unless excavated to loamy material.	Severe: high shrink-swell potential.
Muskogee: MuB	Severe: slow permeability; seasonal water table at a depth of 1 to 2 feet.	Slight where slopes are 1 to 2 percent; moderate where slopes are 2 to 3 percent.	Moderate to severe: moderate to high shrink-swell potential.
Newtonia: NeB	Moderate: moderate permeability.	Moderate: moderate permeability.	Severe to moderate: moderate to high shrink-swell potential.
Ochlockonee: Oc	Severe: subject to flooding	Severe: moderately rapid permeability; subject to flooding.	Severe: subject to flooding
Oklared: Ok	Severe: subject to flooding	Severe: moderately rapid permeability.	Severe: subject to flooding
Panola: Pa	Severe: very slow permeability; seasonal water table at a depth of 0 to 1 foot.	Slight	Severe: high shrink-swell potential; seasonal water table at a depth of 0 to 1 foot.
*Pickens: PcE, PeB—For Alikchi part of PeB, see Alikchi series.	Severe: bedrock at a depth of 10 to 20 inches.	Severe: bedrock at a depth of 10 to 20 inches.	Severe: bedrock at a depth of 10 to 20 inches.
*Pledger: Pg, Pr—For Roebuck part of Pr, see Roebuck series.	Severe: very slow permeability.	Slight	Severe: high shrink-swell potential.
Redlake: Rd	Severe: very slow permeability.	Slight	Severe: high shrink-swell potential.
*Rexor: Re, RgB—For Guyton part of RgB, see Guyton series.	Severe: subject to flooding	Moderate if protected from flooding; moderate permeability.	Severe: subject to flooding

uses in town and country planning—Continued

Picnic areas	Camp areas	Paths and trails	Trees and shrubs
Moderate where slopes are 12 to 15 percent; severe where slopes are 15 to 45 percent.	Moderate where slopes are 12 to 15 percent; severe where slopes are 15 to 45 percent.	Moderate where slopes are 12 to 25 percent; stoniness severe where slopes are 25 to 45 percent.	Severe: low available water capacity.
Severe: seasonal water table at a depth of 0 to 1 foot; poorly drained.	Severe: seasonal water table at a depth of 0 to 1 foot; very slow permeability.	Severe: seasonal water table at a depth of 0 to 1 foot; poorly drained.	Severe: water table at a depth of 0 to 1 foot.
Severe: slopes 35 to 60 percent.	Severe: slopes 35 to 60 percent.	Severe: slopes 35 to 60 percent.	Severe: bedrock at a depth of 8 to 20 inches; low available water capacity.
Severe: silty clay surface layer.	Severe: silty clay surface layer; very slow permeability.	Severe: silty clay surface layer.	Moderate: root growth restricted.
Slight	Slight	Slight	Slight.
Moderate: subject to flooding	Severe: subject to flooding	Moderate where subject to flooding 2 or 3 times per season; severe where subject to flooding 3 or more times per season.	Slight.
Severe: clay surface layer; subject to flooding.	Severe: clay surface layer; very slow permeability.	Severe: clay surface layer	Moderate: root growth restricted by silty clays.
Severe: seasonal water table at a depth of 1 to 2 feet.	Severe: seasonal water table at a depth of 1 to 2 feet; very slow permeability.	Severe: seasonal water table at a depth of 1 to 2 feet.	Moderate: seasonal water table at a depth of 1 to 2 feet.
Slight	Moderate: moderately well drained.	Slight	Slight.
Severe: clay surface layer	Severe: clay surface layer; very slow permeability.	Severe: clay surface layer	Moderate: root growth restricted in the layer.
Moderate: moderately well drained.	Moderate: slow permeability	Moderate: seasonal water table at a depth of 1 to 2 feet.	Moderate: seasonal water table at a depth of 1 to 2 feet.
Slight	Slight	Slight	Slight.
Moderate: subject to flooding.	Severe: subject to flooding	Slight to moderate: subject to flooding.	Slight.
Moderate: subject to flooding.	Severe: subject to flooding	Slight	Slight.
Moderate: somewhat poorly drained.	Severe: seasonal water table at a depth of 0 to 1 foot; very slow permeability.	Moderate: somewhat poorly drained.	Severe: seasonal water table at a depth of 0 to 1 foot.
Slight where slopes are 0 to 8 percent; moderate where slopes are 8 to 15 percent.	Slight where slopes are 0 to 8 percent; moderate where slopes are 8 to 15 percent.	Slight	Severe: bedrock at a depth of 10 to 20 inches.
Severe: clay surface layer	Severe: clay surface layer; very slow permeability.	Severe: clay surface layer	Moderate: root growth restricted.
Severe: clay surface layer	Severe: clay surface layer; very slow permeability.	Severe: clay surface layer	Moderate: root growth restricted.
Slight to moderate: subject to flooding.	Moderate: subject to flooding	Slight	Slight.

TABLE 8.—*Limitations of the soils for stated*

Soil series and map symbols	Septic tank filter fields	Sewage lagoons	Sites for nonindustrial buildings
Roebuck: Rk	Severe: very slow permeability.	Moderate: seasonal water table at a depth of 2 to 3 feet.	Severe: high shrink-swell potential.
Ruston: RuD, RuD2	Slight where slopes are 3 to 5 percent; moderate where slopes are 5 to 15 percent.	Moderate where slopes are 3 to 7 percent; moderate permeability; severe where slopes are 7 to 15 percent.	Slight where slopes are 3 to 6 percent; moderate where slopes are 6 to 15 percent.
Sacul: SaE	Severe: slow permeability	Moderate where slopes are 5 to 7 percent; severe where slopes are 7 to 45 percent.	Severe to moderate; high to moderate shrink-swell potential.
Saffell: SeC, SeE	Slight where slopes are 1 to 5 percent; moderate where slopes are 5 to 12 percent.	Moderate to severe where slopes are 1 to 7 percent; severe where slopes are 7 to 12 percent.	Slight where slopes are 1 to 6 percent; moderate where slopes are 6 to 12 percent.
Sallisaw: Sf	Slight	Severe: rapid permeability at a depth of 4 to 5 feet.	Slight
Severn: Sg	Slight	Severe: moderately rapid permeability.	Severe: subject to flooding
*Sherwood: ShB, ShC, SlC2, SmC, SmE. For Zafra part of units SmC and SmE, see Zafra series.	Moderate: rock at a depth of 30 to 60 inches; slopes 1 to 12 percent.	Moderate where slopes are 1 to 7 percent; moderate permeability; severe where slopes are 7 to 12 percent.	Moderate: moderate to low shrink-swell potential.
Sumter: SuE	Severe: slow permeability; chalk at a depth of 20 to 40 inches.	Severe: chalk at a depth of 20 to 40 inches.	Severe: moderate to high shrink-swell potential; slopes.
*Swink: SwE. For Hollywood part of SwE, see Hollywood series.	Severe: bedrock at a depth of 6 to 20 inches.	Severe: bedrock at a depth of 6 to 20 inches.	Severe: bedrock at a depth of 6 to 20 inches; high shrink-swell potential; slopes.
*Tiak: TfB, TfC, TfD, TkC, TkE. For Ruston part of units TkC and TkE, see Ruston series.	Severe: slow permeability	Moderate where slopes are 1 to 7 percent; severe where slopes are 7 to 15 percent.	Severe: high shrink-swell potential.
Tomast: To	Severe: seasonal water table at a depth of 0 to 1 foot; slow permeability.	Severe: seasonal water table at a depth of 0 to 1 foot.	Severe: seasonal water table at a depth of 0 to 1 foot.
Tuscumbia: Tu	Severe: very slow permeability; seasonal water table at a depth of 0 to 1 foot; subject to flooding.	Severe: subject to flooding; slight if not flooded.	Severe: seasonal water table at a depth of 0 to 1 foot; high shrink-swell potential; subject to flooding.
*Wrightsville: We. For Elysian part of We, see Elysian series.	Severe: slow permeability; seasonal water table at a depth of 0 to 1 foot.	Severe: seasonal water table at a depth of 0 to 1 foot.	Severe: seasonal water table at a depth of 0 to 1 foot; high shrink-swell potential.
Zafra. Mapped only in complex with Carnasaw and Sherwood soils.	Severe: bedrock at a depth of 20 to 56 inches.	Moderate where slopes are 1 to 7 percent; bedrock at a depth of 20 to 56 inches; severe where slopes are 7 to 12 percent.	Slight where slopes are 1 to 6 percent; moderate where slopes are 6 to 12 percent.

uses in town and country planning—Continued

Picnic areas	Camp areas	Paths and trails	Trees and shrubs
Severe: clay surface layer.	Severe: clay surface layer; very slow permeability.	Severe: clay surface layer	Moderate: root growth restricted.
Slight where slopes are 3 to 8 percent; moderate where slopes are 8 to 15 percent.	Slight where slopes are 3 to 8 percent; moderate where slopes are 8 to 15 percent.	Slight	Slight.
Slight where slopes are 5 to 8 percent; moderate where slopes are 8 to 15 percent; severe where slopes are 15 to 45 percent.	Moderate where slopes are 5 to 15 percent; slow permeability; severe where slopes are 15 to 45 percent.	Slight where slopes are 5 to 15 percent; moderate where slopes are 15 to 25 percent; severe where slopes are 25 to 45 percent.	Slight.
Slight where slopes are 1 to 8 percent; moderate where slopes are 8 to 12 percent.	Slight where slopes are 1 to 8 percent; moderate where slopes are 8 to 12 percent.	Slight	Moderate: moderate to low available water capacity.
Slight	Slight	Slight	Slight.
Moderate: subject to flooding.	Severe: subject to flooding; slight if protected from flooding.	Slight	Slight.
Slight where slopes are 1 to 8 percent; moderate where slopes are 8 to 12 percent.	Slight where slopes are 1 to 8 percent; moderate where slopes are 8 to 12 percent.	Slight	Slight.
Moderate: silty clay loam surface layer.	Moderate: silty clay loam surface layer; slow permeability.	Moderate: silty clay loam surface layer.	Moderate: root-restricting layer at a shallow depth.
Severe: clay surface layer	Severe: clay surface layer; stoniness.	Severe: clay surface layer; stoniness.	Severe: bedrock at a depth of 6 to 20 inches.
Slight where slopes are 1 to 8 percent; moderate where slopes are 8 to 15 percent.	Moderate: slow permeability	Slight	Moderate: root-restricting layer at a shallow depth.
Severe: seasonal water table at a depth of 0 to 1 foot.	Severe: seasonal water table at a depth of 0 to 1 foot.	Moderate to severe: seasonal water table at a depth of 0 to to 1 foot; somewhat poorly drained.	Moderate to severe: seasonal water table at a depth of 0 to 1 foot.
Severe: seasonal water table at a depth of 0 to 1 foot; clay surface layer; subject to flooding.	Severe: seasonal water table at a depth of 0 to 1 foot; very slow permeability; subject to flooding.	Severe: seasonal water table at a depth of 0 to 1 foot; subject to flooding.	Severe: seasonal water table at a depth of 0 to 1 foot.
Severe: seasonal water table at a depth of 0 to 1 foot; poorly drained.	Severe: seasonal water table at a depth of 0 to 1 foot.	Severe: seasonal water table at a depth of 0 to 1 foot; poorly drained.	Severe: seasonal water table at depth of 0 to 1 foot.
Slight where slopes are 1 to 8 percent: moderate where slopes are 8 to 12 percent.	Slight where slopes are 1 to 8 percent; moderate where slopes are 8 to 12 percent.	Slight	Slight.

The alluvium of McCurtain County consists of loamy and clayey sediment along the Red River. This fertile sediment is mostly from sources in the west. Other alluvial sediment consists of loamy and clayey sediment from local streams. Examples of soils that formed in Red River alluvium are Roebuck, Redlake, Oklared, and Severn. Examples of soils that formed in sediment from local streams are Bibb, Iuka, Ochlockonee, and Kaufman.

Relief

Relief affects the formation of soils by its influence on drainage, erosion, temperature of the soil, and plant cover.

In McCurtain County relief, or lay of the land, is determined largely by the resistance of underlying formations to weathering and geological erosion. About 21 percent of McCurtain County consists of nearly level and gently sloping soils on flood plains and terraces.

The effects of relief have exhibited a strong influence on the amount of water percolating through the soil. The deep Guyton soils are nearly level on flood plains and terraces and are strongly developed. The deep Ruston soils are gently sloping to moderately steep and have a well-defined subsoil. The shallow Hector soils are steep and very steep, and they have a poorly defined subsoil because there is an excessive amount of runoff and not enough movement of clay downward to develop the subsoil.

Time

Time as a factor in soil formation cannot be measured strictly in years. The length of time needed for the development of genetic horizons depends on the intensity and interreactions of the soil-forming factors in promoting the losses, gains, transfers, or transformations of soil constituents that are necessary for forming soil horizons. Soils with no definite genetic horizons are young or immature. Mature or older soils have approached equilibrium with their environment and tend to have well-defined horizons.

The soils of McCurtain County range from young to old. Some of the old mature soils are Ruston, Blevins, and Tiak on the uplands. Although Cahaba, Garton, and Gallion are younger soils, they have well-expressed soil horizons. Pickens and Swink soils, on the other hand, are considered young even though they have had sufficient time to develop well-expressed horizons. They are sloping, however, and geological erosion has taken away soil material as fast or almost as fast as it has formed. Ochlockonee, Severn, and Oklared soils are on flood plains and have been forming for such a short time that they show little horizon development.

Active Processes of Soil Formation

Several active processes have influenced the formation of horizons in the soils of this county. These processes are the accumulation of organic matter, the leaching of calcium carbonates and bases, the reduction and transfer of iron, and the formation and translocation of silicate clay minerals. The results of these processes are not evident to the same degree in all the soils of the county. In most soils more than one of these processes have been active in the development of horizons.

Most of the older soils in the county have three major horizons. Some of the properties in which the major horizons differ are color, texture, structure, consistence, reaction, organic-matter content, and thickness. Subdivisions of the major horizons are based on minor differences.

Newtonia soils formed under a cover of native grasses, and the A horizon is high in organic matter and bases. Sherwood soils formed under a cover of pine and hardwood, and the A horizon has less organic matter and bases than Newtonia soils.

Differences in the leaching of calcium carbonate and other bases are evident in a comparison of the B horizons at a 72-inch depth in Panola and Tomast soils. At this depth Panola soils are typically mildly alkaline in reaction and high in bases, and Tomast soils are very strongly acid in reaction and low in bases.

Differences in the reduction and transfer of iron and the translocation of silicate clay minerals are evident in a comparison of Redlake and Wrightsville soils. Redlake soil is a young soil on flood plains and is recharged with bases during each flood. Wrightsville soils are old soils on terraces and are more developed than Redlake soils.

Classification of Soils

Classification consists of an orderly grouping of soils according to a system designed to make it easier to remember soil characteristics and interrelationships. Classification is useful in organizing and applying the results of experience and research. Soils are placed in narrow classes for discussion in detailed soil surveys and for application of knowledge within farms and fields. The many thousands of narrow classes are then grouped into progressively fewer and broader classes in successively higher categories, so that information can be applied to large geographic areas.

Two systems of classifying soils have been used in the United States in recent years. The older system was adopted in 1938 (*3*) and revised later (*5*). The system currently used by the National Cooperative Soil Survey was developed in the early sixties (*7*) and was adopted in 1965. It is under continual study (*4*).

The current system of classification has six categories. Beginning with the most inclusive, these categories are the order, the suborder, the great group, the subgroup, the family, and the series. The criteria for classification are soil properties that are observable or measurable, but the properties are selected so that soils of similar genesis are grouped together. The placement of some soil series in the current system of classification, particularly in families, may change as more precise information becomes available.

Table 9 shows the classification of each soil series of McCurtain County by family, subgroup, and order, according to the current system.

ORDER.—Ten soil orders are recognized in the current system. These are the Entisols, Vertisols, Inceptisols, Aridisols, Mollisols, Spodosols, Alfisols, Ultisols, Oxisols, and Histosols. The properties used to differentiate the soil orders are those that tend to give broad climatic

TABLE 9.—*Classification of soil series of McCurtain County*

Series	Family	Subgroup	Order
Adaton [1]	Fine-silty, mixed, thermic	Typic Ochraqualfs	Alfisols.
Alikchi	Fine-silty, siliceous, thermic	Typic Glossaqualfs	Alfisols.
Alusa	Fine, montmorillonitic, thermic	Typic Albaqualfs	Alfisols.
Bibb	Coarse-loamy, siliceous, acid, thermic	Typic Fluvaquents	Entisols.
Blevins [2]	Fine-silty, siliceous, thermic	Typic Paleudults	Ultisols.
Cadeville [3]	Fine, mixed, thermic	Albaquic Hapludalfs	Alfisols.
Cahaba	Fine-loamy, siliceous, thermic	Typic Hapludults	Ultisols.
Carnasaw	Clayey, mixed, thermic	Typic Hapludults	Ultisols.
Caspiana	Fine-silty, mixed, thermic	Typic Argiudolls	Mollisols.
Ceda	Loamy-skeletal, siliceous, nonacid, thermic	Typic Udifluvents	Entisols.
Coushatta	Fine-silty, mixed, thermic	Fluventic Eutrochrepts	Inceptisols.
Elysian	Coarse-loamy, siliceous, thermic	Haplic Glossudalfs	Alfisols.
Felker	Fine-silty, siliceous, thermic	Aquic Paleudults	Ultisols.
Frizzell	Coarse-silty, siliceous, thermic	Aquic Glossudalfs	Alfisols.
Gallion [4]	Fine-silty, mixed, thermic	Typic Hapludalfs	Alfisols.
Garton	Fine, mixed, thermic	Aquic Argiudolls	Mollisols.
Goldston	Loamy-skeletal, siliceous, thermic	Ruptic-Ultic Dystrochrepts	Inceptisols.
Guyton	Fine-silty, siliceous, thermic	Typic Glossaqualfs	Alfisols.
Hector	Loamy, siliceous, thermic	Lithic Dystrochrepts	Inceptisols.
Hollywood	Fine, montmorillonitic, thermic	Typic Pelluderts	Vertisols.
Idabel	Coarse-loamy, mixed, thermic	Fluventic Eutrochrepts	Inceptisols.
Iuka	Coarse-loamy, siliceous, acid, thermic	Aquic Udifluvents	Entisols.
Kaufman	Fine, montmorillonitic, thermic	Vertic Haplaquolls	Mollisols.
Kinta	Clayey, mixed, thermic	Aeric Paleaquults	Ultisols.
Kullit	Fine-loamy, siliceous, thermic	Aquic Paleudults	Ultisols.
Latanier	Clayey over loamy, mixed, thermic	Vertic Hapludolls	Mollisols.
Muskogee	Fine-silty, mixed, thermic	Aquic Paleudalfs	Alfisols.
Newtonia	Fine-silty, mixed, thermic	Typic Paleudolls	Mollisols.
Ochlockonee	Coarse-loamy, siliceous, acid, thermic	Typic Udifluvents	Entisols.
Oklared	Coarse-loamy, mixed, calcareous, thermic	Typic Udifluvents	Entisols.
Panola	Fine, montmorillonitic, thermic	Vertic Ochraqualfs	Alfisols.
Pickens	Loamy-skeletal, mixed, thermic	Lithic Dystrochrepts	Inceptisols.
Pledger	Fine, mixed, thermic	Vertic Hapludolls	Mollisols.
Redlake	Fine, mixed, thermic	Vertic Eutrochrepts	Inceptisols.
Rexor	Fine-silty, siliceous, thermic	Ultic Hapludalfs	Alfisols.
Roebuck [5]	Fine, montmorillonitic, thermic	Vertic Hapludolls	Mollisols.
Ruston	Fine-loamy, siliceous, thermic	Typic Paleudults	Ultisols.
Sacul	Clayey, mixed, thermic	Aquic Hapludults	Ultisols.
Saffell	Loamy-skeletal, siliceous, thermic	Typic Hapludults	Ultisols.
Sallisaw	Fine-loamy, siliceous, thermic	Typic Paleudalfs	Alfisols.
Severn	Coarse-silty, mixed, calcareous, thermic	Typic Udifluvents	Entisols.
Sherwood	Fine-loamy, mixed, thermic	Typic Hapludults	Ultisols.
Sumter	Fine-silty, carbonatic, thermic	Rendollic Eutrochrepts	Inceptisols.
Swink	Clayey-skeletal, montmorillonitic, thermic	Lithic Hapludolls	Mollisols.
Tiak	Clayey, mixed, thermic	Aquic Paleudults	Ultisols.
Tomast	Fine-silty, siliceous, thermic	Aeric Paleaquults	Ultisols.
Tuscumbia	Fine, mixed, nonacid, thermic	Vertic Haplaquepts	Inceptisols.
Wrightsville	Fine, mixed, thermic	Typic Glossaqualfs	Alfisols.
Zafra	Loamy-skeletal, siliceous, thermic	Typic Hapludults	Ultisols.

[1] These soils are taxadjuncts to the Adaton series. They differ in that the total sand content is slightly more than 15 percent. They are enough like the Adaton series in morphology, composition, and behavior that a new series is not warranted.

[2] These soils are taxadjuncts to the Blevins series. They differ in that they lack silt in the argillic horizon. They are enough like the Blevins series in morphology, composition, and behavior that a new series is not warranted.

[3] These soils are taxadjuncts to the Cadeville series. They differ in that reaction is higher in the lower B horizon and in the C horizon. They are enough like the Cadeville series in morphology, composition, and behavior that a new series is not warranted.

[4] These soils are taxadjuncts to the Gallion series. They differ in that they lack silt in the argillic horizon. They are enough like the Gallion series in morphology, composition, and behavior that a new series is not warranted.

[5] Some of these soils are taxadjuncts to the Roebuck series. They differ in that they are calcareous throughout the solum. They are enough like the Roebuck series in morphology, composition, and behavior that a new series is not warranted.

groupings of soils. Two exceptions, the Entisols and Histosols, occur in many different climates. Six of the ten soil orders are represented in McCurtain County. These are the Alfisols, Entisols, Inceptisols, Mollisols, Ultisols, and Vertisols.

SUBORDER.—Each order is divided into suborders, mainly on the basis of characteristics that seem to produce classes having genetic similarity. Mainly, these are characteristics that reflect either the presence or absence of water-logging or soil differences resulting from the climate or vegetation. The climatic range is narrower than that of the orders.

GREAT GROUP.—Each suborder is divided into great groups, on the basis of uniformity in the kinds and sequence of major horizons and similarity of the significant features of corresponding horizons. The horizons considered are those in which clay, iron, or humus have accumulated and those that have pans that interfere with

the growth of roots or the movement of water. The features selected are the self-mulching properties of clays, soil temperature, chemical composition (mainly calcium, magnesium, sodium, and potassium), and the like.

SUBGROUP.—Each great group is divided into subgroups, one representing the central (typic) segment of the group, and other groups, called intergrades, that have properties of one great group and also one or more properties of another great group, suborder, or order. Subgroups may also be established in those instances where soil properties intergrade outside the range of any great group, suborder, or order.

FAMILY.—Families are established within a subgroup mainly on the basis of properties that affect the growth of plants or the behavior of soils in engineering use. Among the properties considered are texture, mineralogy, reaction, soil temperature, permeability, thickness of horizons, and consistence.

SERIES.—A series is a group of soils that have major horizons that, except for texture of the surface layer, are similar in important characteristics and in arrangement in the profile.

General Nature of the County

The additional information about the soil survey area in this section will be most useful to people not familiar with McCurtain County. It includes early history, physiography, drainage and relief, natural resources, transportation and industry, farming, and climate of the county.

McCurtain County was formed out of the Choctaw Nation of Indian Territory. The county was named for one of the principal chiefs of the Choctaw Indian tribe, Green McCurtain.

McCurtain County has the oldest farm in Oklahoma. The Shawneetown farm three miles south of Idabel was settled by a Frenchman in 1770. Shawnee Indians moved into the area in 1808 and built fences and farmed the fertile bottom lands of the Red River. The area was purchased by Colonel Robert M. Jones, Choctaw planter, in 1830, from which time he operated one of the largest plantations in Oklahoma.

Idabel, county seat of McCurtain County, was settled in 1903, and the first town government was organized in 1906. The town was named for the two daughters, Ida and Belle, of Mr. Purnell, Division Superintendent of the Arkansas and Choctaw Railroad, now the St. Louis-San Francisco Railway.

McCurtain County is noted for its scenic beauty and historical interest. Besides having the oldest farm, this county has the oldest church and the only rice farm in Oklahoma.

McCurtain County has five general types of areas: the timbered sandstone and shale area, the timbered rolling southern coastal plain, the lowlands or "flatwoods" coastal plain, the prairie area, and the bottom lands of streams and rivers. The main part of the county is the timbered sandstone and shale area, which is made up of steep mountainous areas and smooth sloping crests and ridges.

Important natural resources of the county include timber, gravel, sand, limestone, and water.

Vast timber resources and other building materials are in the county. Southern yellow pine dominates the timber industry in the area. McCurtain County has 280 million board feet of growing stock and more than one billion board feet of yellow pine sawtimber. Hardwood timber stock amounts to 173 million board feet, while 446 million board feet is sawtimber size.

Sand and gravel are taken from many streams and rivers throughout the county. Thick gravel deposits occur throughout areas of the southern coastal plains.

Limestone is plentiful. Three limestone mining pits are in operation along the south bank of the Little River, producing farm and road materials.

McCurtain County has an abundant supply of water. The water supply for Idabel, Broken Bow, and Valliant comes from the release of water into the Little River and the Mountain Fork River from Pine Creek Reservoir and Broken Bow Reservoir. Ground water is the source of most domestic and stock water supplies. Streams and farm ponds furnish large amounts of stock water.

McCurtain County is served by the St. Louis-San Francisco Railway and the Texas, Oklahoma, and Eastern Railroad. The St. Louis-San Francisco Railway provides daily freight service to the east and to the west. No passenger service is available. The Texas, Oklahoma, and Eastern Railroad is privately owned, and its use is restricted mainly to the shipping of lumber and lumber products.

Bus service and freight trucking are available. A landing strip for private planes is located at Idabel and Broken Bow airports. Regular scheduled airline transportation is not available. Air taxi service is available at the airports.

The county is served by a network of highways. U.S. Highway 70 runs west and east through the county, and U.S. 259 north and south. State Highway 98 serves the western part of the county; State Highways 37, 87, and 3, the southern part; and Highways 144 and 4, the northern part. In farm areas all-weather roads provide access to the hard-surfaced highways from all parts of the county.

Physiography, Drainage, and Relief

McCurtain County has an area of 1,167,846 acres. Most of it is dense woods. The prairie area extends into the county from the west and covers an area of only 40,693 acres.

The topography of McCurtain County is nearly level to very steep. The general slope is toward the south and east, and all drainage reaches the Red River and its tributaries. Little River has the largest drainage system in the county. It enters the western part of the county and flows south and east. Glover River and Mountain Fork River are the two largest tributaries that drain the northern part of the county. The Red River forms a watery southern border between the county and Texas.

The average elevation in the county is approximately 860 feet above sea level. The Flashman Tower area in the extreme northwestern corner reaches a height of about 1,500 feet. The lowest point in the county is only about

350 feet above sea level on the north bank of the Red River at the Oklahoma-Arkansas boundary. The approximate elevations of Idabel and Broken Bow, the county's major cities, are 504 and 475 feet, respectively.

Farming

About 40 percent of the soil in McCurtain County is suited to cultivation.

In recent years more people have been purchasing farms to supplement the income provided by industry. In 1959 there were 1947 farms averaging 180 acres. In 1964 there were 1973 farms averaging 189 acres.

The main farm enterprises are forestry, raising livestock, and producing crops. The main cash crops are trees for lumber, cotton, soybeans, and corn. A large acreage of common bermudagrass, and in recent years coastal bermudagrass, is cut for hay. The forestry enterprise is of large extent and is mainly commercial in nature.

The number of livestock and livestock products has increased in recent years, as has pasture development.

Poultry production has changed from a family flock to the production of layer hens and broiler flocks.

McCurtain County's leading industry is farming. Production of farm and forest products has constituted the basic industries since the county was first settled.

Climate [8]

McCurtain County has a warm, moist subtropical climate. Air masses from the Gulf of Mexico play the dominant role in influencing the weather, although cool, moist air masses from the Pacific and cold, dry air masses from Canada and the Arctic Circle frequent the area during the winter months. Seasonal changes are gradual. The spring and autumn months are mild, with cool nights and warm days. Summers are hot, and the high humidity causes the high temperatures to be more unpleasant than they would be in drier air. Winters are mild but well defined. Long periods of severe cold are infrequent. Table 10 summarizes the records of temperature and precipitation at Smithville.

Based on a composite of weather records for Smithville in the northern part of the county and for Idabel in the southern part, average daily maximum temperatures in McCurtain County range from 54 degrees F. in January to 94 degrees in July and August. Average daily minimum temperatures range from 30 degrees in January to 68 degrees in July. The highest temperature ever recorded in the county was 115 degrees at Smithville on August 10, 1936. The lowest temperature ever recorded was a reading of −22 degrees at Smithville on February 2, 1951. The number of days in which freezing temperatures are experienced averages about 85 per year in the northern part of the county, where the Kiamichi Mountains are an influence, and about 65 per year in the southern part, where the topography is rolling. The temperature fails to rise above the freezing mark on an average of about 3 days per year, and in only one winter out of four will a temperature of zero or below be recorded. Temperatures of 90 degrees or above occur on an average of 94 days per year at Idabel and 78 days at Smithville. Temperatures of 100 degrees or higher are recorded approximately 15 days per year in McCurtain County.

Precipitation averages 47 inches per year at Idabel and 54 inches at Smithville, and it is well distributed throughout the year. Spring is the wettest season, re-

[8] By STANLEY HOLBROOK, climatologist for Oklahoma, National Weather Service, U.S. Department of Commerce.

TABLE 10.—*Temperature and precipitation data*

[All data from Smithville; absence of data indicates no data available; period of record 1939–68]

Month	Temperature				Precipitation				
	Average daily maximum	Average daily minimum	Average maximum	Average minimum	Average total	One year in 10 will have		Days with snow cover of 1 inch or more	Average depth of snow on days with snow cover
						Less than	More than		
	°F	°F	°F	°F	*Inches*	*Inches*	*Inches*	*Number*	*Inches*
January	52	28	71	7	3.5	0.6	6.8	2	3
February	56	31	74	13	4.4	1.1	8.3	1	2
March	65	38	80	19	4.8	1.6	7.1	[1]	1
April	75	48	86	29	5.3	2.0	9.1		
May	81	56	91	40	6.6	1.4	11.7		
June	89	64	96	52	4.5	1.0	9.2		
July	93	67	102	57	4.9	1.5	10.3		
August	93	65	102	55	4.3	1.0	7.0		
September	87	58	97	42	3.9	.9	7.9		
October	78	48	89	31	3.8	.5	8.9		
November	64	37	77	19	3.6	1.1	8.0		
December	55	30	73	13	4.4	1.5	7.2	[1]	3
Year	74	48	[2] 103	[3] 5	54.0	39.2	70.7	3	2

[1] Less than one-half day.

[2] Average annual highest temperatures.

[3] Average annual lowest temperatures.

ceiving 31 percent of the average yearly precipitation. Autumn is the driest season, with 21 percent. The greatest annual precipitation that has been recorded in the county was 79 inches at Carter Tower in 1945. The least annual precipitation, 28 inches, was recorded at Valliant in 1943. The most rainfall that ever fell in one month was 19 inches at Smithville in March 1945. The most daily rainfall, 8 inches, fell at Smithville on March 29, 1945. Table 11 gives probabilities by specific dates for last freezing temperature in the spring and the first freezing temperatures in the fall.

Snowfall is generally light. On an average, 2 to 4 inches of snow falls each year and seldom remains on the ground more than two days. Based on records at Smithville, the greatest seasonal snowfall was 19 inches in 1941–42. The greatest daily snowfall, 8 inches, fell at Smithville on March 13, 1924.

The growing season allows ample time for the various field crops grown in the county to mature. It averages about 190 days in the northern part of the county and about 220 days in the southern part. The average date of the last freeze in the spring is March 27 at Idabel and April 15 at Smithville. The average date of the first fall freeze is October 22 at Smithville and November 3 at Idabel.

Prevailing winds are southerly, with an average speed of 12 miles per hour. Strong winds associated with thunderstorms are most common during the spring season.

In the past 43 years only 18 tornadoes have struck the county, and 13 of these occurred during the spring. There have been 12 damaging hailstorms in the county in the past 35 years, and 11 of these struck in the spring.

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Glossary

AC soil. A soil that has an A and a C horizon but no B horizon. Commonly such soils are immature, as those developing from alluvium or those on steep, rocky slopes.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as crumbs, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Soil material, such as sand, silt, or clay, that has been deposited on land by streams.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern.

Available water capacity (also termed 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 capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil.

Base saturation. The degree to which material that has base-exchange properties is saturated with exchangeable cations other than hydrogen, expressed as a percentage of the cation-exchange capacity.

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 clay on the surface of a soil aggregate. Synonyms: clay coat, clay skin.

Claypan. A compact, slowly permeable soil horizon that contains more clay than the horizon above and below it. A claypan is commonly hard when dry and plastic or stiff when wet.

Climax vegetation. The stabilized plant community on a particular

TABLE 11.—*Probabilities of last freezing temperatures in spring and first in fall*

[All data from Idabel; period of record 1921–50]

Probability	Dates for given probability and temperature				
	16° F.	20° F.	24° F.	28° F.	32° F.
Spring:					
1 year in 10, later than	February 24	March 9	March 14	April 3	April 13
2 years in 10, later than	February 16	February 28	March 8	March 27	April 7
5 years in 10, later than	January 30	February 11	February 24	March 13	March 27
Fall:					
1 year in 10, earlier than	December 6	November 23	November 15	October 31	October 19
2 years in 10, earlier than	December 11	November 30	November 21	November 5	October 24
5 years in 10, earlier than	December 21	December 12	December 2	November 16	November 3

site; it reproduces itself and does not change so long as the environment does not change.

Complex, soil. A mapping unit consisting of different kinds of soils that occur in such small individual areas or in such an intricate pattern that they cannot be shown separately on a publishable soil map.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrations of compounds, or of soil grains cemented together. The composition of some concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are examples of material commonly found in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material, and tends to stretch somewhat and pull apart, rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft. —When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard and brittle; little affected by moistening.

Drainage class (natural). Refers to the conditions of frequency and duration of periods of saturation or partial saturation that existed during the development of the soil, 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 different classes of natural soil drainage are recognized.

Excessively drained soils are commonly very porous and rapidly permeable and have a low water-holding capacity.

Somewhat excessively drained soils are also very permeable and are free from mottling throughout their profile.

Well-drained soils are nearly free from mottling and are commonly of intermediate texture.

Moderately well drained soils commonly have a slowly permeable layer in or immediately beneath the solum. They have uniform color in the A and upper B horizons and have mottling in the lower B and the C horizons.

Somewhat poorly drained soils are wet for significant periods but not all the time, and some soils commonly have mottling at a depth below 6 to 16 inches.

Poorly drained soils are wet for long periods and are light gray and generally mottled from the surface downward, although mottling may be absent or nearly so in some soils.

Very poorly drained soils are wet nearly all the time. They have a dark-gray or black surface layer and are gray or light gray, with or without mottling, in the deeper parts of the profile.

Decreaser. Any of the climax range plants most heavily grazed. Because they are the most palatable, they are first to be destroyed by overgrazing.

Deferred grazing. The practice of delaying grazing until range plants have reached a definite stage of growth, in order to increase the vigor of the forage and to allow the desirable plants to produce seed. Contrasts with continuous grazing and rotation grazing.

Diversion, or diversion terrace. A ridge of earth, generally a terrace, that is built to divert runoff from its natural course and, thus, to protect areas downslope from the effects of such runoff.

Erosion. The wearing away of the land surface by wind (sandblast), running water, and other geological agents.

Fertility, soil. The quality of a soil that enables it to provide compounds, in adequate amounts and in proper balance, for the growth of specified plants, when other growth factors such as light, moisture, temperature, and the physical condition of the soil are favorable.

Flood plain. Nearly level land, consisting of stream sediments, that borders a stream and is subject to flooding unless protected artificially.

Genesis, soil. The manner in which a soil originates. Refers especially to the processes initiated by climate and organisms that are responsible for the development of the solum, or true soil, from the unconsolidated parent material, as conditioned by relief and age of landform.

Gilgai. Typically, the microrelief of Vertisols—clayey soils that have a high coefficient of expansion and contraction with changes in moisture; usually a succession of microbasins and microknolls, in nearly level areas, or of microvalleys and microridges that run with the slope.

Gleyed soil. A soil in which waterlogging and lack of oxygen have caused the material in one or more horizons to be neutral gray in color. The term "gleyed" is applied to soil horizons with yellow and gray mottling caused by intermittent waterlogging.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rains. The distinction between gully and rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by normal tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage. V-shaped gullies result if the material is more difficult to erode with depth; whereas U-shaped gullies result if the lower material is more easily eroded than that above it.

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes, These are the major horizons:

O horizon.—The layer of organic matter on the surface of a mineral soil. This layer consists of decaying plant residues.

A horizon.—The mineral horizon at the surface or just below an O horizon. This horizon is the one in which living organisms are most active and therefore is marked by the accumulation of humus. The horizon may have lost one or more of soluble salts, clay, and sesquioxides (iron and aluminum oxides).

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or some combination of these; (2) by prismatic or blocky structure; (3) by redder or stronger colors than the A horizon; or (4) by some combination of these. Combined A and B horizons are usually called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon—The weathered rock material immediately beneath the solum. In most soils this material is presumed to be like that from which the overlying horizons were formed. If the material is known to be different from that in the solum, a Roman numeral precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock usually underlies a C horizon but may be immediately beneath an A or B horizon.

Increasers. Species in the climax vegetation that increase in relative amount as the more desirable plants are reduced by close grazing; increasers commonly are shorter than decreasers, and some are less palatable to livestock.

Invaders. On range, plants that come in and grow after the climax vegetation has been reduced by grazing. Generally, invader plants are those that follow disturbance of the surface. (Most weeds are "invaders").

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state. In engineering, a high liquid limit indicates that the soil has a high content of clay and a low capacity for supporting loads.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineralogical, and biological properties of the various horizons, and their thickness and arrangement in the soil profile.

Mottling, soil. Irregularly marked with spots of different colors that vary in number and size. Mottling in soils usually indicates aeration and lack of 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 these: *fine,* less than 5 millimeters (about

0.2 inch) in diameter along the greatest dimension; *medium*, ranging from 5 millimeters to 15 millimeters (about 0.2 to 0.6 inch) in diameter along the greatest dimension; and *coarse*, more than 15 millimeters (about 0.6 inch) in diameter along the greatest dimension.

Munsell notation. A system for designating color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with a hue of 10YR, a value of 6, and a chroma of 4.

Ped. An individual natural soil aggregate, such as a crumb, a prism, or a block, in contrast to a clod.

Permeability. The quality that enables the soil to transmit water or air. Terms used to describe permeability are as follows: *very slow, slow, moderately slow, moderate, moderately rapid, rapid,* and *very rapid.*

Phase, soil. A subdivision of a soil, series, or other unit in the soil classification system made because of differences in the soil that affect its management but do not affect its classification in the natural landscape. A soil series, for example, may be divided into phases because of differences in slope, stoniness, thickness, or some other characteristic that affects its management but not its behavior in the natural landscape.

pH value. A numerical means for designating acidity and alkalinity in soils. A pH value of 7.0 indicates precise neutrality; a higher value, alkalinity; and a lower value, acidity.

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 a semisolid to a plastic state.

Plowpan. A compacted layer formed in the soil immediately below the plowed layer.

Poorly graded. A soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles in poorly graded soil material, density can be increased only slightly by compaction.

Profile, soil. A vertical section of the soil through all its horizons and extending into the parent material.

Range condition. The state of health or productivity of both soil and forage in a given range, in terms of what productivity could or should be under normal climate and the best practical management. Condition classes generally recognized are—*excellent, good, fair,* and *poor.* The classification is based on the percentage of original, or climax, vegetation on the site, as compared to what ought to grow on it if management were good.

Range site. An area of range where climate, soil, and relief are sufficiently uniform to produce a distinct kind of climax vegetation.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction because it is neither acid nor alkaline. An acid, or "sour," soil is one that gives an acid reaction; an alkaline soil is one that is alkaline in reaction. In words, the degrees of acidity or alkalinity are expressed thus:

	pH		*pH*
Extremely acid	Below 4.5	Neutral	6.6 to 7.3
Very strongly acid	4.5 to 5.0	Mildly alkaline	7.4 to 7.8
Strongly acid	5.1 to 5.5	Moderately alkaline	7.9 to 8.4
Medium acid	5.6 to 6.0	Strongly alkaline	8.5 to 9.0
Slightly acid	6.1 to 6.5	Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Rill. A steep-sided channel resulting from accelerated erosion. A rill normally is a few inches in depth and width and is not large enough to be an obstacle to farm machinery.

Sand. Individual rock or mineral fragments in a soil that range in diameter from 0.05 to 2.0 millimeters. Most sand grains consist of quartz, but they may be of any mineral composition. The textural class name of any soil that contains 85 percent or more sand and not more than 10 percent clay.

Silt. Individual mineral particles in a soil that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). Soil of the silt textural class is 80 percent or more silt and less than 12 percent clay.

Site index. A numerical means of expressing the quality of a forest site that is based on the height of the dominant stand at an arbitrarily chosen age; for example, the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on relatively steep slopes and in swelling clays, where there is marked change in moisture content.

Slope. Soil slope is expressed in words and percentage of gradient. In this county slopes are as follows: Nearly level, 0 to 1 percent; very gently sloping, 1 to 3 percent; gently sloping, 3 to 5 percent; sloping, 5 to 8 percent; strongly sloping, 8 to 12 percent; moderately steep, 12 to 20 percent; steep, 20 to 45 percent; and very steep, 45 percent plus.

Soil. A natural, three-dimensional body on the earth's surface that supports plants and that has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

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: *Very coarse sand* (2.0 to 1.0 millimeter); *coarse sand* (1.0 to 0.5 millimeter); *medium sand* (0.5 to 0.25 millimeter); *fine sand* (0.25 to 0.10 millimeter); *very fine sand* (0.10 to 0.05 millimeter); *silt* (0.05 to 0.002 millimeter); and *clay* (less than 0.002 millimeter). The separates recognized by the International Society of Soil Science are as follows: I (2.0 to 0.2 millimeter); II (0.2 to 0.02 millimeter); III (0.02 to 0.002 millimeter); IV (less than 0.002 millimeter).

Solum. The upper part of a soil profile, above the parent material, in which the processes of soil formation are active. The solum in mature soil includes the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristic of the soil are largely confined to the solum.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. 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 grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tillage of a soil below normal depth ordinarily to shatter a hardpan or claypan.

Substratum. Technically, the part of the soil below the solum.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, about 5 to 8 inches in thickness. The plowed layer.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that it may soak into the soil or flow slowly to a prepared outlet without harm. Terraces in fields are generally built so they can be farmed. Terraces intended mainly for drainage have a deep channel that is maintained in permanent sod.

Terrace (geological). An old alluvial plain, ordinarily flat or undulating, bordering a river, lake, or the sea. Stream terraces are frequently called second bottoms, as contrasted to flood plains, and are seldom subject to overflow. Marine terraces were deposited by the sea and are generally wide.

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."

Tilth, soil. The condition of the soil in relation to the growth of plants, especially soil structure. Good tilth refers to the friable state and is associated with high noncapillary porosity and

stable, granular structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Water table. The highest part of the soil or underlying rock material that is wholly saturated with water. In some places an upper, or perched, water table may be separated from a lower one by a dry zone.

Well-graded soil. A soil or soil material consisting of particles that are well distributed over a wide range in size or diameter. Such a soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an oven-dry basis, at which plants (specifically sunflower) wilt so much that they do not recover when placed in a dark, humid atmosphere.

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