United States Department of Agriculture

Natural Resources Conservation Service

In cooperation with Texas Agricultural Experiment Station and Texas State Soil and Water Conservation Board

Soil Survey of Freestone County, Texas

How to Use This Soil Survey

General Soil Map

The general soil map, which is a color map, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

To find information about your area of interest, locate that area on the map, identify the name of the map unit in the area on the color-coded map legend, then refer to the section **General Soil Map Units** for a general description of the soils in your area.

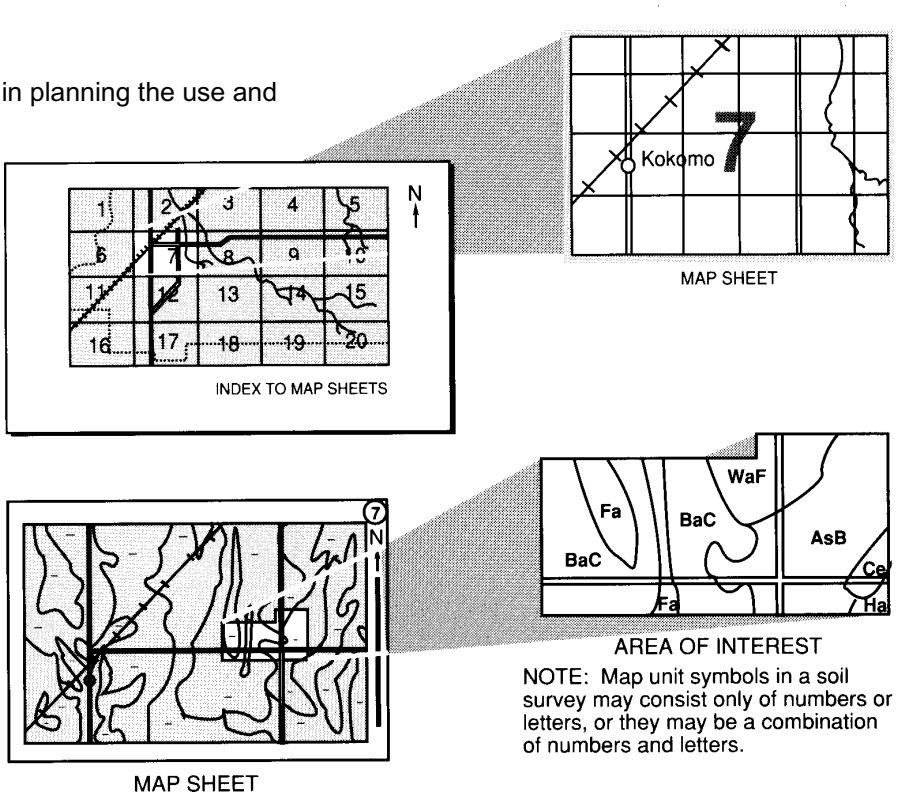
Detailed Soil Maps

The detailed soil maps can be useful in planning the use and management of small areas.

To find information about your area of interest, locate that area on the **Index to Map Sheets**. Note the number of the map sheet and turn to that sheet.

Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Turn to the **Contents**, which lists the map units by symbol and name and shows the page where each map unit is described.

The **Contents** shows which table has data on a specific land use for each detailed soil map unit. Also see the **Contents** for sections of this publication that may address your specific needs.



NOTE: Map unit symbols in a soil survey may consist only of numbers or letters, or they may be a combination of numbers and letters.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (formerly the Soil Conservation Service) has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1984. Soil names and descriptions were approved in 1986. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1986. This survey was made cooperatively by the Natural Resources Conservation Service and the Texas Agricultural Experiment Station and the Texas State Soil and Water Conservation Board. The survey is part of the technical assistance furnished to the Freestone Soil and Water Conservation District.

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

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Cover: This coastal bermudagrass pasture is on Bigbrown silty clay loam, 1 to 8 percent slopes, a mine soil constructed and revegetated after completion of strip-mining. The mining of lignite for use in electrical power generation is a major industry in Freestone County.

Additional information about the Nation's natural resources is available on the Natural Resources Conservation Service home page on the World Wide Web. The address is http://www.nrcs.usda.gov (click on "Technical Resources").

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Issued 2002

Foreword

This soil survey contains information that affects land use planning in Freestone County. It contains predictions of soil behavior for selected land uses. The survey also highlights soil limitations, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

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

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. The information in this report is intended to identify soil properties that are used in making various land use or land treatment decisions. Statements made in this report are intended to help the land users identify and reduce the effects of soil limitations that affect various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

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

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

John P. Burt
State Conservationist
Natural Resources Conservation Service

Soil Survey of
Freestone County, Texas

By Edward F. Janak, Jr., and Edward L. Griffin, Natural Resources Conservation Service

Fieldwork by Herbert E. Bruns, Woodrow G. Chervenka, Edward L. Griffin, Edward F. Janak, Jr., and William D. Meade, Natural Resources Conservation Service

United States Department of Agriculture, Natural Resources Conservation Service, in cooperation with
the Texas Agricultural Experiment Station and the Texas State Soil and Water Conservation Board

FREESTONE COUNTY is in the northeast part of central Texas (fig. 1). It has a total area of 571,437 acres, or 893 square miles, 3,149 acres of which is large bodies of water of 40 acres or more in size. The population of the county is on the increase. According to the 1970 census, the population was 11,116; in 1980, it was 14,830; and in 1990, it was 15,818. Fairfield, the county seat, had a population of 3,234 in 1990. Other towns in the county are Dew, Donie, Freestone, Kirvin, Oakwood, Streetman, Teague, Winkler, and Wortham.

The topography is nearly level to hilly. Elevation ranges from about 190 feet where the Trinity River leaves the county, to about 610 feet on Burleson Hill in the southeastern part. Most of Freestone County is in the Trinity River watershed except the extreme southwest part, which is in the watershed of the Navasota River.

About 90 percent of the land area is grazing land, 5 percent is cropland, 1 percent is woodland, and 4 percent is used for other purposes.

Parts of three Major Land Resource Areas are in Freestone County. The Northern Blackland Prairie has dominantly dark-colored loamy and clayey soils. The native vegetation is mid and tall grasses. The Southern Claypan Area has dominantly light-colored loamy and sandy soils. The native vegetation is oak trees with an understory of mid and tall grasses. The East Texas Timberlands has dominantly light-colored sandy and loamy soils and native vegetation of oaks, pines, and shade-tolerant grasses.

This soil survey updates the survey of Freestone County published in 1921 *(4)*. It provides additional information and has larger maps, which show the soils in greater detail.

General Nature of the County

This section provides general information on the history, agriculture, natural resources, and climate of Freestone County.

History

Caddoan Indians were early inhabitants of Freestone County and surrounding areas. In the 1830's, the first immigrant settlers built homes along the Trinity River. In 1850, Freestone County was created from Limestone County and named for the stones indigenous to the area. Fairfield became the first and only county seat. In the 1870's, railroads were built in the extreme southern and western parts of the county, causing the population and economy to rise in these areas. Before construction of the railroads, the Trinity River was very important in exporting products from the county.

Agriculture

The early settlers along the Trinity River and its major tributaries found plentiful water, grass, wood, and sandy soils that could be easily plowed. They cultivated small areas of vegetable crops, corn, and tobacco for home use. Each family had a few

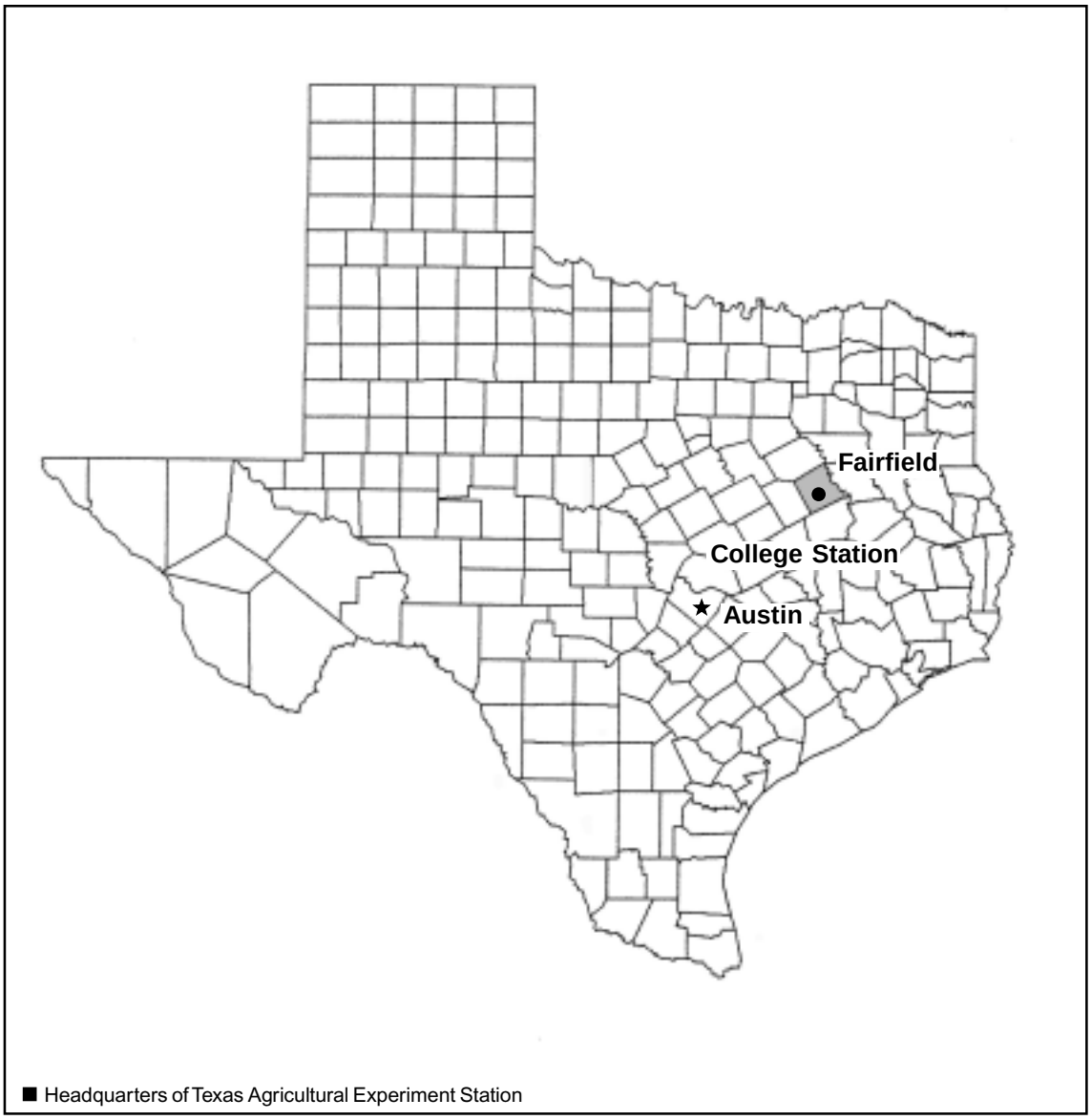

Figure 1.—Location of Freestone County in Texas.

livestock, mainly cattle. Because markets were far away, these early settlers were largely self-sustaining.

Following the Civil War, people began moving west. This migration, coupled with the invention of the moldboard plow, brought rapid agricultural changes to the area. The moldboard plow broke sod for crops in large areas of uncultivated land. During these early years, practices to conserve the soil were unknown. Erosion and depletion of organic matter reduced much of the land's productivity.

In March 1940, the Freestone-Leon Soil and Water Conservation District was formed to help solve erosion problems.

Today, beef cattle provide the largest source of agricultural income, primarily from cow-calf operations. Cropland is used mostly to grow small grain for livestock grazing. Small acreages are in truck crops and orchards. Most of the land that was formerly cultivated has been converted to pasture.

Natural Resources

Soil, the most important natural resource in the county, is critical to the production of livestock forage, hay, crops, and timber.

Freestone County's numerous oil and gas wells

provide a source of income for many landowners. Many residents are employed in the drilling and servicing of these wells.

Lignite, a form of soft coal, underlies large areas of the county. Mining of this lignite, which is used as fuel for large steam powered electrical generators, began in the early 1970's. Mining operations, power generation, and mined land reclamation provide employment in the area.

Climate

Table 1 gives data on temperature and precipitation for the survey area as recorded at Fairfield in the period 1961 to 1990. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter, the average temperature is 49 degrees F and the average daily minimum temperature is 38 degrees. The lowest temperature on record, which occurred on December 23, 1989 is -2 degrees. In summer, the average temperature is 82 degrees and the average daily maximum temperature is 94 degrees. The highest recorded temperature, which occurred on August 19, 1984, is 109 degrees.

Growing degree days are shown in table 3. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (50 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is about 39.8 inches. Of this, 20 inches, or 50 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 7 inches. The heaviest 1-day rainfall during the period of record was 7 inches on August 12, 1966. Thunderstorms occur on about 45 days each year, and most occur in May.

Snowfall is rare. In 70 percent of the winters, there is no measurable snowfall. In 20 percent, the snowfall, usually of short duration, is more than 1 inch. The heaviest 1-day snowfall on record was 7 inches.

The average relative humidity in midafternoon is about 57 percent. Humidity is higher at night, and the average at dawn is about 83 percent. The sun shines 74 percent of the time possible in summer and 56 percent in winter. The prevailing wind is from the south. Average windspeed is highest, 13 miles per hour, in April.

How This Survey Was Made

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

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

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

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically.

Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

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

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

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

The descriptions, names, and delineations of the soils in this survey area do not fully agree with those of the soils in adjacent survey areas. Differences are the result of a better knowledge of soils, modifications in series concepts, or variations in the intensity of mapping or in the extent of the soils in the survey areas.

General Soil Map Units

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

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

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

Loamy and Sandy Savannah Soils of the Uplands and Stream Terraces

These soils make up about 55 percent of the county. The major soils are Axtell, Bigbrown, Derly, Edge, Gasil, Edge, Padina, Rader, Silawa, Silstid, and Tabor. These soils are mostly claypan soils that have a loamy or sandy surface layer and a more clayey subsoil. The subsoil grades into underlying layers of sandy to shaly materials or into ancient loamy and clayey alluvium. The landscape is nearly level terraces and undulating erosional uplands. The native vegetation consists of post oak, blackjack oak, and hickory trees with an understory of American beautyberry, yaupon, greenbriar, forbs, and native grasses. Most of the native vegetation has been cleared or grazed out. These areas are used mostly as improved pasture or as rangeland where thickets of small oak trees and understory vegetation are common. These soils provide habitat for many species of wildlife. Deer hunting is an economic consideration when managing these soils. Some areas are strip-mined for lignite.

1. Edge-Tabor

Loamy, very slowly permeable, nearly level to strongly sloping, well drained and moderately well drained soils; on uplands and high stream terraces.

This map unit makes up about 37 percent of the county. It is about 47 percent Edge soils, 17 percent Tabor soils, and 36 percent soils of minor extent.

The well drained Edge soils are on gently to moderately sloping ridgetops and interstream divides and strongly sloping upland side slopes. The moderately well drained Tabor soils are on broad, gently sloping upland interstream divides and nearly level high stream terraces.

Typically, the Edge soils have a loamy surface layer and a clayey subsoil underlain by interbedded shale and sandy material.

Typically, the Tabor soils have a loamy surface layer and a clayey subsoil underlain by shaly material that increases in alkalinity as depth increases.

Of minor extent in this map unit are Crockett, Gasil, Hatliff, Hearne, Lufkin, Nahatche, Padina, Silawa, and Silstid soils. The loamy Crockett and Gasil soils are in positions on the landscape similar to those of the Tabor soils. The loamy Hatliff and Nahatche soils are on the flood plains of streams and the loamy Lufkin soils are in depressions. The loamy Hearne and Silawa soils are in positions on the landscape similar to those of the Edge soils. The sandy Padina, Silawa, and Silstid soils are on higher-lying, convex ridgetops.

The soils of this map unit are used mainly as pastureland and rangeland. A few areas are cultivated and planted in small grains. Suitability of these soils for growing improved pasture and native grasses is moderate. Because of the slope, Edge soils are not suited for use as cropland. The Tabor soils are moderately suitable for this use. These soils are moderately or well suited to wildlife habitat. These soils are poorly suited to most urban uses. They are only moderately suited to most recreational uses because of low strength, very slow permeability, and shrinking and swelling with changes in moisture.

2. Padina-Silstid

Sandy, moderately permeable, gently sloping to moderately sloping, well drained soils; on uplands

This map unit makes up about 10 percent of the county. It is about 31 percent Padina soils, 30 percent Silstid soils, and 39 percent soils of minor extent.

The Padina soils are on gently sloping, broad divides, generally on the highest parts of the landscape. The Silstid soils are on broad, gently sloping divides and on moderately sloping side slopes.

Typically, the Padina soils have a very thick sandy surface layer and a loamy subsoil.

Typically, the Silstid soils have a thick sandy surface layer and a loamy subsoil.

Of minor extent in this map unit are Arenosa, Edge, Gasil, Hearne, Robco, Silawa, and Tabor soils. The sandy Arenosa soils are in positions on the landscape similar to those of the Padina soils. The loamy Edge, Hearne, and Silawa soils are on strongly sloping side slopes. The loamy Gasil and Tabor soils are on smooth slopes below the Silstid soils. The sandy Robco soils are on foot slopes and at the heads of drainageways.

The soils of this map unit are used mainly as pastureland and rangeland. A few areas are cultivated and planted in corn, watermelons, and fruit orchards. Suitability of these soils for growing improved pasture and native grasses is low to moderate. The soils are moderately suited to use as cropland and are moderately suited to use as wildlife habitat. These soils are well suited to most urban uses. Because of the sandy texture of these soils, suitability is moderate for most recreational uses.

3. Silawa-Gasil-Tabor

Loamy, moderately permeable and very slowly permeable, nearly level to strongly sloping, well drained and moderately well drained soils; on stream terraces and uplands

This map unit makes up about 4 percent of the county. It is about 35 percent Silawa soils, 27 percent Gasil soils, 17 percent Tabor soils, and 21 percent soils of minor extent.

The well drained, moderately permeable Silawa soils are on strongly sloping side slopes of high stream terraces. The well drained, moderately permeable Gasil soils are on broad, gently sloping interstream divides. The moderately well drained, very slowly permeable Tabor soils are on broad, gently sloping interstream divides and nearly level high stream terraces.

Typically, the Silawa soils have a loamy surface layer and a loamy subsoil underlain by stratified sandy and loamy materials.

Typically, the Gasil soils have a loamy surface layer and a loamy subsoil.

Typically, the Tabor soils have a loamy surface layer and a clayey subsoil underlain by shaly material that increases in alkalinity as depth increases.

Of minor extent in this map unit are Edge, Hearne, Lufkin, Padina, and Silstid soils. The loamy Edge and Hearne soils are in positions on the landscape similar to those of the Silawa soils. The loamy Lufkin soils are in depressional areas. The sandy Padina and Silstid soils are on higher-lying convex ridgetops.

The soils of this map unit are used mainly as pastureland and rangeland. A few areas are cultivated and planted in small grains. Suitability of these soils for growing improved pasture and native grasses is moderate to high. Because of slope, Silawa soils are not suited to use as cropland. Suitability of the Gasil and Tabor soils is moderate to high for this use. Suitability for wildlife habitat is moderate to high. The Gasil soils are well suited to most urban uses. Slope limits some urban uses on the Silawa soils. The Tabor soils are poorly suited to urban uses because of low strength, very slow permeability and shrinking and swelling with changes in moisture. The Gasil and Tabor soils are well suited to most recreational uses. The Silawa soils are moderately suited to these uses.

4. Bigbrown

Loamy, moderately slowly permeable, gently sloping to moderately sloping, well drained soils; on uplands

This map unit makes up about 2 percent of the county. It is about 76 percent Bigbrown soils, 18 percent soils of minor extent, and about 6 percent miscellaneous areas associated with the mining operation. The extent of the miscellaneous areas decreases as reclamation progresses.

The Bigbrown soils consist of reclaimed overburden materials. The extent of these soils increases as more mined areas are smoothed and planted in vegetation.

Typically, the Bigbrown soils have a loamy surface layer. The loamy underlying material has randomly sorted strata of shaly, clayey, and sandy materials. These soils are moderately alkaline.

Of minor extent in this map unit are Edge, Hatliff, Nahatche, Padina, Silstid, and Tabor soils. The loamy Edge and Tabor soils and the sandy Padina and Silstid soils are in unmined areas adjacent to the Bigbrown soils. The loamy Hatliff and Nahatche soils are on flood plains of streams. Also included are

miscellanous areas consisting of active strip mine pits, stockpiled overburden, and freshly smoothed areas that have not been established to vegetation.

The soils of this map unit are used mainly as pasture. Several areas are used experimentally to determine suitability for use as cropland, for growing native grasses and trees, and for wildlife habitat. Suitability is moderate to high for use as improved pasture. The soils are poorly suited to most urban uses because of instability of fill. They are well suited to most recreational uses.

5. Rader-Derly-Axtell

Loamy, very slowly permeable, nearly level to moderately sloping, poorly drained and moderately well drained soils; on stream terraces

This map unit makes up about 1 percent of the county. It is about 32 percent Rader soils, 27 percent Derly soils, 17 percent Axtell soils, and 24 percent soils of minor extent.

The poorly drained Derly soils are in areas that are broad and nearly level to slightly depressional. The moderately well drained Rader soils are in nearly level and gently sloping areas on the landscape above the Derly soils or on mounds within areas of the Derly soils. The moderately well drained Axtell soils are in gently sloping areas adjacent to the Derly and Rader soils and on moderately sloping side slopes along drainageways.

Typically, the Rader soils have a loamy surface layer and a loamy subsoil that increases in clay content as depth increases.

Typically, the Derly soils have a loamy surface layer and a subsoil that is loamy in the upper part and clayey in the lower part.

Typically, the Axtell soils have a loamy surface layer and a clayey subsoil that is very strongly acid in the upper part and moderately alkaline in the lower part.

Of minor extent in this map unit are the sandy Bienville and Styx soils. The sandy Bienville soils are in lower areas adjacent to flood plains. Styx soils are in nearly level and gently sloping positions on the landscape similar to those of the Rader soils.

The soils of this map unit are used mainly as pasture and rangeland. A few areas are cultivated and planted in small grains. Suitability of these soils for growing improved pasture grasses is moderate to high. Suitability is moderate for growing native grasses. The soils are well suited to wildlife habitat. These soils are moderately suitable for use as cropland. The Derly and Axtell soils are poorly suited to most urban uses. They are only moderately suited to most recreational uses because of shrinking and swelling with changes in moisture, wetness, and very slow permeability. The Rader soils are moderately suited to most urban uses and well suited to most recreational uses.

Loamy and Sandy Forested Soils of the Uplands

These soils make up about 23 percent of the county. The major soils are Cuthbert, Kirvin, Oakwood, Pickton, Tonkawa, and Wolfpen. These soils have a sandy or loamy surface layer and loamy or clayey subsoil. The subsoil grades into underlying sandy, loamy, or shaly geological materials. The landscape is undulating to steep erosional uplands. The native vegetation is dominately southern red oak, post oak, sweetgum, American elm, and hickory trees with an understory of yaupon, American beautyberry, greenbriar, and sassafras. Scattered pine trees grow in some areas. Many areas of native vegetation have been cleared and are now in improved pasture. These soils provide habitat for many species of wildlife. Deer hunting is an economic consideration when managing these soils.

6. Wolfpen-Cuthbert-Pickton

Loamy and sandy, moderately permeable and moderately slowly permeable, gently sloping to steep, well drained soils; on uplands

This map unit makes up about 17 percent of the county. It is about 33 percent Wolfpen soils, 24 percent Cuthbert soils, 16 percent Pickton soils, and 27 percent soils of minor extent.

The very deep, sandy, moderately permeable Wolfpen and Pickton soils are on broad, gently sloping divides and on strongly sloping and moderately steep side slopes. The very deep, loamy, moderately slowly permeable Cuthbert soils are on strongly sloping to steep side slopes and hills.

Typically, the Wolfpen soils have a thick sandy surface layer and a loamy subsoil that increases in acidity as depth increases.

Typically, the Cuthbert soils have a loamy surface layer and a clayey subsoil underlain by stratified loamy and shaly materials. These soils are strongly or very strongly acid.

Typically, the Pickton soils have a very thick sandy surface layer and a loamy subsoil.

Of minor extent in this map unit are Hatliff, Keechi, Kirvin, Leagueville, Nahatche, Oakwood, and Tonkawa soils. The loamy Hatliff and Nahatche soils and the sandy Keechi soils are on the flood plains of streams. The loamy Kirvin soils are on higher-lying

convex knolls. The sandy Leagueville soils are along narrow drainageways and on concave foot slopes. The loamy Oakwood soils are on smooth slopes below the Wolfpen soils. The sandy Tonkawa soils are in positions on the landscape similar to those of the Pickton soils.

The soils of this map unit are used mainly for pastureland and wildlife habitat. A few areas are planted to loblolly and shortleaf pines. A few areas are planted in truck crops, fruit trees, and small grains. Suitability of these soils is moderate for growing improved pasture grasses and low to moderate for producing native grasses. Suitability for use as cropland is low to moderate. The Cuthbert soils are not suited to this use because of slope. The soils are moderately suited or well suited to timber production. Suitability for wildlife habitat is moderate to high.

In most areas, these soils are poorly suited to urban uses because of slope. However, the gently sloping areas of Pickton and Wolfpen soils are well suited to urban uses. Suitability is moderate for most recreational uses. The major limitation of the Wolfpen and Pickton soils is the sandy surface layer. Slope limits the Cuthbert soils for recreational uses.

7. Pickton-Tonkawa

Sandy, moderately permeable and rapidly permeable, gently sloping to moderately steep, well drained and excessively drained soils; on uplands

This map unit makes up about 2 percent of the county. It is about 43 percent Pickton soils, 22 percent Tonkawa soils, and 35 percent soils of minor extent.

The well drained, moderately permeable Pickton soils are on gently sloping or undulating interstream divides and on strongly sloping and moderately steep side slopes. The excessively drained, rapidly permeable Tonkawa soils are on broad, gently sloping to strongly sloping interstream divides, and are generally higher on the landscape than the Pickton soils.

Typically, the Pickton soils have a very thick sandy surface layer and a loamy subsoil.

Typically, the Tonkawa soils have a very thick sandy surface layer and a sandy subsoil.

Of minor extent in this map unit are Cuthbert, Leagueville, and Wolfpen soils. The loamy Cuthbert soils are on steep side slopes. The sandy Leagueville soils are in depressions and at the head of drainageways. The sandy Wolfpen soils are in positions on the landscape similar to those of the Pickton soils.

The soils of this map unit are used mainly for pastureland and wildlife habitat. Some areas are planted in loblolly and shortleaf pines. A few areas are planted in watermelons. Suitability of these soils is moderate to poor for growing improved pasture and poor for producing native grasses. Suitability for use as cropland and for timber production is moderate to poor. These soils are poorly suited to wildlife habitat. They are moderately to poorly suited to most urban uses. Slope is the main limitation in areas where the slope is more than 8 percent. Suitability for most recreational uses is moderate to poor. The sandy surface layer and slope are the main limitations.

8. Oakwood-Kirvin

Loamy, moderately slowly permeable, gently sloping and moderately sloping, moderately well drained and well drained soils; on upland divides

This map unit makes up about 2 percent of the county. It is about 51 percent Oakwood soils, 23 percent Kirvin soils, and 26 percent soils of minor extent.

The moderately well drained Oakwood soils are on broad, gently sloping interstream divides. The well drained Kirvin soils are on gently sloping and moderately sloping, higher-lying convex knolls.

Typically, the Oakwood soils have a loamy surface layer and a loamy subsoil.

Typically, the Kirvin soils have a loamy surface layer and a very strongly acid, loamy subsoil that has strata of shale in the lower part. The subsoil is underlain by extremely acid stratified shale and loamy material.

Of minor extent in this map unit are Cuthbert, Hatliff, Nahatche, Raino, and Wolfpen soils. The loamy Cuthbert soils are on strongly sloping to steep side slopes. The loamy Hatliff and Nahatche soils are on flood plains of streams. The loamy Raino soils are on saddles and foot slopes below the Oakwood soils. The sandy Wolfpen soils are in positions on the landscape slightly above the Oakwood soils.

The soils of this map unit are used mainly for pastureland. They are well suited or moderately suited to growing improved pasture grasses, but poorly to moderately suited to producing native grasses. Most areas of these soils are moderately suited to use as cropland. These soils are highly suitable for timber production and are well suited to wildlife habitat. These soils are well suited to most urban and recreational uses. The main limitations of the Kirvin soils are shrinking and swelling with changes in moisture and moderately slow permeability.

9. Cuthbert

Loamy, moderately slowly permeable, strongly sloping to steep, well drained soils; on uplands

This map unit makes up about 2 percent of the county. It is about 62 percent Cuthbert soils and 38 percent soils of minor extent.

The Cuthbert soils are on strongly sloping to steep side slopes and on moderately steep and steep stony hills. The soils of minor extent are on gently sloping to strongly sloping ridgetops and interstream divides and on narrow flood plains.

Typically, the Cuthbert soils have a loamy surface layer and a clayey subsoil underlain by stratified loamy and shaly materials. These soils are strongly or very strongly acid.

Of minor extent in this map unit are Hatliff, Kirvin, Nahatche, Oakwood, Pickton, and Wolfpen soils. The loamy Hatliff and Nahatche soils are on flood plains of streams. The loamy Kirvin and Oakwood soils and the sandy Pickton and Wolfpen soils are on gently sloping and strongly sloping divides. The Pickton and Wolfpen soils are on lower, more convex side slopes below the Cuthbert soils.

The soils of this map unit are used mainly as wildlife habitat. In some areas, the surface layer has been removed for gravel. A few areas of this map unit are used to produce pine timber. These soils are not suited to use as cropland because of slope, stoniness, and the hazard of erosion. Most areas of these soils are moderately to poorly suited to improved pasture. Some areas are not suitable for improved pasture because of slope, stoniness, or both. Suitability for growing native grasses is poor; however, suitability for wildlife habitat is good. These soils are moderately suited to timber production. Suitability is poor for most urban and recreational uses, mainly because of slope.

Loamy and Clayey Soils of the Flood Plains

These soils make up about 15 percent of the county. The major soils are Hatliff, Kaufman, Nahatche, Trinity, and Whitesboro. Kaufman and Trinity soils are clays that crack severely when dry. Whitesboro, Hatliff, and Nahatche soils are loamy throughout. The soils in this group formed in alluvium from local and distant sources. The landscape is a nearly level flood plain with stream channels and a few sloughs, natural levees, and alluvial fans. Originally, the flood plains were dominately forested with water oak, willow oak, pecan, American elm, sweetgum, and cottonwood. The understory plants were American beautyberry, greenbriar, grape, dewberry, and yaupon. Many areas have been cleared and are now being used as improved pasture, rangeland, and cropland. The flood plains provide habitat for many species of wildlife. Deer hunting is an economic consideration in managing the soils in this group.

10. Kaufman-Trinity

Clayey, very slowly permeable, nearly level, somewhat poorly drained soils; on river flood plains

This map unit makes up about 7 percent of the county. It is about 57 percent Kaufman soils, 33 percent Trinity soils, and 10 percent soils of minor extent.

The Kaufman and Trinity soils are on flood plains of the Trinity River. Generally, the Trinity soils are on the northern part of the flood plain and the Kaufman soils are below the confluence of large tributary creeks that carry noncalcareous sediments.

Typically, the Kaufman soils have a clayey surface layer and a clayey subsoil. They are slightly alkaline.

Typically, the Trinity soils have a clayey surface layer and a clayey subsoil. They are moderately alkaline.

Soils of minor extent in this map unit are Gladewater, Hatliff, Nahatche, and Whitesboro soils. The clayey Gladewater soils are in old sloughs and depressional areas. The loamy Hatliff, Nahatche,and Whitesboro soils are on natural levees along channels and on alluvial fans adjacent to surrounding uplands.

The soils of this map unit are used mainly as pastureland, rangeland, and wildlife habitat. These soils are well suited to growing both improved and native grasses. Most of the soils are not suited to use as cropland because of frequent flooding; however, they are well suited to this use in areas that are protected from flooding. Suitability for wildlife habitat is moderate. The soils are poorly suited to hardwood timber production. These soils are poorly suited to most urban and recreational uses because of flooding, wetness, and shrinking and swelling with changes in moisture.

11. Nahatche-Hatliff

Loamy, moderately permeable and moderately rapidly permeable, nearly level, somewhat poorly drained and moderately well drained soils; on flood plains of creeks

This map unit makes up about 6 percent of the county. It is about 53 percent Nahatche soils, 28 percent Hatliff soils, and 19 percent soils of minor extent.

The somewhat poorly drained, moderately permeable Nahatche soils are on broad flood plains of large creeks and in backwater areas on flood plains of smaller creeks and local streams. The moderately well drained, moderately rapidly permeable Hatliff soils are on pointbars, natural levees along stream channels, and alluvial fans.

Typically, the Nahatche soils have a loamy surface layer and a loamy subsoil.

Typically, the Hatliff soils have a loamy surface layer and a stratified loamy and sandy subsoil.

Soils of minor extent in this map unit are the sandy Keechi soils and the loamy Pluck soils. These soils are in old sloughs and depressional areas.

The soils of this map unit are used mainly as pasture and wildlife habitat. These soils are moderately suited to growing improved pasture and native grasses. They are well suited to wildlife habitat. These soils are not suited to use as cropland because of flooding. The Nahatche soils are moderately suited to growing hardwood trees, but poorly suited to growing pine trees. The Hatliff soils are moderately suited to growing pine trees. These soils are poorly suited to most urban and recreational uses because of wetness and flooding.

12. Whitesboro

Loamy, moderately permeable, nearly level, well drained soils; on flood plains of large creeks

This map unit makes up about 2 percent of the county. It is about 70 percent Whitesboro soils and 30 percent soils of minor extent.

The soils of this map unit are on the broad, nearly level flood plains of the upper part of Tehuacana Creek.

Typically, the Whitesboro soils have a loamy surface layer and a loamy subsoil. They are neutral or slightly alkaline.

Soils of minor extent in this map unit are Gladewater, Hatliff, Kaufman, and Nahatche soils. The clayey Gladewater soils are in old sloughs and depressional areas. The Hatliff and Nahatche soils are on flood plains of small tributary streams. The clayey Kaufman soils are in positions on the landscape similar to those of the Whitesboro soils.

The soils of this map unit are used mainly as pastureland. They are well suited to growing both improved pasture grasses and native grasses. These soils are well suited to use as cropland except in areas where flooding is frequent and growing crops is not practical. Native and improved varieties of pecan are grown on this soil. Most of these soils are moderately suited to wildlife habitat. Because of the hazard of flooding, they are poorly suited to most urban uses and only moderately suited to most recreational uses.

Loamy and Clayey Prairie Soils of the Uplands and Stream Terraces

These soils make up about 7 percent of the county. The major soils are Burleson, Crockett, and Wilson soils. These soils have a loamy or clayey surface layer and a clayey subsoil that is underlain by alkaline, marine, clayey and shaly geological materials or clayey alluvium. The landscape is mainly undulating erosional uplands with some areas of nearly level terraces. In many areas, these soils are covered with a large amount of mesquite and other kinds of brush. Most of these soils are used for livestock grazing. Mid and short grasses have largely replaced the native tall grasses because of grazing pressure. A few areas are used for cropland. These soils provide habitat for only a few wildlife species.

13. Crockett

Loamy, very slowly permeable, nearly level to moderately sloping, moderately well drained soils; on uplands

This map unit makes up about 7 percent of the county. It is about 67 percent Crockett soils and 33 percent soils of minor extent.

The Crockett soils are on broad, nearly level to gently sloping interstream divides and on gently sloping and moderately sloping side slopes.

Typically, the Crockett soils have a loamy surface layer and a clayey subsoil that is alkaline in the lower part. It is underlain by shale that is moderately alkaline.

Of minor extent in this map unit are Ellis, Ferris, Lamar, Leson, Mabank, Whitesboro, and Wilson soils. The clayey Ellis and Ferris soils and the loamy Lamar soils are on strongly sloping side slopes. The clayey Leson soils are in positions on the landscape similar to those of the Crockett soils. The loamy Mabank and Wilson soils are mainly on foot slopes. The loamy Whitesboro soils are on narrow flood plains of streams.

The soils of this map unit are used mainly as pastureland and rangeland. They are moderately suited to growing improved pasture and grain crops. They are well suited to producing native grasses, except in areas where the hazard of erosion is severe. In those areas, the soils are either poorly suited or not suited to use as improved pastureland or cropland, and only moderately suited to producing native grasses. These soils are well suited to wildlife habitat. They are poorly suited to urban uses and

moderately suited to recreational uses. Shrinking and swelling with changes in moisture is the main limitation.

14. Burleson-Wilson

Clayey and loamy, very slowly permeable, nearly level to gently sloping, moderately well drained soils; on ancient stream terraces

This map unit makes up less than 1 percent of the county. It is about 27 percent Burleson soils, 25 percent Wilson soils, and 48 percent soils of minor extent.

The clayey Burleson soils are in broad, nearly level areas. The loamy Wilson soils are in nearly level and gently sloping areas.

Typically, the Burleson soils have a neutral, clayey surface layer and a moderately alkaline, clayey subsoil.

Typically, the Wilson soils have a loamy surface layer and a clayey subsoil that increases in alkalinity as depth increases.

Of minor extent in this map unit are Crockett, Derly, Ferris, Lamar, Rader, and Styx soils. The loamy Crockett and Lamar soils and the clayey Ferris soils are on side slopes. The loamy Derly soils are in lower, poorly drained areas. The loamy Rader soils and the sandy Styx soils are in slightly higher positions on the landscape.

The soils of this map unit are used mainly as pastureland and rangeland. They are moderately to well suited to growing both improved pasture and native grasses and are moderately to well suited to use as cropland. Suitability for wildlife habitat is poor to moderate. These soils are poorly suited to most urban uses and poor to moderately suited to most recreational uses. Shrinking and swelling with changes in moisture is the main limitation.

Detailed Soil Map Units

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

A map unit delineation on a map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils or miscellaneous areas. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils and miscellaneous areas are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some "included" areas that belong to other taxonomic classes.

Most included soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, inclusions. They may or may not be mentioned in the map unit description. Other included soils and miscellaneous areas, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, inclusions. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. The included areas of contrasting soils or miscellaneous areas are mentioned in the map unit descriptions. A few included areas may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

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

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

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

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Crockett fine sandy loam, 1 to 3 percent slopes, is a phase of the Crockett series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, or associations.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Derly-Rader complex, 0 to 1 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Nahatche-Hatliff association, frequently flooded, is an example.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Pits is an example.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Contents") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils or miscellaneous areas.

ArC—Arenosa fine sand, 1 to 8 percent slopes

This very gently sloping to moderately sloping soil is on broad uplands. The surfaces are mainly smooth or convex. Areas are irregular in shape and range from about 10 to 200 acres in size.

Typically, the surface layer is slightly acid, pale brown fine sand about 9 inches thick. The underlying material, from a depth of 9 to 30 inches, is moderately acid, light yellowish brown fine sand. From a depth of 30 to 80 inches it is moderately acid, very pale brown fine sand.

This soil is somewhat excessively drained. Surface runoff is very low. Permeability is very rapid and the available water capacity is low. The hazard of water erosion is slight. The hazard of wind blowing bare soil is severe.

Included with this soil in mapping are small areas of Padina and Silstid soils. These soils are in slightly lower positions on the landscape. The included soils make up less than 15 percent of the map unit.

This Arenosa soil is used mainly as pasture and hayland. A few areas are used as cropland.

This soil is poorly suited to pastures of coastal bermudagrass and lovegrass because of the low available water capacity. Overseeding legumes, such as vetch, into the coastal bermudagrass lengthens the grazing season and increases soil fertility by adding nitrogen. Applications of lime and a complete fertilizer are needed for optimum grass production.

This soil is poorly suited to use as cropland, mainly because of the low available water capacity. Leaving crop residue on or near the surface helps to reduce soil erosion and maintain organic matter content. Applications of lime and a complete fertilizer help to maintain higher yields.

Suitability of this soil for growing native grasses is poor. The low available water capacity severely limits plant growth, except for the most drought-tolerant plants.

The soil is poorly suited to wildlife habitat.

Suitability is moderate for most urban uses and poor for most recreational uses. The sandy nature of the soil is the main limitation.

This soil is in capability subclass IVs and in the Very Deep Sand range site.

AxB—Axtell fine sandy loam, 1 to 5 percent slopes

This gently sloping soil is on broad divides of stream terraces. The surfaces are slightly convex. Areas are irregular in shape and range from about 30 to 200 acres in size.

Typically, the surface layer is slightly acid, dark yellowish brown fine sandy loam about 7 inches thick. The subsoil extends to a depth of 80 inches. From a depth of 7 to 24 inches, it is very strongly acid, red clay that has light brownish gray and yellowish brown mottles; from a depth of 24 to 42 inches, the subsoil is moderately acid, mottled red, light brownish gray, and yellowish brown clay; from a depth of 42 to 49 inches, it is moderately acid, mottled grayish brown, strong brown, and yellowish red clay; and from a depth of 49 to 80 inches, it is moderately alkaline, mottled grayish brown, yellowish brown, and light olive brown clay.

This soil is moderately well drained. Surface runoff is medium to high. Permeability is very slow and the available water capacity is high. The hazard of water erosion is moderate.

Included with this soil in mapping are small areas of Derly, Rader, and Styx soils. The Derly soils are in small wet spots. The Rader soils are on low mounds and on foot slopes. The Styx soils are in slightly higher positions on the landscape. Also included are small areas of eroded Axtell soil. The included soils make up less than 15 percent of the map unit.

This Axtell soil is used mainly as pasture. It is moderately suited to pastures of bermudagrass and bahiagrass. Overseeding legumes, such as vetch, singletary peas, or arrowleaf clover, into the bermudagrass lengthens the grazing season, helps to reduce erosion, and increases soil fertility by adding nitrogen. Applications of lime and a complete fertilizer of nitrogen, phosphorus, and potash help to maintain optimum forage production.

This soil is poorly suited for cropland because of the hazard of erosion. If small grains and hay crops are grown, residue should be left on or near the surface to help reduce erosion, aid water infiltration, and maintain organic matter. Terracing and contour farming are needed to divert runoff water. Grassed waterways can control excess runoff water from terraces.

This soil is moderately suited to growing native grasses. The main limitation to plant growth is the restricted movement of air, roots, and water in the very slowly permeable subsoil.

This soil is well suited to wildlife habitat.

Suitability for most urban uses is poor. The subsoil shrinks and swells with changes in moisture, is very slowly permeable, and has low strength. The soil is moderately suited to most recreational uses. The main limitation is very slow permeability.

This soil is in capability subclass IVe and in the Claypan Savannah range site.

AxD—Axtell fine sandy loam, 5 to 8 percent slopes

This moderately sloping soil is on side slopes along drainageways on stream terraces. The surfaces are slightly convex. Areas are generally long and narrow and range from 20 to about 200 acres in size.

Typically, the surface layer is slightly acid, dark brown fine sandy loam about 3 inches thick. The subsurface layer is strongly acid, yellowish brown, fine sandy loam about 3 inches thick. The subsoil extends to a depth of 60 inches. From a depth of 6 to 15 inches, it is very strongly acid, red clay that has yellowish brown and light brownish gray mottles; from a depth of 15 to 38 inches, it is strongly acid, yellowish red clay that has red and light brownish gray mottles; from a depth of 38 to 44 inches, it is neutral, yellowish brown clay that has red and light brownish gray mottles; and from a depth of 44 to 60 inches, it is moderately alkaline, mottled yellowish brown, yellowish red, and light brownish gray shale with a clayey texture.

This soil is moderately well drained. Surface runoff is very high. Permeability is very slow and the available water capacity is high. The hazard of water erosion is severe.

Included with this soil in mapping are small areas of Edge, Silawa, and Styx soils. These soils have more convex slopes and are in higher positions on the landscape. Also included are small areas of eroded Axtell soils. The included soils make up 10 to 20 percent of the map unit.

This Axtell soil is used mainly as wildlife habitat. It is moderately suitable for this use.

This soil is moderately suited to pastures of bermudagrass and bahiagrass. Overseeding legumes, such as vetch, singletary peas, or arrowleaf clover into the pasture grass helps reduce erosion, lengthens the grazing season, and increases soil fertility by adding nitrogen. Applications of lime and a complete fertilizer of nitrogen, phosphorus, and potash are needed to maintain optimum grass production.

This soil is not suitable for cropland because of slope and the severe hazard of erosion.

This soil is moderately suited to growing native grasses. The main limitation to plant growth is the restricted movement of air, roots, and water in the very slowly permeable subsoil.

The soil is moderately suited to wildlife habitat.

Suitability is poor for most urban uses and moderate for most recreational uses. Limitations are very slow permeability, slope, and potential for shrinking and swelling with changes in moisture.

This soil is in capability subclass VIe and in the Claypan Savannah range site.

BnB—Bienville loamy fine sand, 1 to 5 percent slopes

This gently sloping soil is on low stream terraces. The surfaces are mainly convex. Areas are irregular in shape and range from about 10 to 250 acres in size.

Typically, the surface layer is strongly acid, dark yellowish brown loamy fine sand about 8 inches thick. The subsurface layer is moderately acid, yellowish brown, loamy fine sand about 26 inches thick. The upper part of the subsoil, from a depth of 34 to 48 inches, is moderately acid, strong brown loamy fine sand that has light yellowish brown spots and streaks. The lower part, from a depth of 48 to 74 inches, is moderately acid, brown loamy fine sand that has thin strata of yellowish red fine sandy loam. The underlying material, from a depth of 74 to 80 inches, is slightly acid, reddish yellow loamy fine sand.

This soil is somewhat excessively drained. Surface runoff is very low. Permeability is moderately rapid and the available water capacity is low. The hazard of water erosion is moderate. In years when rainfall is above average, a water table is at a depth of 4 to 6 feet during the winter and early in spring.

Included with this soil in mapping are small areas of Rader and Styx soils. The Rader soils are on lower slopes and the Styx soils are in positions on the landscape similar to those of the Bienville soils. The

included soils make up less than 15 percent of the map unit.

This Bienville soil is used as pasture, hayland, and cropland. It is moderately suited to pastures of coastal bermudagrass and lovegrass. Overseeding legumes, such as vetch or arrowleaf clover, into the pasture grass lengthens the grazing season and increases soil fertility by adding nitrogen. Applications of lime and a complete fertilizer are needed to maintain optimum grass production.

This soil is moderately suited to growing crops such as corn, peas, and watermelons. Leaving the crop residue on or near the surface helps to reduce erosion and maintain organic matter content. Applications of lime and a complete fertilizer help to maintain higher yields.

This soil is well suited to producing timber. Woodland management practices, such as selective cutting; removing undesirable trees, shrubs, and vines; and protecting the woodland from uncontrolled burning, increase timber production.

The soil is poorly suited to growing native grasses because of the low available water capacity.

This soil is poorly suited to wildlife habitat.

This soil is well suited to most urban uses and moderately suited to most recreational uses.

This soil is in capability subclass IIIs, and the woodland ordination symbol is 10S.

BoC—Bigbrown silty clay loam, 1 to 8 percent slopes

This gently sloping to moderately sloping soil is in upland areas that have been strip-mined to remove the underlying deposits of lignite. This soil consists of reclaimed overburden materials. The surfaces are mostly plane or convex. Areas range from about 400 to several thousand acres in size. The extent of this map unit increases as more mined areas are reclaimed by smoothing the overburden and establishing vegetation. Areas of this soil were first reclaimed in about 1973.

Typically, the surface layer is moderately alkaline, dark grayish brown silty clay loam about 8 inches thick. The underlying material, from a depth of 8 to 70 inches, is moderately alkaline, dark grayish brown silty clay loam that has random strata and fragments of shale, silty clay, and sandy loam. From a depth of 70 to 80 inches, it is moderately alkaline, strong brown sandy clay loam that has layers of shale and fine sandy loam.

This soil is well drained. Surface runoff is medium to rapid. Permeability is moderately slow and the available water capacity is high. The hazard of water erosion is moderate to severe.

Included in mapping are small areas of similar soils with sandy or clayey materials below the surface layer; soils that contain oxidized materials that are remnants of premined soils; soils with surface textures other than silty clay loam, ranging from fine sandy loam to clay loam; and soils with slopes greater than 8 percent. Also included are miscellaneous areas associated with the mining operation, such as active mine pits, overburden stockpiles, and partly reclaimed areas. Similar soils make up about 25 percent of the map unit and miscellaneous areas about 7 percent.

This Bigbrown soil is used mainly as pasture and hayland. It has moderate to high suitability for pastures of coastal bermudagrass. Overseeding legumes, such as vetch, arrowleaf clover, or crimson clover into the pasture grass lengthens the grazing season and increases soil fertility by adding nitrogen. The legumes also help in the formation of soil structure and in the buildup of microbes. Applications of lime and a complete fertilizer are necessary to maintain optimum grass production.

This soil is poorly suited for cropland because of the severe hazard of erosion in areas where slopes are more than 5 percent. In areas where slopes are 5 percent or less, the suitability for growing cultivated crops is moderate.

Suitability of this soil for use as rangeland and wildlife habitat is poor because of the lack of native vegetation. Extensive testing and trials are ongoing to determine the suitability of native plant species for this soil.

Suitability is poor for most urban uses. Low strength and instability of the underlying materials caused by differential settling are limitations. The soil is well suited to most recreational uses.

This soil is in capability subclass IVe. No woodland ordination symbol or range site is assigned.

BuA—Burleson clay, 0 to 1 percent slopes

This nearly level soil is on old stream terraces. Areas are irregular in shape and range from about 20 to 500 acres in size.

Typically, the surface layer is about 51 inches thick. The upper part, to a depth of 8 inches is neutral, very dark gray clay that has strong brown mottles. The next part, from a depth of 8 to 37 inches, is neutral, very dark gray clay that has brown mottles. The lower part, from a depth of 37 to 51 inches, is moderately alkaline, dark gray clay that has light olive brown and

brown mottles. The upper part of the subsoil, from a depth of 51 to 63 inches, is moderately alkaline, grayish brown clay that has light olive brown and brown mottles. The lower part, from a depth of 63 to 80 inches, is moderately alkaline, light olive brown clay that has yellowish brown mottles.

This soil is moderately well drained. Surface runoff is low. Permeability is very slow and the available water capacity is high. The hazard of water erosion is slight.

Included with this soil in mapping are small areas of Wilson soils that have a loamy surface layer and areas of Wilson soils that have slopes of 1 to 2 percent. The included soils make up less than 15 percent of the map unit.

This Burleson soil is used mainly as pasture. It is well suited to pastures of bermudagrass. Overseeding legumes, such as vetch or singletary peas, into the pasture grass lengthens the grazing season and increases soil fertility by adding nitrogen. Applications of a complete fertilizer are needed to maintain optimum grass production.

This soil is well suited to growing cotton, grain sorghum, corn, and small grains. Leaving crop residue on or near the surface aids water infiltration and maintains organic matter. Applications of nitrogen and phosphorus are needed for optimum yields.

The soil is well suited to growing native grasses. It is poorly suited to wildlife habitat.

Suitability is poor for most urban uses and moderate for most recreational uses. The soil shrinks and swells with changes in moisture, is very slowly permeable, and has a clayey surface layer.

This soil is in capability subclass IIw and in the Blackland range site.

CrA—Crockett fine sandy loam, 0 to 1 percent slopes

This nearly level soil is on uplands. The surfaces are plane to slightly convex. Areas range from about 10 to 150 acres in size.

Typically, the surface layer is neutral, dark grayish brown fine sandy loam about 7 inches thick. The upper part of the subsoil, from a depth of 7 to 13 inches, is neutral, mottled dark reddish brown and olive gray clay. The next part, from a depth of 13 to 36 inches, is moderately alkaline, olive gray clay that has dark reddish brown mottles. The lower part, from a depth of 36 to 54 inches, is moderately alkaline, olive clay. The underlying material, from a depth of 54 to 60 inches, is moderately alkaline, mottled gray and light yellowish brown shale that has a clay loam texture.

This soil is moderately well drained. Surface runoff is low. Permeability is very slow and the available water capacity is high. The hazard of water erosion is slight.

Included with this soil in mapping are small areas of Wilson and Mabank soils in low areas. The included soils make up as much as 20 percent of the map unit.

This Crockett soil is used mainly as pasture. It is moderately suited to pastures of bermudagrass and bahiagrass. Overseeding legumes, such as vetch, singletary peas, and arrowleaf clover, into the pasture grass helps to reduce erosion, lengthens the grazing season, and increases soil fertility by adding nitrogen.

This soil is moderately suited to growing cotton, grain sorghum, corn, and small grains. Leaving crop residue on or near the surface helps to reduce water erosion and maintain organic matter. Applications of nitrogen and phosphorus are needed to maintain optimum yields. Lime is sometimes needed, especially where a high rate of fertilizer is applied.

This soil is well suited to growing native grasses. It is well suited to wildlife habitat.

Suitability is poor for most urban uses and moderate for most recreational uses. The main limitations are low strength, very slow permeability, and potential for shrinking and swelling with changes in moisture.

This soil is in capability subclass IIIs and in the Claypan Prairie range site.

CrB—Crockett fine sandy loam, 1 to 3 percent slopes

This gently sloping soil is on uplands. The surfaces are slightly convex. Areas are irregular in shape and range from about 15 to 1,000 acres in size.

Typically, the surface layer is slightly acid, dark brown fine sandy loam about 7 inches thick. The upper part of the subsoil, from a depth of 7 to 15 inches, is slightly acid, mottled dark grayish brown, very dark grayish brown and red clay. The next part, from a depth of 15 to 39 inches, is neutral, dark grayish brown clay that has light olive brown and red mottles. The lower part of the subsoil, from a depth of 39 to 46 inches, is moderately alkaline, light olive brown clay that has brownish yellow mottles. The underlying material, from a depth of 46 to 60 inches, is moderately alkaline, mottled dark grayish brown, grayish brown, and reddish yellow shale.

This soil is moderately well drained. Surface runoff is medium. Permeability is very slow and the available water capacity is high. The hazard of water erosion is moderate.

Figure 2.—Small field of corn on Crockett fine sandy loam, 1 to 3 percent slopes.

Included with this soil in mapping are areas of Edge, Mabank, Tabor, and Wilson soils. The Edge and Tabor soils are in positions on the landscape similar to those of the Crockett soil. The Mabank and Wilson soils are on foot slopes in low areas. Also included are small areas of eroded Crockett soil. The included soils make up less than 20 percent of the map unit.

This Crockett soil is used mainly as pasture. It is moderately suited to pastures of bermudagrass and bahiagrass. Overseeding legumes, such as vetch, singletary peas, and arrowleaf clover, into the pasture grass helps reduce erosion, lengthens the grazing season, and increases soil fertility by adding nitrogen.

This soil is moderately suited to growing cotton, grain sorghum, corn, and small grains (fig. 2).

Leaving crop residue on or near the surface helps to control water erosion and maintain organic matter. Terracing and contour farming are needed to control runoff. Applications of nitrogen and phosphorus are needed to maintain optimum yields. Lime is sometimes needed, especially where a high rate of fertilizer is applied.

This soil is well suited to growing native grasses. It is well suited to wildlife habitat.

Suitability is poor for most urban uses and moderate for most recreational uses. The main limitations are low strength, very slow permeability, and potential for shrinking and swelling with changes in moisture.

This soil is in capability subclass IIIe and in the Claypan Prairie range site.

CrC—Crockett fine sandy loam, 3 to 5 percent slopes

This gently sloping soil is on upland side slopes. The surfaces are slightly convex. Areas are irregular in shape and range from about 10 to 80 acres in size.

Typically, the surface layer is neutral, dark grayish brown fine sandy loam about 8 inches thick. The

upper part of the subsoil, from a depth of 8 to 15 inches, is slightly acid, mottled dark brown and reddish brown clay. The lower part, from a depth of 15 to 45 inches, is moderately alkaline, dark brown clay that has dark grayish brown mottles. The underlying material, from a depth of 45 to 60 inches, is moderately alkaline, olive brown shale that has a clay texture and olive yellow and light olive gray mottles.

This soil is moderately well drained. Surface runoff is high. Permeability is very slow and the available water capacity is high. The hazard of water erosion is severe.

Included with this soil in mapping are small areas of Edge, Ellis, and Leson soils. The Edge and Leson soils are in positions on the landscape similar to those of the Crockett soil. The Ellis soils have slightly steeper slopes. Also included are small areas of eroded Crockett soil. The included soils make up as much as 20 percent of the map unit.

This Crockett soil is used mainly as pasture. It is moderately suited to pastures of bermudagrass and bahiagrass. Overseeding legumes, such as vetch, singletary peas, and arrowleaf clover into the pasture grass lengthens the grazing season, helps reduce erosion, and increases soil fertility by adding nitrogen.

This soil has poor suitability for cropland because of the hazard of erosion. Leaving crop residue on or near the surface helps to control water erosion and maintain organic matter. Terracing and contour farming are needed to reduce runoff. Applications of nitrogen and phosphate are needed for optimum yields. Lime is sometimes needed, especially where a high rate of fertilizer is applied.

This soil is well suited to growing native grasses and to wildlife habitat.

Suitability is poor for most urban uses and moderate for most recreational uses. The main limitations are low strength, very slow permeability, and potential for shrinking and swelling with changes in moisture.

This soil is in capability subclass IVe and in the Claypan Prairie range site.

CrC3—Crockett fine sandy loam, 2 to 5 percent slopes, eroded

This gently sloping soil is on upland side slopes above drainageways. Rills and shallow gullies are in some areas. The gullies are about 5 to 15 feet wide, 1 to 3 feet deep, and 75 to 300 feet apart. Most are crossable with farm machinery. Some areas have few or no gullies. The surface layer is less than 4 inches thick because of sheet erosion. Areas are long and narrow or irregular in shape and range from about 10 to 200 acres in size.

Typically, the surface layer is moderately acid, dark brown fine sandy loam about 4 inches thick. The upper part of the subsoil, from a depth of 4 to 12 inches, is slightly acid, mottled dark brown and dark reddish brown clay. The next part, from a depth of 12 to 30 inches, is neutral, dark grayish brown clay. The lower part, from a depth of 30 to 42 inches, is moderately alkaline, olive brown clay. The underlying material, from a depth of 42 to 60 inches, is moderately alkaline, mottled olive yellow, gray, and brownish yellow silty clay loam.

This soil is moderately well drained. Surface runoff is high. Permeability is very slow and the available water capacity is moderate. The hazard of water erosion is severe.

Included with this soil in mapping are small areas of Ellis, Edge, and Leson soils. The Ellis soils have slightly steeper slopes. The Edge and Leson soils are in positions on the landscape similar to those of the Crockett soil. The included soils make up less than 20 percent of the map unit.

This Crockett soil is used mainly as pasture. It is poorly suited to pastures of bermudagrass, bahiagrass, and weeping lovegrass because of the thin surface layer. Overseeding legumes, such as vetch, singletary peas, and arrowleaf clover, into the pasture grass helps to reduce water erosion, lengthens the grazing season, and increases soil fertility by adding nitrogen. Nitrogen and phosphorus are needed for optimum yields. Lime is sometimes needed, especially where a high rate of fertilizer is applied.

This soil has poor suitability for cropland because of the thin surface layer and the hazard of water erosion. Where crops are grown, close-growing crops, such as wheat and oats, are better suited.

The soil is moderately suited to growing native grasses. It is well suited to wildlife habitat.

Suitability is poor for most urban uses and moderate for most recreational uses. The main limitations are low strength, very slow permeability, and potential for shrinking and swelling with changes in moisture.

This soil is in capability subclass IVe and in the Claypan Prairie range site.

CrD—Crockett fine sandy loam, 5 to 8 percent slopes

This moderately sloping soil is on upland side slopes. The surfaces are slightly convex. Areas are

irregular in shape and range from about 10 to 100 acres in size.

Typically, the surface layer is slightly acid, dark grayish brown fine sandy loam about 6 inches thick. The upper part of the subsoil, from a depth of 6 to 15 inches, is neutral, dark brown clay that has yellowish red and light olive brown mottles. The next part, from a depth of 15 to 36 inches, is neutral, dark brown clay that has light olive brown mottles. The lower part, from a depth of 36 to 44 inches, is moderately alkaline, mottled olive yellow, light brownish gray, and dark brown clay. The underlying material, from a depth of 44 to 60 inches, is moderately alkaline, mottled olive yellow, light brownish gray, and gray shale that has silty clay loam texture.

This soil is moderately well drained. Surface runoff is very high. Permeability is very slow and the available water capacity is high. The hazard of water erosion is severe.

Included with this soil in mapping are areas of Edge, Ellis, Ferris, and Lamar soils. The Edge soil is in positions on the landscape similar to those of the Crockett soil. The Ellis, Ferris, and Lamar soils are in positions higher on the landscape and have steeper slopes. Also included are small areas of eroded Crockett soil. The included soils make up less than 20 percent of the map unit.

This Crockett soil is used mainly as pasture. It is poorly suited to pastures of bermudagrass and bahiagrass. Overseeding legumes, such as vetch, singletary peas and arrowleaf clover, into the pasture grass helps to reduce erosion, lengthens the grazing season, and increases soil fertility by adding nitrogen.

This soil is not suitable for cropland because the combination of slope and surface runoff creates a severe hazard of erosion.

This soil is well suited to growing native grasses and moderately suited to wildlife habitat.

Suitability is poor for most urban uses and moderate for most recreational uses. The main limitations are low strength, slope, very slow permeability, and potential for shrinking and swelling with changes in moisture.

This soil is in capability subclass VIe and in the Claypan Prairie range site.

CrD4—Crockett fine sandy loam, 3 to 8 percent slopes, severely eroded

This gently sloping to moderately sloping soil is on upland side slopes above drainageways. Rills and shallow gullies are in most areas. The gullies are about 5 to 50 feet wide, 1 to 3 feet deep, and 30 to 100 feet apart. Many are not crossable with farm machinery. The areas between the gullies have undergone sheet erosion and the surface layer is generally less than 4 inches thick. Areas are long and narrow or irregular in shape and range from about 20 to 200 acres in size.

Typically, the surface layer is moderately acid, dark brown fine sandy loam about 2 inches thick. The upper part of the subsoil, from a depth of 2 to 12 inches, is slightly acid, mottled dark reddish brown and dark brown clay. The next part, from a depth of 12 to 30 inches, is neutral, dark grayish brown clay that has reddish brown mottles. The lower part, from a depth of 30 to 42 inches, is moderately alkaline, light olive brown clay that has dark grayish brown mottles. The underlying material, from a depth of 42 to 60 inches, is moderately alkaline, mottled dark grayish brown, olive yellow, and gray shale that has silty clay loam texture.

This soil is moderately well drained. Surface runoff is high or very high. Permeability is very slow and the available water capacity is moderate. The hazard of water erosion is severe.

Included with this soil in mapping are areas of Ellis, Ferris, Lamar, and Leson soils. The Ellis, Ferris, and Lamar soils are on higher and steeper slopes. The Leson soils are on lower and more gentle slopes. The included soils make up less than 20 percent of the map unit.

This Crockett soil is used mainly as pasture. It is poorly suited to pastures of bermudagrass and bahiagrass. Overseeding legumes, such as vetch, singletary peas, and arrowleaf clover into the pasture grass helps to reduce erosion, lengthens the grazing season, and increases soil fertility by adding nitrogen.

This Crockett soil is not suitable for cropland because the combination of slope and surface runoff creates a severe hazard of erosion.

This soil is poorly suited to growing native grasses and moderately suited to wildlife habitat.

Suitability is poor for most urban uses and moderate for most recreational uses. The main limitations are low strength, slope, very slow permeability, and potential for shrinking and swelling with changes in moisture.

This soil is in capability subclass VIe and in the Claypan Prairie range site.

CtE—Cuthbert fine sandy loam, 5 to 15 percent slopes

This strongly sloping to moderately steep soil is on upland side slopes. The surfaces are plane to slightly

convex. Areas are irregular in shape and are generally parallel to drainageways. They range from about 25 to several hundred acres in size.

Typically, the surface layer is strongly acid, dark grayish brown and brown fine sandy loam about 7 inches thick. The upper part of the subsoil, from a depth of 7 to 26 inches, is very strongly acid, red clay. Yellowish brown mottles appear at a depth of about 14 inches. The lower part of the subsoil, from a depth of 26 to 31 inches, is very strongly acid red clay loam that has yellowish red and yellowish brown mottles. The underlying material, from a depth of 31 to 65 inches, is very strongly acid, stratified, red fine sandy loam, yellowish red clay loam, and light brownish gray shale.

This soil is well drained. Surface runoff is rapid. Permeability is moderately slow and the available water capacity is moderate. The hazard of water erosion is severe.

Included with this soil in mapping are small areas of Kirvin and Wolfpen soils. The Kirvin soils are on narrow ridges between secondary drainageways. The Wolfpen soils are on lower, more convex slopes. Also included are areas of Cuthbert soils that have a gravelly surface layer and slopes of more than 15 percent. The included soils make up less than 20 percent of the map unit.

This Cuthbert soil is used mainly as pasture and wildlife habitat. It is moderately suited to pastures of coastal bermudagrass or bahiagrass. Overseeding legumes, such as vetch, singletary peas and arrowleaf clover, into the pasture grass helps to reduce erosion, lengthens the grazing season, and increases soil fertility by adding nitrogen. Applications of lime and a complete fertilizer help to maintain optimum grass production.

This soil is not suitable for cropland because the combination of slope and surface runoff creates a severe hazard of erosion.

This soil is moderately suited to use as woodland. The main concerns are the hazard of erosion and the clay near the surface that restricts the use of equipment. Woodland management practices, such as selective cutting; removal of undesirable trees, shrubs, and vines; and protection from uncontrolled fire, increase production on this soil. Native trees include southern red oak, post oak, hickory, and some shortleaf pine. Understory vegetation is mainly sweetgum, panicums, winged elm, greenbriar, American beautyberry, and post oak.

This soil is well suited to wildlife habitat and poorly suited to growing native grasses.

Suitability is poor for most urban uses. Low strength and slope are the main limitations. Suitability for most recreational uses is moderate, mainly because of slope and moderately slow permeability.

This soil is in capability subclass VIe, and the woodland ordination symbol is 8C.

CvF—Cuthbert gravelly fine sandy loam, 15 to 30 percent slopes

This moderately steep to steep soil is on upland side slopes. The surfaces are mainly slightly convex. Areas are generally long and narrow and parallel to drainageways. Areas range from about 25 to 250 acres in size.

Typically, the surface layer is moderately acid, dark brown, gravelly fine sandy loam about 3 inches thick. The subsurface layer, from a depth of 3 to 5 inches, is strongly acid, brown, gravelly fine sandy loam. The subsoil, from a depth of 5 to 34 inches, is very strongly acid, red clay that has grayish shale fragments in the lower part. The underlying material, from a depth of 34 to 60 inches, is stratified layers of extremely acid, red, brownish yellow, and light brownish gray loamy, sandy, and shaly materials.

This soil is well drained. Surface runoff is medium to high. Permeability is moderately slow and the available water capacity is moderate. The hazard of water erosion is severe.

Included with this soil in mapping are small areas of Kirvin and Wolfpen soils. Also included are Cuthbert soils with more than 35 percent gravel in the surface layer or with up to 10 percent of the surface covered by stones. The Kirvin soils and the very gravelly and stony Cuthbert soils are along the top of narrow divides between secondary drainageways. The Wolfpen soils are in a lower position on the landscape and have more convex slopes. The included soils make up less than 25 percent of the map unit.

This Cuthbert soil is used mainly as wildlife habitat. It is not suitable for pasture or cropland because of slope and the hazard of erosion.

This soil is moderately suited to use as woodland. Steepness of slope increases the hazard of erosion, and clay near the surface restricts the use of equipment. Woodland management practices, such as selective cutting; removal of undesirable trees, shrubs, and vines; and protection from uncontrolled fire, increase production on this soil. Native trees include southern red oak, post oak, and hickory.

Figure 3.—An area of Cuthbert soils, graded, 5 to 15 percent slopes, where the gravelly surface layer has been removed for use in construction projects.

Shortleaf pines are in a few areas. Understory vegetation is mainly sweetgum, panicums, winged elm, greenbriar, American beautyberry, and post oak.

This soil is poorly suited to growing native grasses. It is moderately suited to wildlife habitat.

Suitability is poor for most urban and recreational uses. Slope, low strength, and the gravelly surface layer are the main limitations.

This soil is in capability subclass VIIe, and the woodland ordination symbol is 8R.

CxE—Cuthbert soils, graded, 5 to 15 percent slopes

This strongly sloping to moderately steep soil is on uplands. The surfaces are slightly convex. Areas are irregular in shape and range from 5 to 300 acres in size.

Areas of this soil have been surface-mined for ironstone gravel (fig. 3). Areas are not uniform, but are mainly on ridges on the highest part of the landscape. This soil is extremely variable. The clay subsoil is

mostly exposed. Remnants of original loamy and gravelly surface material are in some places. The lack of topsoil makes reclamation and revegetation of this soil difficult. Most areas have sparse stands of grasses, weeds, and trees, while other areas are barren and eroded.

Typically, the subsoil is exposed. It is very strongly acid red clay to a depth of 14 inches. The upper part of the subsoil, from a depth of 14 to 22 inches, is very strongly acid red clay that has yellowish brown mottles. The lower part, from a depth of 22 to 28 inches, is extremely acid yellowish red clay that has red and gray shale fragments. The underlying material, from a depth of 28 to 60 inches, is extremely acid, interbedded layers of yellowish brown and reddish yellow loamy material, brown sandy material, and red and gray shale.

This soil is well drained. Surface runoff is medium to high. Permeability is moderately slow and the available water capacity is moderate. The hazard of water erosion is moderate.

Included with this soil in mapping are small areas of Kirvin soils and undisturbed Cuthbert soils. Also included are areas of graded Cuthbert soils that have a thin layer of original surface material and areas of Cuthbert soils that have slopes of more than 15 percent. The included soils make up less than 25 percent of the map unit.

This soil is used mainly as wildlife habitat. It is moderately suited for this use.

This soil is poorly suited to pastures of coastal bermudagrass. Removing the surface soil has left a very strongly acid clayey layer that has poor physical characteristics, making grass difficult to establish. Using fibrous-rooted, cool-season plants, such as oats, ryegrass, clovers, and vetch, can improve soil structure and provide cover to reduce erosion. Applications of lime and a complete fertilizer help to establish those plants and to maintain native and improved grasses.

This soil is not suitable for cropland because of slope and the hazard of erosion.

The suitability for growing commercial timber on this soil is poor because the topsoil has been removed, exposing a clayey subsoil that increases the hazard of erosion, limits equipment use, and decreases seedling survival. Selective thinning; removal of undesirable trees, shrubs, and vines; and protection from burning are good management practices that improve timber production.

This soil is poorly suited to growing native grasses.

Suitability is poor for most urban and recreational uses, mainly because of low strength, the clayey texture, and the potential for shrinking and swelling with changes in moisture.

This soil is in capability subclass VIe, and the woodland ordination symbol is 5C.

CzG—Cuthbert gravelly fine sandy loam, 15 to 40 percent slopes, very stony

This moderately steep to steep soil is on low hills on the highest parts of the landscape. The surfaces are mostly slightly convex. Ironstone rocks, ranging from
3 inches to 4 feet across, cover 2 to 10 percent of the soil surface. Areas are mainly elliptical in shape and range from 10 to about 300 acres in size.

Typically, the surface layer is moderately acid, dark yellowish brown, gravelly fine sandy loam about 5 inches thick. The upper part of the subsoil, from a depth of 5 to 30 inches, is extremely acid, red clay. Yellowish mottles appear at a depth of 16 inches. The lower part of the subsoil, from a depth of 30 to 35 inches, is extremely acid, red sandy clay loam that has yellowish mottles and light gray shale fragments. The underlying material, from a depth of 35 to 60 inches, is extremely acid, interbedded yellowish, reddish, and grayish sandy, loamy, and shaly materials.

This soil is well drained. Surface runoff is high. Permeability is moderately slow and the available water capacity is moderate. The hazard of water erosion is severe.

Included with this soil in mapping are small areas of Kirvin and Wolfpen soils. The Kirvin soils are on the gently sloping tops of hills. The Wolfpen soils are in lower, more convex areas. Also included are areas of Cuthbert soils that do not have stones on the surface and a few small areas that have been mined for gravel. The included soils make up less than 20 percent of the map unit.

This Cuthbert soil is used mainly as wildlife habitat.

This soil is not suitable for pasture or cropland because of slope, the hazard of erosion, and large stones that restrict use of farm equipment (fig. 4).

This soil is moderately suited to use as woodland. The main limitations are steepness of slope, severe hazard of erosion, and large stones that restrict equipment. Management practices, such as selective cutting; removal of undesirable trees, shrubs, and vines; and protection from uncontrolled fire, help to increase production. Native trees include southern red oak, post oak, and hickory. Shortleaf pines are in a

Figure 4.—Steep slopes and stones limit most uses for Cuthbert gravelly fine sandy loam, 15 to 40 percent slopes, very stony.

few areas. Understory vegetation is mainly sweetgum, panicums, winged elm, greenbriar, American beautyberry, and post oak.

This soil is poorly suited to growing native grasses. It is moderately suited to wildlife habitat.

Suitability is poor for urban and recreational uses, mainly because of slope, low strength, and stones.

This soil is in capability subclass VIIe, and the woodland ordination symbol is 8R.

DrA—Derly-Rader complex, 0 to 1 percent slopes

These nearly level soils are on stream terraces. Areas are irregular in shape and range from 25 to several hundred acres in size.

Derly soils are about 50 percent of this map unit and Rader soils are about 35 percent. Other soils are about 15 percent. The Derly and Rader soils are so intricately mixed and small in area that they cannot be mapped separately. The Derly soils are in flat areas between mounds. The Rader soils are on mounds that are 50 to 200 feet in diameter and 2 to 4 feet higher than the lower areas. Individual mounds are about 50 to 300 feet apart. In some areas, Rader soils are on low ridges that meander through the low areas.

Typically, the surface layer of the Derly soil is strongly acid, grayish brown loam about 7 inches thick. The upper part of the subsoil, from a depth of 7 to 12 inches, is strongly acid, grayish brown clay loam that has yellowish brown and yellowish red mottles and tongues of light brownish gray loam. The lower

part, from a depth of 12 to 60 inches, is moderately acid, grayish brown clay that has yellowish brown mottles and tongues of light brownish gray loam.

The Derly soil is poorly drained. Surface runoff is low and permeability is very slow. The available water capacity is high. The hazard of water erosion is slight. A perched water table is generally within a depth of 1 foot during winter and early spring.

Typically, the surface layer of the Rader soil is moderately acid, dark yellowish brown fine sandy loam about 12 inches thick. The subsurface layer, from a depth of 12 to 25 inches, is moderately acid, yellowish brown fine sandy loam. The upper part of the subsoil, from a depth of 25 to 38 inches, is strongly acid, brownish yellow sandy clay loam that has light brownish gray and yellowish red mottles and tongues of pale brown fine sandy loam. The middle part, from a depth of 38 to 55 inches, is strongly acid, mottled light brownish gray, brownish yellow, and red sandy clay. The lower part, from a depth of 55 to 80 inches, is moderately acid, mottled light brownish gray, grayish brown, red, and brownish yellow clay.

The Rader soil is moderately well drained. Surface runoff is low. Permeability is very slow and the available water capacity is high. The hazard of water erosion is slight. A perched water table is generally at a depth of 2 to 5 feet during the winter.

Included with this soil in mapping are areas of Axtell, Raino, and Styx soils. The Axtell and Raino soils are on the lower slopes of the mounds. The Styx soils are on the highest part of the mounds. Also included are areas of a soil similar to the Derly soil, except it has less clay in the subsoil. This soil is in positions on the landscape similar to those of the Derly soil. The included soils make up 5 to 25 percent of the map unit.

The soils of this map unit are used mainly as pasture and wildlife habitat. Suitability for pastures of coastal bermudagrass or fescue is moderate. Overseeding Louisiana S-1 clover into the pasture grass lengthens the grazing season and increases soil fertility by adding nitrogen. Applications of lime and a complete fertilizer are needed for optimum grass production.

These soils are moderately suited to use as cropland. Leaving crop residue on or near the surface helps to reduce soil erosion and maintain organic matter content. Applications of lime and a complete fertilizer are needed for optimum yields.

These soils are moderately suited to growing native grasses. They are well suited to wildlife habitat.

Suitability is poor for most urban uses and moderate for most recreational uses. The main limitations are wetness, very slow permeability, and potential for shrinking and swelling with changes in moisture.

The Derly soil is in capability subclass IVw; the Rader soil is in capability class IIs. The Derly soil is in the Claypan Savannah range site; the Rader soil is in the Sandy Loam range site.

EgB—Edge fine sandy loam, 1 to 5 percent slopes

This gently sloping soil is on broad interstream divides. The surfaces are smooth or slightly convex. Areas are irregular in shape and range from about 10 to 750 acres in size.

Typically, the surface layer is strongly acid, dark brown fine sandy loam about 4 inches thick. The subsurface layer, from a depth of 4 to 8 inches, is strongly acid, yellowish brown fine sandy loam. The upper part of the subsoil, from a depth of 8 to 22 inches, is strongly acid, red clay that has light brownish gray mottles. The middle part, from a depth of 22 to 40 inches, is moderately acid, red clay that has light brownish gray and grayish brown mottles. The lower part of the subsoil, from a depth of 40 to 47 inches, is slightly acid, mottled brownish yellow, light brownish gray, and red sandy clay loam. The underlying material, from a depth of 47 to 80 inches, is neutral, interbedded brown, pale brown, and brownish yellow sandy and loamy material and light brownish gray and red shale.

This soil is moderately well drained. Surface runoff is medium to high. Permeability is very slow and the available water capacity is high. The hazard of water erosion is moderate.

Included with this soil in mapping are small areas of Crockett, Gasil, Silstid, and Tabor soils. The Crockett soils are in positions on the landscape similar to those of the Edge soil. The Gasil and Silstid soils are in slightly higher positions on the landscape. The Tabor soils are in lower positions on foot slopes. Also included are small areas of eroded Edge soils and Edge soils that have 15 to 30 percent ironstone gravel in the surface layer. The included soils make up less than 20 percent of the map unit.

This Edge soil is used mainly as pasture. It is moderately suited to pastures of bermudagrass and bahiagrass.

Overseeding legumes, such as vetch, singletary peas or arrowleaf clover, into the bermudagrass helps to reduce erosion, lengthens the grazing season, and increases soil fertility by adding nitrogen. Applications of lime and a complete fertilizer are needed for optimum grass production.

This soil has poor suitability for cropland because

of the hazard of erosion; however, when used for this purpose, small grains are the crops most suited. Leaving crop residue on or near the surface aids in water infiltration, and helps to reduce soil erosion and maintain organic matter content. Terraces and contour farming are needed to control runoff and reduce erosion.

This soil is moderately suited to growing native grasses. It is well suited to wildlife habitat.

Suitability is poor for most urban uses. The soil is well suited to most recreational uses. The main limitations are very slow permeability and the potential for shrinking and swelling with changes in moisture.

This soil is in capability subclass IVe and in the Claypan Savannah range site.

EgE—Edge fine sandy loam, 5 to 12 percent slopes

This strongly sloping soil is on upland side slopes. The surfaces are plane to slightly convex. Areas are irregular in shape, generally follow along drainageways, and range from 10 to about 800 acres in size.

Typically, the surface layer is moderately acid, dark brown fine sandy loam about 5 inches thick. The upper part of the subsoil, from a depth of 5 to 30 inches, is strongly acid, red clay. Brownish yellow mottles appear at a depth of 18 inches. The lower part of the subsoil, from a depth of 30 to 40 inches, is moderately acid, mottled red and brownish yellow clay loam that has fragments of light brownish gray shaly material. The underlying material, from a depth of 40 to 60 inches, is moderately acid, light brownish gray shale that has brownish yellow and red mottles interbedded with layers of pale brown sandy material.

This soil is well drained. Permeability is very slow and the available water capacity is moderate. Surface runoff is very high and the hazard of water erosion is severe.

Included with this soil in mapping are areas of Axtell, Silawa, and Silstid soils. The Axtell and Silawa soils are in positions on the landscape similar to those of the Edge soils. The Silstid soils are on narrow, gently sloping divides. Also included are areas of eroded Edge soil. The included soils make up less than 20 percent of the map unit.

This Edge soil is used mainly as pasture and wildlife habitat. It is poorly suited to growing pasture grasses, such as coastal bermudagrass, but is moderately suited to growing native grasses. It is moderately suited to wildlife habitat.

This soil is not suitable for cropland because of slope and the hazard of water erosion.

Suitability is poor for most urban and recreational uses. The main limitations are low strength, very slow permeability, corrosivity to uncoated steel, slope, and the potential for shrinking and swelling with changes in moisture.

This soil is in capability subclass VIe and in the Claypan Savannah range site.

ErC—Edge-Gullied land complex, 2 to 8 percent slopes

These gently sloping to strongly sloping soils are on interstream divides and upland side slopes. Areas are irregular in shape and range from 5 to 75 acres in size.

About 40 to 65 percent of this map unit is Edge soil, about 25 to 40 percent is Gullied land, and about 10 to 20 percent is other soils. The Edge soil and gullied land are so intricately mixed that separating them in mapping is not practical.

Typically, the surface layer of the Edge soil is strongly acid, brown fine sandy loam about 3 inches thick. The subsoil extends to a depth of 41 inches. From a depth of 3 to 14 inches, it is very strongly acid, dark red clay; from a depth of 14 to 28 inches, it is very strongly acid, yellowish red clay that has light brownish gray and yellowish brown mottles; from a depth of 28 to 36 inches, it is very strongly acid, mottled light brownish gray, yellowish brown, and yellowish red clay loam; and from a depth of 36 to 41 inches, it is moderately acid, mottled light brownish gray and yellowish brown sandy clay loam. The underlying material, from a depth of 41 to 60 inches, is neutral, mottled yellowish brown and light brownish gray sandy clay loam.

The Edge soil is moderately well drained. Surface runoff is medium to very high. Permeability is very slow and the available water capacity is high. The hazard of water erosion is severe.

Typically, Gullied land consists of U-shaped gullies that are 3 to 10 feet deep, 10 to 50 feet wide, and 50 to 150 feet apart. The gullies are actively eroding, increasing in width by mass slumping of the gully walls and in length by headward cutting. The bottoms of the gullies are generally void of vegetation.

The soils of this map unit are used mainly as pasture and wildlife habitat. They are poorly suited to use as pasture and hayland because of the area occupied by large uncrossable gullies.

These soils are not suitable for cropland because of gullies and the hazard of erosion. In the past, most

areas were cultivated, which began the process of gully formation.

These soils are poorly suited to growing native grasses and to wildlife habitat.

Suitability is poor for most urban uses and moderate for most recreational uses. The main limitations are very slow permeability, slope, gullies, and the potential for shrinking and swelling with changes in moisture.

The Edge soil is in capability subclass VIe and in the Claypan Savannah range site. Gullied land is in capability subclass VIIe; a range site has not been assigned.

EsE—Ellis clay, 3 to 12 percent slopes

This gently sloping to strongly sloping soil is on upland side slopes above drainageways. Areas are generally long and narrow and range from about 25 to 200 acres in size.

Typically, the surface layer is neutral, dark grayish brown clay about 7 inches thick. The upper part of the subsoil, from a depth of 7 to 20 inches, is slightly alkaline, olive brown clay. The next part, from a depth of 20 to 30 inches, is moderately alkaline, light olive brown clay. The lower part, from a depth of 30 to 37 inches, is moderately alkaline, mottled light olive brown, olive gray, and yellowish brown silty clay. The underlying material, from a depth of 37 to 60 inches, is moderately alkaline, mottled light yellowish brown, grayish brown, and yellowish brown shale that has a clay texture.

This soil is well drained. Surface runoff is high to very high. Permeability is very slow and the available water capacity is moderate. The hazard of water erosion is severe.

Included with this soil in mapping are small areas of Crockett, Ferris, and Lamar soils. The Crockett soils are on lower slopes and divides between secondary drainageways. The Ferris and Lamar soils are in positions on the landscape similar to those of the Ellis soils. The included soils make up less than 20 percent of the map unit.

This Ellis soil is used mainly as pasture. It is poorly suited to this use because grass is difficult to establish and the production is low. When grasses are grown, bermudagrass, kleingrass, vetch, and singletary peas are better suited. Applications of nitrogen and phosphorus are needed for optimum grass production.

This soil is not suitable for cropland because of slope and the hazard of erosion.

This soil is moderately suited to growing native grasses and poorly suited to wildlife habitat.

Suitability is poor for most urban uses and moderate for most recreational uses. The main limitations are slope, very slow permeability, and the potential for shrinking and swelling with changes in moisture.

This soil is in capability subclass IVe and in the Eroded Blackland range site.

FeD—Ferris clay, 3 to 8 percent slopes

This gently sloping to moderately sloping soil is on upland side slopes above drainageways. The surfaces are smooth or slightly convex. Areas are long and narrow or irregular in shape and range from about 15 to 100 acres in size.

Typically, the surface layer is moderately alkaline, very dark grayish brown clay about 8 inches thick. The upper part of the subsoil, from a depth of 8 to 18 inches, is moderately alkaline, olive brown clay. The lower part, from a depth of 18 to 38 inches, is moderately alkaline, light olive brown clay. The underlying material, from a depth of 38 to 60 inches, is moderately alkaline, light olive brown clay.

This soil is well drained. Surface runoff is high. Permeability is very slow and the available water capacity is high. The hazard of water erosion is severe.

Included with this soil in mapping are small areas of Ellis and Lamar soils. These soils are in positions on the landscape similar to those of the Ferris soil. The included soils make up as much as 20 percent of the map unit.

This Ferris soil is used mainly as pasture. It is poorly suited to this use because grass is difficult to establish and production is low. When grasses are grown, bermudagrass, kleingrass, vetch, and singletary peas are better suited. Applications of nitrogen and phosphorus are needed for optimum grass production.

This soil is not suitable for cropland because of the hazard of erosion.

This soil is moderately suited to growing native grasses and poorly suited to wildlife habitat.

Suitability is poor for most urban uses and moderate for most recreational uses. The main limitations are slope, very slow permeability, and the potential for shrinking and swelling with changes in moisture.

This soil is in capability subclass VIe and in the

Eroded Blackland range site.

GfB—Gasil fine sandy loam, 1 to 5 percent slopes

This gently sloping soil is on upland interstream divides. The surfaces are plane or slightly convex. Areas are irregular in shape and range from 5 to about 150 acres in size.

Typically, the surface layer is moderately acid, yellowish brown fine sandy loam about 9 inches thick. The subsurface layer, from a depth of 9 to 16 inches, is slightly acid, light yellowish brown fine sandy loam. The upper part of the subsoil, from a depth of 16 to 49 inches, is brownish yellow sandy clay loam that has red mottles. The lower part, from a depth of 49 to 62 inches, is brownish yellow sandy clay loam that has red and yellowish red mottles. The subsoil is moderately acid from a depth of 16 to 38 inches and strongly acid from a depth of 38 to 62 inches.

This soil is well drained. Surface runoff is very low to low and permeability is moderate. The available water capacity is high. The hazard of water erosion is moderate.

Included with this soil in mapping are areas of Edge, Rader, Silstid, and Tabor soils. The Edge and Silstid soils are in slightly higher positions on the landscape. The Rader soils are at the heads of drainageways and on foot slopes. The Tabor soils are in positions on the landscape similar to those of the Gasil soil. The included soils make up as much as 20 percent of the map unit.

This Gasil soil is used mainly as pasture. It is well suited to pastures of coastal bermudagrass. Overseeding legumes, such as vetch and arrowleaf clover, into the bermudagrass lengthens the grazing season and increases soil fertility by adding nitrogen. Applications of a complete fertilizer are needed for optimum grass production. Applications of lime are needed in some areas, especially where a high rate of fertilizer is applied.

This soil is moderately suitable for cropland. Leaving crop residue on or near the surface helps to reduce soil erosion and maintain organic matter content. Applications of lime and a complete fertilizer help to maintain optimum yields.

This soil is moderately suited to growing native grasses. It is well suited to wildlife habitat.

This soil is well suited to most urban and recreational uses.

This soil is in capability subclass IIIe and in the Sandy Loam range site.

Gh—Gladewater clay, frequently flooded

This nearly level soil is on the flood plains of the Trinity River and its larger tributaries. The surfaces are mainly smooth or slightly concave. Flooding generally occurs once or twice a year from November through May for a period of a few days to a week. Slopes range from 0 to 1 percent.

Typically, the surface layer is moderately acid, very dark grayish brown clay about 8 inches thick. The subsoil, from a depth of 8 to 46 inches, is dark gray clay that has dark brown and strong brown mottles. It is moderately acid in the upper part and strongly acid in the lower part. The underlying material, from a depth of 46 to 63 inches, is moderately acid, very dark gray clay that has strong brown mottles.

This soil is poorly drained. Surface runoff is low. Permeability is very slow and the available water capacity is high. The hazard of water erosion is slight. A water table is generally within a depth of 2 feet during the winter and spring.

Included with this soil in mapping are small areas of Kaufman, Nahatche, Pluck, and Whitesboro soils. The Kaufman, Nahatche, and Whitesboro soils are in slightly higher positions on the landscape. The Pluck soils are in positions similar to those of the Gladewater soil. The included soils make up less than 20 percent of the map unit.

This Gladewater soil is used mainly as pasture and wildlife habitat.

This soil is moderately suited to pastures of coastal bermudagrass. Overseeding a legume, such as Louisiana S-1 clover, into the pasture grass lengthens the grazing season and increases soil fertility by adding nitrogen. Applications of lime, nitrogen, and phosphorus are needed for optimum grass production.

This soil is poorly suited to hardwood timber production because wetness and flooding inhibit stand development and restrict the use of equipment. Native trees include willow oak, water oak, sweetgum, and green ash. Understory vegetation consists mainly of oaks, sweetgum, sedges, and panicums.

This soil is not suitable for cropland because of the hazard of flooding.

This soil is poorly suited to growing native grasses. It is moderately suited to openland, woodland, and wetland wildlife habitat.

Suitability is poor for most urban and recreational uses because of wetness, the hazard of flooding, and the potential for shrinking and swelling with changes in moisture.

Figure 5.—Native grass on Hearne fine sandy loam, 5 to 15 percent slopes.

This soil is in capability subclass Vw and in the Clayey Bottomland range site. The woodland ordination symbol is 6W.

HeE—Hearne fine sandy loam, 5 to 15 percent slopes

This strongly sloping to moderately steep soil is on upland side slopes. The surfaces are plane to slightly convex. Areas are irregular in shape, generally follow along drainageways, and range from about 15 to 250 acres in size.

Typically, the surface layer is moderately acid, dark brown fine sandy loam about 4 inches thick. The subsurface layer, from a depth of 4 to 8 inches, is strongly acid, brown fine sandy loam. The upper part of the subsoil, from a depth of 8 to 19 inches, is very strongly acid, dark red clay. The middle part, from a depth of 19 to 23 inches, is very strongly acid, yellowish red clay that has yellowish brown and red mottles. The lower part of the subsoil, from a depth of 23 to 33 inches, is very strongly acid clay that is mottled red, yellowish red, and yellowish brown. The underlying material, from a depth of 33 to 65 inches, is very strongly acid, stratified yellowish red and yellowish brown fine sandy loam and red sandy clay loam.

This soil is well drained. Surface runoff is high. Permeability is slow and the available water capacity is moderate. The hazard of water erosion is severe.

Included with this soil in mapping are small areas of Edge and Silstid soils. The Edge soils are in positions on the landscape similar to those of the Hearne soil. The Silstid soils are on lower, more convex slopes. Also included are areas of Hearne soils that have a gravelly fine sandy loam surface layer or that have up to 5 percent of the surface covered by stones. In a few such areas, the surface layer has been removed for gravel. The included soils make up less than 20 percent of the map unit.

This soil is used mainly as pasture and wildlife habitat (fig. 5). It is poorly suited to pastures of coastal bermudagrass or bahiagrass.

Overseeding legumes, such as vetch, arrowleaf clover, or crimson clover, into the pasture grass lengthens the grazing season and increases soil fertility by adding nitrogen. Applications of lime and a complete fertilizer are needed for optimum grass production.

This soil is not suitable for cropland because of slope and the hazard of erosion.

This soil is poorly suited to growing native grasses. It is moderately suited to wildlife habitat.

Suitability is poor for most urban uses, mainly because of low strength, slope, and the potential for shrinking and swelling with changes in moisture. Suitability for most recreational uses is moderate. Slope is the main limitation.

This soil is in capability subclass VIe and in the Sandy Loam range site.

Ka—Kaufman clay loam, overwash, occasionally flooded

This nearly level soil is on the flood plains of upper Tehuacana Creek and its tributaries. Flooding occurs for brief periods about once every 2 to 10 years, most likely from February through May. Slopes are less than 1 percent. Areas are irregular in shape and range from about 40 to several hundred acres in size.

Typically, the surface layer is neutral, very dark brown clay loam about 6 inches thick. The subsoil extends to a depth of 80 inches. From a depth of 6 to 14 inches, it is slightly acid, very dark grayish brown clay loam; from a depth of 14 to 23 inches, it is slightly acid, black clay; from a depth of 23 to 57 inches, it is very dark gray clay that ranges from slightly acid to moderately alkaline; and from a depth of 57 to 80 inches, it is moderately alkaline, dark grayish brown clay that has yellowish brown mottles.

This soil is somewhat poorly drained. Surface runoff is low and permeability is very slow. The available water capacity is high. The hazard of water erosion is slight. A water table is generally within a depth of 4 feet during the winter and spring months.

Included with this soil in mapping are small areas of Gladewater and Whitesboro soils. The Gladewater soils are in depressions. The Whitesboro soils are on natural levees along streams and on alluvial fans adjacent to uplands. Also included in a similar landscape position is a Kaufman soil that has a clayey surface layer. A few areas of this soil are rarely or frequently flooded. The included soils make up about 15 percent of the map unit.

This Kaufman soil is used mainly as pasture. It is well suited to pastures of bermudagrass and fescue. Overseeding legumes, such as white clover and singletary peas, into the pasture grasses lengthens the grazing season and increases soil fertility by adding nitrogen. Applications of a nitrogen and phosphorus fertilizer are needed for optimum grass production.

Suitability for producing hardwood timber is poor. Wetness and the clayey texture limit equipment use during certain times of the year and cause severe seedling mortality and plant competition.

This soil is well suited to growing cotton, grain sorghum, and small grains. Leaving crop residue on or near the surface aids water infiltration and helps to maintain organic matter content. Applications of a nitrogen and phosphorus fertilizer are needed for optimum yields.

This soil is well suited to growing native grasses. It is moderately suited to wildlife habitat.

Suitability is poor for most urban and recreational uses. The soil is subject to flooding, shrinks and swells with changes in moisture, and is very slowly permeable.

This soil is in capability subclass IIw and in the Clayey Bottomland range site. The woodland ordination symbol is 4C.

Kc—Kaufman clay, occasionally flooded

This nearly level soil is on flood plains of the Trinity River and its larger tributaries. Levees protect it from frequent flooding. In most areas, flooding occurs once or twice for 1 to 3 days during most 5-year periods, depending upon the degree of protection. Flooding is most likely to occur from November through May. Slopes are less than 1 percent. Areas are irregular in shape and range from about 40 to 1,200 acres in size.

Typically, the surface layer is slightly alkaline, very dark gray clay about 40 inches thick. The subsoil, from a depth of 40 to 60 inches, is slightly alkaline, very dark grayish brown clay.

This soil is somewhat poorly drained. Surface runoff is low and permeability is very slow. The available water capacity is high. The hazard of water erosion is slight. A water table is generally within a depth of 4 feet during the winter and spring.

Included with this soil in mapping are small areas of Trinity and Whitesboro soils. The Trinity soils are in positions on the landscape similar to those of the Kaufman soil. The Whitesboro soils are on natural levees along stream channels. The included soils make up less than 20 percent of the map unit.

This Kaufman soil is used mainly as pasture and cropland. The soil is well suited to pastures of bermudagrass and fescue. Overseeding legumes, such as white clover and singletary peas, into the pasture grasses lengthens the grazing season and increases soil fertility by adding nitrogen. Applications of nitrogen and phosphorus are needed for optimum grass production.

This soil is well suited to growing cotton, grain sorghum, and small grains. Leaving crop residue on or near the surface aids water infiltration and helps to maintain organic matter. Applications of a nitrogen and phosphorus fertilizer are needed for optimum yields.

Suitability is poor for producing hardwood timber. Wetness and the clayey texture limit equipment use during certain times of the year and cause severe seedling mortality and plant competition.

This soil is well suited to growing native grasses. It is moderately suited to wildlife habitat.

Suitability is poor for most urban and recreational uses. The soil is subject to flooding, shrinks and swells with changes in moisture, is very slowly permeable, and has a clayey surface layer.

This soil is in capability subclass IIw and in the Clayey Bottomland range site. The woodland ordination symbol is 4C.

Kd—Kaufman clay, frequently flooded

This nearly level soil is on flood plains of the Trinity River and its larger tributaries. Flooding occurs once or twice in most years, most likely from November through May. Slopes are less than 1 percent. Most areas are oblong, ranging from about 500 feet to over a mile wide. They range up to several thousand acres in size and can occupy entire flood plains. Some areas are only part of a flood plain and range from 40 to 500 acres in size.

Typically, the surface layer is slightly alkaline, very dark gray clay about 42 inches thick. The upper part of the subsoil, from a depth of 42 to 53 inches, is slightly alkaline, dark gray clay that has dark grayish brown mottles. The lower part, from a depth of 53 to 70 inches, is slightly alkaline, dark grayish brown clay that has light olive brown mottles.

This soil is somewhat poorly drained. Surface runoff is low. Permeability is very slow and the available water capacity is high. The hazard of water erosion is slight. A water table is generally within a depth of 4 feet during the winter and spring.

Included with this soil in mapping are small areas of Gladewater, Nahatche, Trinity, and Whitesboro soils. The Gladewater soils are in old sloughs and in depressions. The Nahatche and Whitesboro soils are on natural levees along stream channels and on alluvial fans adjacent to uplands. The Trinity soils are in positions on the landscape similar to those of the Kaufman soil. Also included are areas of Kaufman soils where flooding occurs only occasionally and areas of Kaufman soils that have loamy materials below a depth of 40 inches. These soils are in slightly higher positions on the landscape. The included soils make up less than 15 percent of the map unit.

This Kaufman soil is used mainly as pasture and wildlife habitat. It is well suited to pastures of bermudagrass and fescue. Overseeding legumes, such as white clover and singletary peas, into the pasture grasses lengthens the grazing season and increases soil fertility by adding nitrogen. Applications of a nitrogen and phosphorus fertilizer are needed for optimum grass production.

Suitability is poor for producing hardwood timber. Wetness and the clayey texture limit equipment use during certain times of the year and cause severe seedling mortality and plant competition.

This soil is not suitable for cropland unless flooding is controlled. Where flooding is controlled, the soil is well suited.

This soil is well suited to growing native grasses. It is moderately suited to wildlife habitat.

Suitability is poor for most urban and recreational uses. Flooding occurs frequently. The soil shrinks and swells with changes in moisture, is very slowly permeable, and has a clayey surface layer.

This soil is in capability subclass Vw and in the Clayey Bottomland range site. The woodland ordination symbol is 4C.

Kf—Kaufman clay, loamy substratum, frequently flooded

This nearly level soil is on flood plains of the Trinity River. Flooding occurs once or twice in most years, mainly from November through May. Slopes are less than 1 percent. Areas are irregular in shape and range from 100 to 500 acres in size.

Typically, the surface layer is neutral, black clay about 9 inches thick. The upper part of the subsoil, from a depth of 9 to 42 inches, is moderately alkaline, very dark gray clay. The lower part, from a depth of 42 to 56 inches, is moderately alkaline, very dark grayish brown clay that has light olive brown mottles. The upper part of the underlying material, from a depth of 56 to 67 inches, is moderately alkaline, dark brown sandy clay loam. The lower part, from a depth of 67 to 80 inches, is moderately alkaline, dark yellowish brown fine sandy loam.

This soil is somewhat poorly drained. Surface runoff is low. Permeability is very slow and the available water capacity is high. The hazard of water erosion is slight. A water table is generally within a depth of 4 feet during the winter and spring.

Included with this soil in mapping are small areas

of Trinity and Whitesboro soils. The Trinity soils are in positions on the landscape similar to those of the Kaufman soil. The Whitesboro soils are in slightly higher positions. Also included are areas of other Kaufman soils in similar positions and soils that flood only once or twice in most 5-year periods. They are in slightly higher positions on the landscape. The included soils make up less than 20 percent of the map unit.

This Kaufman soil is used mainly as pasture and wildlife habitat. It is well suited to pastures of improved bermudagrass or fescue. Overseeding legumes, such as white clover or singletary peas, into the bermudagrass lengthens the grazing season and increases soil fertility by adding nitrogen. Applications of a nitrogen and phosphorus fertilizer are needed for optimum grass production.

Suitability is poor for producing hardwood timber. Wetness and the clayey texture limit equipment use during certain times of the year and cause severe seedling mortality and plant competition.

This soil is not suitable for cropland because of flooding. Where flooding is controlled, the soil is well suited.

This soil is well suited to growing native grasses. It is moderately suited to wildlife habitat.

Suitability is poor for most urban and recreational uses. The soil is frequently flooded, shrinks and swells with changes in moisture, is very slowly permeable, and has a clayey surface layer.

This soil is in capability subclass Vw and in the Clayey Bottomland range site. The woodland ordination symbol is 4C.

Kh—Keechi loamy fine sand, frequently flooded

This soil is on nearly level flood plains of streams that drain watersheds. The surfaces are mainly concave. Flooding occurs once or twice in most years for a period of 1 to 5 days, mainly from December through May. Slopes range from 0 to 1 percent. Areas follow the meander of the streams and range from about 200 to 1,000 feet wide. They are about 10 to several hundred acres in size.

Typically, the surface layer is loamy fine sand that is 16 inches thick. The upper part of the surface layer is slightly acid and light yellowish brown with grayish brown and dark yellowish brown mottles. The lower part is moderately acid and gray with yellowish red and dark yellowish brown mottles. The subsoil, from a depth of 16 to 50 inches, is moderately acid, gray loam that has dark yellowish brown and dark gray mottles. The underlying material, from a depth of 50 to 80 inches, is slightly acid, dark gray clay that has yellowish red and light gray mottles.

This soil is poorly drained. Surface runoff is low. Permeability is slow and the available water capacity is moderate. The hazard of water erosion is slight. A water table is generally within a depth of 1 foot during the winter and spring.

Included with this soil in mapping are areas of Hatliff, Leagueville, Nahatche, and Pluck soils. The Hatliff soils are on natural levees along stream channels. The Leagueville soils are on foot slopes of adjacent uplands. The Nahatche soils are in slightly higher positions on the landscape. The Pluck soils are in positions similar to those of the Keechi soil. The included soils make up less than 20 percent of the map unit.

This Keechi soil is used mainly as wildlife habitat. It is moderately suited to this purpose.

This soil is moderately suited to pastures of coastal bermudagrass, bahiagrass, and fescue. The high water table and frequent flooding are limitations to this use. Overseeding legumes, such as white clover or singletary peas, into the pasture grass lengthens the grazing season and increases soil fertility by adding nitrogen. Applications of lime and a complete fertilizer are needed for optimum grass production.

This soil is poorly suited to woodland because wetness imposes severe equipment limitations. Native trees are mainly water oak and sweetgum. Understory vegetation is mainly greenbriar, yaupon, hawthorne, sedges and grasses, such as panicums and paspalums.

This soil is not suitable for cropland because of flooding. It is poorly suited to growing native grasses.

Suitability is poor for most urban and recreational uses, mainly because of flooding and wetness.

This soil is in capability subclass VIIw.

KrB—Kirvin fine sandy loam, 1 to 5 percent slopes

This gently sloping soil is on upland interstream divides. The surfaces are plane to slightly convex. Areas are elliptical or irregular in shape and range from 5 to about 200 acres in size.

Typically, the surface layer is slightly acid, dark brown and brown fine sandy loam about 8 inches thick. The upper part of the subsoil, from a depth of 8 to 35 inches, is very strongly acid, red clay. Yellowish brown mottles appear at a depth of 22 inches. The lower part of the subsoil, from a depth of 35 to 44 inches, is very strongly acid, red clay that has strong brown mottles. The underlying material, from a depth

of 44 to 60 inches, is stratified layers of extremely acid, yellowish brown sandy loam and mottled light brownish gray and red shale.

This soil is well drained. Surface runoff is low. Permeability is moderately slow and the available water capacity is moderate. The hazard of water erosion is moderate.

Included with this soil in mapping are small areas of Cuthbert, Oakwood, and Wolfpen soils. The Cuthbert soils are in positions on the landscape similar to those of the Kirvin soils. The Oakwood soils are in areas that have lower and smoother slopes. The Wolfpen soils are in slightly higher positions on the landscape. Also included is a Kirvin soil that has a gravelly fine sandy loam surface layer. This soil is in higher, more convex areas. The included soils make up less than 20 percent of the map unit.

This Kirvin soil is used mainly as pasture. It is moderately suited to pastures of coastal bermudagrass or bahiagrass. Overseeding legumes, such as vetch, arrowleaf clover, or crimson clover, into the coastal bermudagrass lengthens the grazing season and increases soil fertility by adding nitrogen. Applications of lime and a complete fertilizer are needed for optimum grass production.

This soil is well suited to woodland. The hazard of erosion is a management concern. Woodland management practices, such as selective cutting; removal of undesirable trees, shrubs, and vines; and protection from uncontrolled fire, increase timber production. Native trees include southern red oak, post oak, and hickory. Shortleaf pines are in a few areas. Understory vegetation is mainly sweetgum, panicums, winged elm, greenbriar, American beautyberry, and post oak.

Suitability of this soil for cropland is moderate. Water erosion is a hazard. The most suitable crops are small grains. Leaving crop residue on or near the surface helps to reduce soil erosion and maintain organic matter content. Applications of lime and a complete fertilizer are needed for optimum yields.

This soil is poorly suited to growing native grasses. It is well suited to wildlife habitat. It is well suited to most urban and recreational uses.

This soil is in capability subclass IIIe, and the woodland ordination symbol is 8A.

KyC—Kirvin gravelly fine sandy loam, 2 to 8 percent slopes

This gently sloping to strongly sloping soil is on uplands. The surfaces are mainly convex. Areas are mainly elliptical, occupying narrow interstream divides or low sloping knolls. Areas range from 5 to about 75 acres in size.

Typically, the surface layer is slightly acid, dark brown and brown, gravelly fine sandy loam about 7 inches thick. The upper part of the subsoil, from a depth of 7 to 31 inches, is very strongly acid, red clay. Brownish yellow mottles appear at a depth of 19 inches. The lower part of the subsoil, from a depth of 31 to 44 inches, is very strongly acid, red clay that has strata of light brownish gray shale and yellowish brown sandy loam. The underlying material, from a depth of 44 to 60 inches, is extremely acid, stratified pale brown and yellowish brown fine sandy loam and mottled red and light brownish gray shale.

This soil is well drained. Surface runoff is low to medium. Permeability is moderately slow and the available water capacity is moderate. The hazard of water erosion is slight.

Included with this soil in mapping are small areas of Cuthbert, Oakwood, and Wolfpen soils. The Cuthbert soils are in positions on the landscape similar to those of the Kirvin soils. The Oakwood soils are in areas that have lower, smoother slopes. The Wolfpen soils are in slightly higher positions on the landscape. Also included are small areas of a Kirvin soil that has more than 35 percent gravel in the surface layer and a Kirvin soil that has as much as 5 percent of the surface covered by stones. The very gravelly and stony Kirvin soils are along the highest parts of narrow ridges. The included soils make up less than 25 percent of the map unit.

This Kirvin soil is used mainly as pasture and wildlife habitat. It is moderately suited to pastures of coastal bermudagrass or bahiagrass (fig. 6). Overseeding legumes, such as vetch, arrowleaf clover, or crimson clover, into the coastal bermudagrass lengthens the grazing season and increases soil fertility by adding nitrogen. Applications of lime and a complete fertilizer are needed for optimum grass production.

The soil is poorly suited to cropland, mainly because of the hazard of water erosion. The most suitable crops are small grains. Leaving crop residue on or near the surface helps to reduce soil erosion and maintain organic matter content. Applications of lime and a complete fertilizer are needed for optimum yields.

This soil is well suited to woodland. Woodland management practices, such as selective cutting; removal of undesirable trees, shrubs, and vines; and protection from uncontrolled fire, increase timber production. Native trees include southern red oak, post oak, and hickory. Shortleaf pines are in a few

Figure 6.—A county road separates improved pastures of coastal bermudagrass on Kirvin gravelly fine sandy loam, 2 to 8 percent slopes. Cuthbert gravelly fine sandy loam, 15 to 30 percent slopes, is shown in the background.

areas. Understory vegetation is mainly sweetgum, panicums, winged elm, greenbriar, American beautyberry, and post oak.

This soil is poorly suited to growing native grasses. It is well suited to wildlife habitat.

Suitability is moderate for most urban uses. Low strength and the potential for shrinking and swelling are the main limitations. Suitability is poor for most recreational uses because of slope and the gravelly surface layer.

This soil is in capability subclass IVe, and the woodland ordination symbol is 8A.

LaE—Lamar clay loam, 5 to 12 percent slopes

This strongly sloping soil is on upland side slopes above drainageways. The surfaces are slightly convex. Areas are irregular in shape and range from about 15 to 150 acres in size.

Typically, the surface layer is neutral, dark brown clay loam about 5 inches thick. The subsoil, from a depth of 5 to 38 inches, is moderately alkaline, light olive brown clay loam that has strong brown mottles. The underlying material, from a depth of 38 to 60 inches, is moderately alkaline, light olive brown silty clay loam that has strong brown mottles.

This soil is well drained. Surface runoff is medium. Permeability is moderate and the available water capacity is moderate. The hazard of water erosion is severe.

Included with this soil in mapping are small areas of Crockett and Ellis soils. The Crockett soils are on narrow divides between secondary drainageways. The Ellis soils are in positions on the landscape similar to those of the Lamar soil. Also included are small areas of eroded Lamar soils and a few areas of Lamar soils that are underlain by thin, discontinuous limestone fragments at a depth of about 6 feet. The included soils make up less than 20 percent of the map unit.

This Lamar soil is used mainly as pasture and is

moderately suited to this use. The most suitable pasture plants are bermudagrass, vetch, and singletary peas.

This soil is not suitable for cropland because of slope and the hazard of erosion.

This soil is moderately suited to growing native grasses and poorly suited to wildlife habitat.

Suitability is moderate for most urban and recreational uses. Slope, low strength, and the potential for shrinking and swelling are the main limitations.

This soil is in capability subclass VIe and in the Clay Loam range site.

LgB—Leagueville loamy fine sand, 1 to 5 percent slopes

This gently sloping soil is in depressions and on short toe slopes and foot slopes along narrow drainageways. The surfaces are mainly smooth or concave. Areas are long and narrow or elliptical and range from about 10 to 300 acres in size.

Typically, the surface layer is strongly acid, dark brown loamy fine sand about 4 inches thick. The subsurface layer, from a depth of 4 to 34 inches, is moderately acid, light brownish gray loamy fine sand. The upper part of the subsoil, from a depth of 34 to 52 inches, is extremely acid, light gray sandy clay loam that has brownish yellow and yellowish red mottles. The lower part, from a depth of 52 to 72 inches, is extremely acid, light brownish gray sandy clay loam that has red and strong brown mottles and streaks and pockets of pale brown uncoated sand.

This soil is poorly drained. Surface runoff is low. Permeability is rapid in the surface and subsurface layers and moderate in the subsoil. The available water capacity is moderate. The hazard of water erosion is slight. A water table is generally within a depth of 1 foot during the winter and spring.

Included with this soil in mapping are small areas of Wolfpen soils that are in slightly higher positions on the landscape. Also included is a soil similar to the Leagueville soil that has a sandy surface layer more than 40 inches thick. The included soils make up less than 20 percent of the map unit.

This Leagueville soil is used mainly as wildlife habitat.

This soil is poorly suited to pastures of coastal bermudagrass and fescue. Proper pasture management is difficult because of the seasonal high water table.

This soil is not suitable for cropland. It is too wet for crops commonly grown in the area because of the poor drainage and high water table.

Suitability for woodland use is moderate, mainly because of the equipment use limitation, high seedling mortality, and plant competition.

Suitability of this soil for growing native grasses is moderate. It is moderately suited to wildlife habitat.

Suitability is poor for most urban and recreational uses, mainly because of wetness and seepage.

This soil is in capability subclass IVw, and the woodland ordination symbol is 8W.

LsC—Leson clay, 3 to 5 percent slopes

This gently sloping soil is on upland side slopes above drainageways. The surfaces are plane to slightly convex. Areas are long and narrow and range from about 15 to 100 acres in size.

Typically, the surface layer is black clay about 30 inches thick. It is slightly acid to a depth of 3 inches and is slightly alkaline from a depth of 3 to 30 inches. The upper part of the subsoil, from a depth of 30 to 41 inches, is moderately alkaline, dark grayish brown clay. The lower part, from a depth of 41 to 58 inches, is moderately alkaline, olive brown clay. The underlying material, from a depth of 58 to 75 inches, is slightly alkaline, mottled yellowish brown, grayish brown, and reddish yellow shale that has a clay texture.

This soil is moderately well drained. Surface runoff is high. Permeability is very slow and the available water capacity is high. The hazard of water erosion is moderate.

Included with this soil in mapping are small areas of Crockett, Ellis, and Ferris soils. The Crockett soils are on upper slopes. The Ellis and Ferris soils are in sloping areas along drainageways. Also included are a soil similar to the Leson soil that is calcareous throughout the solum and a few small areas of an eroded Leson soil. The included soils make up less than 20 percent of the map unit.

This Leson soil is used mainly as pasture and rangeland. It is moderately suited to pastures of bermudagrass. Overseeding legumes, such as vetch and singletary peas, into the bermudagrass lengthens the grazing season and increases soil fertility by adding nitrogen. Applications of a nitrogen and phosphorus fertilizer are needed for optimum grass production. The soil is well suited to growing native grasses.

This soil is moderately suited to growing cotton, grain sorghum, and small grains. Leaving crop residue on or near the surface helps to reduce soil erosion, aids water infiltration, and maintains organic matter content. Terracing and contour farming are needed to

control runoff. Applications of a nitrogen and phosphorus fertilizer are needed for optimum yields.

This soil is poorly suited to wildlife habitat.

Suitability is poor for most urban uses and moderate for most recreational uses. The soil shrinks and swells with changes in moisture, is very slowly permeable, and has a clayey surface layer.

This soil is in capability subclass IIIe and in the Blackland range site.

MaA—Mabank fine sandy loam, 0 to 1 percent slopes

This nearly level soil is on broad upland divides. The surfaces are plane or slightly concave. Areas are irregular in shape and range from 15 to 300 acres in size.

Typically, the surface layer is moderately acid, dark grayish brown fine sandy loam about 9 inches thick. The subsoil extends to a depth of 68 inches. From a depth of 9 to 28 inches, it is slightly acid, very dark gray clay; from a depth of 28 to 36 inches, it is moderately alkaline, dark gray clay; from a depth of 36 to 50 inches, it is moderately alkaline, grayish brown clay; and from a depth of 50 to 68 inches, it is moderately alkaline, light gray clay that has grayish brown mottles. The underlying material, from a depth of 68 to 72 inches, is moderately alkaline, mottled light gray and brownish yellow shale that has a clay texture.

This soil is moderately well drained. Surface runoff is low. Permeability is very slow and the available water capacity is high. The hazard of water erosion is slight. The surface layer remains wet for as long as 2 to 3 weeks after heavy rains, especially in winter and spring.

Included with this soil in mapping are small areas of Crockett and Wilson soils. The Crockett soils are in slightly higher positions on the landscape. The Wilson soils are in positions similar to those of the Mabank soil. Also included are a few areas of Mabank soils that have slopes of more than 1 percent. The included soils make up less than 20 percent of the map unit.

This Mabank soil is used mainly as pasture. It is moderately suited to pastures of bermudagrass and bahiagrass. Overseeding legumes, such as vetch and singletary peas, into the bermudagrass lengthens the grazing season and increases soil fertility by adding nitrogen.

This soil is moderately suited to growing cotton, grain sorghum, and small grains. Leaving crop residue on or near the surface aids water infiltration and maintains organic matter content. Applications of a complete fertilizer of nitrogen, phosphorus, and potassium are needed for optimum yields.

The soil is well suited to growing native grasses and is well suited to wildlife habitat.

Suitability is poor for most urban and recreational uses, mainly because of shrinking and swelling with changes in moisture, and very slow permeability.

This soil is in capability subclass IIIw and in the Claypan Prairie range site.

Na—Nahatche clay loam, frequently flooded

This nearly level soil is on flood plains of large creeks. Flooding occurs 1 to 3 times in most years, mainly from November through May, for a period of 1 to 4 days after heavy rains. Slopes range from 0 to 1 percent. Areas are mainly long and narrow, ranging from about 1,000 feet to one-half mile in width, and from 150 to 1,000 acres in size.

Typically, the surface layer is moderately acid, dark brown clay loam that has gray and grayish brown mottles. It is about 10 inches thick. The upper part of the subsoil, from a depth of 10 to 18 inches, is moderately acid, grayish brown clay loam that has dark brown and gray mottles. The next part, from a depth of 18 to 33 inches, is slightly acid, dark gray sandy clay loam that has dark brown mottles. The lower part, from a depth of 33 to 54 inches, is neutral, dark gray silty clay loam that has dark brown mottles. The underlying material, from a depth of 54 to 63 inches, is neutral, grayish brown silty clay loam that has yellowish brown mottles.

This soil is somewhat poorly drained. Surface runoff is negligible. Permeability is moderate and the available water capacity is high. The hazard of water erosion is slight. A water table is generally within a depth of 1 foot during the winter and spring.

Included with this soil in mapping are areas of Hatliff and Pluck soils. The Hatliff soils are on natural levees along stream channels and on alluvial fans adjacent to surrounding uplands. The Pluck soils are in depressions and old sloughs. Also included is a soil similar to the Nahatche soil, except that it has a coarser texture. The included soils make up less than 20 percent of the map unit.

This Nahatche soil is used mainly as pasture and wildlife habitat. It is well suited to pastures of bermudagrass, fescue, and bahiagrass. Legumes, such as white clover and singletary peas, are well adapted. Applications of lime and a complete fertilizer of nitrogen, phosphorus, and potash are needed for optimum grass production. The soil is well suited to wildlife habitat.

This soil is moderately suited to growing native grasses. It is moderately suited to producing hardwood timber, but poorly suited to growing pines. The high water table affects stand development and management.

This soil is not suitable for cropland because of flooding and wetness.

Suitability is poor for most urban and recreational uses, mainly because of flooding.

This soil is in capability subclass Vw and in the Loamy Bottomland range site.

NH—Nahatche-Hatliff association, frequently flooded

This map unit consists of nearly level, loamy soils on the flood plains of local streams. Flooding occurs 1 to 3 times in most years, mainly from November through May, for a period of 1 to 4 days after heavy rains. Slopes range from 0 to 1 percent. Areas are long and narrow, ranging from about 200 feet to one-half mile in width, and from 50 to over 1,000 acres in size.

Nahatche soils make up about 45 to 60 percent of the map unit, occupying the backwater areas of the flood plain. Hatliff soils are on natural levees along stream channels, alluvial fans, and pointbars, and make up 25 to 50 percent of the map unit. Other soils make up 5 to 20 percent. This map unit is more variable in composition than most in the survey area; however, mapping is in sufficient detail for the expected uses of these soils.

Typically, the surface layer of the Nahatche soil is slightly acid, dark brown and brown clay loam that has light brownish gray mottles. It is about 14 inches thick. The underlying material, from a depth of 14 to 35 inches, is moderately acid, grayish brown clay loam that has brown mottles. From a depth of 35 to 44 inches, it is strongly acid, mottled grayish brown and yellowish brown fine sandy loam. From a depth of 44 to 50 inches, the underlying material is moderately acid, light brownish gray clay loam that has strong brown mottles, and from a depth of 50 to 60 inches, it is strongly acid, mottled grayish brown and yellowish brown fine sandy loam.

The Nahatche soils are somewhat poorly drained. Surface runoff is negligible. Permeability is moderate and the available water capacity is high. The hazard of water erosion is slight. A water table is generally within a depth of 1 foot during winter and spring.

Typically, the surface layer of the Hatliff soil is slightly acid, dark brown fine sandy loam about 6 inches thick. The upper part of the subsoil, from a depth of 6 to 21 inches, is strongly acid, yellowish brown fine sandy loam that has light brownish gray mottles. The next part, from a depth of 21 to 38 inches, is moderately acid, yellowish brown loam that has light brownish gray mottles. The lower part, from a depth of 38 to 50 inches, is moderately acid, dark yellowish brown fine sandy loam that has light gray mottles. The underlying material, from a depth of 50 to 65 inches, is slightly acid, light gray loamy fine sand that has dark yellowish brown mottles.

The Hatliff soil is moderately well drained. Surface runoff is negligible. Permeability is moderately rapid and the available water capacity is moderate. The hazard of water erosion is slight. A water table is generally within a depth of 2 feet during the winter.

Included with these soils in mapping are small areas of Pluck soils in old sloughs and depressions. Also included is a soil closely similar to the Hatliff soil, except it has a coarser texture. The included soils make up 5 to 20 percent of the map unit.

The soils of this map unit are used mainly as pasture and are well suited to this purpose. Pasture grasses, such as bermudagrass, fescue, and bahiagrass, and legumes, such as white clover and singletary peas, are well adapted. Applications of lime and a complete fertilizer of nitrogen, phosphorus, and potash are needed for optimum grass production.

These soils are not suitable for cropland because of flooding and wetness.

The Nahatche soils are moderately suited to growing hardwoods, but poorly suited to growing pines. The Hatliff soils are well suited to growing pines.

The soils are moderately suited to growing native grasses. They are well suited to wildlife habitat.

Suitability is poor for most urban and recreational uses, mainly because of flooding.

These soils are in capability subclass Vw and in the Loamy Bottomland range site. The woodland ordination symbol for the Nahatche soil is 6W and for the Hatliff soil it is 10W.

OkB—Oakwood fine sandy loam, 1 to 5 percent slopes

This gently sloping soil is on broad upland divides. The surfaces are smooth or slightly convex. Areas are irregular in shape and range from 5 to several hundred acres in size.

Typically, the surface layer is neutral, fine sandy loam about 15 inches thick. It is dark brown in the upper part and brown with pale brown mottles in the lower part. The upper part of the subsoil, from a depth of 15 to 34 inches, is neutral, yellowish brown sandy clay loam. The next part, from a depth of 34 to 46

inches, is slightly acid, brownish yellow sandy clay loam that has pale brown and reddish yellow mottles. The lower part of the subsoil, from a depth of 46 to 64 inches, is moderately acid, mottled reddish yellow, yellowish red, and light gray sandy clay loam. The underlying material, from a depth of 64 to 80 inches, is moderately acid, mottled reddish yellow, light gray, red, and yellowish red fine sandy loam.

This soil is moderately well drained. Surface runoff is low. Permeability is moderately slow and the available water capacity is high. The hazard of water erosion is moderate. A water table is generally within a depth of 4 feet during the winter and spring.

Included with this soil in mapping are small areas of Kirvin, Raino, and Wolfpen soils. The Kirvin and Wolfpen soils are in slightly higher positions on the landscape. The Raino soils are in depressions and on lower foot slopes. The included soils make up as much as 20 percent of the mapped areas.

This Oakwood soil is used mainly as pasture. It is well suited to pastures of coastal bermudagrass. Overseeding legumes, such as arrowleaf clover or crimson clover, into the bermudagrass lengthens the grazing season and increases soil fertility by adding nitrogen. Applications of lime and a complete fertilizer are needed for optimum grass production.

This soil is moderately suitable for cropland. Leaving crop residue on or near the surface helps to control erosion and maintain organic matter content. Applications of lime and a complete fertilizer are needed for optimum yields.

This soil is well suited to woodland use. Native trees include southern red oak, post oak, American elm, hickory, sweetgum, and shortleaf pine. Loblolly and shortleaf pines are planted in some areas. Understory vegetation consists mainly of winged elm, greenbriar, American beautyberry, yaupon, and grasses such as bluestems, longleaf uniola, and panicums. Woodland management practices, such as selective cutting; removal of undesirable trees, shrubs, and vines; and protection from uncontrolled burning, increase timber production.

This soil is moderately suited to growing native grasses. It is well suited to wildlife habitat.

This soil is well suited to most urban and recreational uses.

This soil is in capability subclass IIIe, and the woodland ordination symbol is 9A.

PaB—Padina loamy fine sand, 1 to 5 percent slopes

This gently sloping soil is on uplands. The surfaces are mainly smooth or convex. Areas are irregular in shape and range from about 10 to 800 acres in size.

Typically, the surface layer is loamy fine sand that is neutral and dark grayish brown to a depth of 4 inches, slightly acid and brown from a depth of 4 to 30 inches, and moderately acid and light yellowish brown from a depth of 30 to 58 inches. The upper part of the subsoil, from a depth of 58 to 62 inches, is moderately acid, yellowish brown fine sandy loam that has gray and red mottles. The lower part, from a depth of 62 to 72 inches, is strongly acid, mottled red, brownish yellow, and light gray sandy clay loam.

This soil is well drained. Surface runoff is very low. Permeability is rapid in the surface and subsurface layers and moderate in the subsoil. The available water capacity is low. The hazard of water erosion is moderate. A water table is generally within a depth of 5 feet during the winter.

Included with this soil in mapping are small areas of Arenosa, Robco, and Silstid soils. The Arenosa and Silstid soils are in positions on the landscape similar to those of the Padina soils, and the Robco soils are in concave depressions and at the heads of drainageways. Also included is a soil closely similar to the Padina soil, except it is very strongly acid in the subsoil. The included soils make up less than 20 percent of the map unit.

This Padina soil is used mainly as pasture. It is moderately suited to pastures of coastal bermudagrass and lovegrass (fig. 7).

Overseeding legumes, such as vetch or arrowleaf clover into the pasture grass lengthens the grazing season and increases soil fertility by adding nitrogen. Applications of lime and a complete fertilizer are needed to increase grass production.

This soil is moderately suited to crops, such as corn, peas, and watermelons. Leaving crop residue on or near the surface helps to reduce erosion and maintain organic matter content. Applications of lime and a complete fertilizer are needed for optimum yields.

This soil is moderately suited to growing native grasses. It is poorly suited to wildlife habitat.

Suitability is moderate for most urban and recreational uses.

This soil is in capability subclass IIIe and in the Deep Sand range site.

PkC—Pickton loamy fine sand, 1 to 8 percent slopes

This gently sloping to moderately sloping soil is on broad upland divides. The surfaces are mainly convex. Areas are irregular in shape and range from 10 to about 2,000 acres in size.

Figure 7.—Weeping lovegrass is well suited to sandy soils, such as this Padina loamy fine sand, 1 to 5 percent slopes.

Typically, the surface layer is moderately acid, dark brown loamy fine sand about 7 inches thick. The subsurface layer, from a depth of 7 to 54 inches, is slightly acid loamy fine sand that is dark yellowish brown in the upper part and yellowish brown in the lower part. The upper part of the subsoil, from a depth of 54 to 61 inches, is slightly acid, strong brown sandy clay loam that has reddish brown mottles. The lower part, from a depth of 61 to 80 inches, is strongly acid, mottled strong brown, yellowish red, and light gray sandy clay loam.

This soil is well drained. Surface runoff is very low. Permeability is rapid in the surface and subsurface layers and moderate in the subsoil. The available water capacity is low. The hazard of water erosion is moderate. A water table is generally within a depth of 5 feet during the winter.

Included with this soil in mapping are small areas of Leagueville, Tonkawa, and Wolfpen soils. The Leagueville soils are in concave depressions and at the heads of drainageways. The Tonkawa and Wolfpen soils are in positions on the landscape similar to those of the Pickton soils. The included soils make up less than 15 percent of the map unit.

This Pickton soil is used mainly as pasture. It is moderately suited to pastures of coastal bermudagrass and lovegrass. Overseeding legumes, such as vetch and arrowleaf clover, into the coastal bermudagrass lengthens the grazing season and increases soil fertility by adding nitrogen. Applications

of lime and a complete fertilizer are needed for optimum grass production.

This soil is moderately suited to crops, such as corn, peas, and watermelons. Leaving crop residue on the surface helps to reduce soil erosion and maintain organic matter content.

Applications of lime and a complete fertilizer are needed for optimum yields.

This soil is moderately suited to woodland use. The main limitations are the low available water capacity and droughtiness. Management practices, such as selective cutting; removal of undesirable trees, shrubs, and vines; and protection from uncontrolled burning, increase timber production.

This soil is poorly suited to growing native grasses and is poorly suited to wildlife habitat.

Suitability is moderate to poor for most urban uses and moderate for most recreational uses.

This soil is in capability subclass IIIs, and the woodland ordination symbol is 8S.

PkE—Pickton loamy fine sand, 8 to 15 percent slopes

This strongly sloping to moderately steep soil is on upland side slopes. The surfaces are mainly convex. Areas are irregular in shape and range from 10 to about 500 acres in size.

Typically, the surface layer is moderately acid, dark yellowish brown loamy fine sand about 12 inches thick. The subsurface layer, from a depth of 12 to 58 inches, is slightly acid, yellowish brown loamy fine sand. The upper part of the subsoil, from a depth of 58 to 75 inches, is slightly acid, brownish yellow sandy clay loam that has yellowish red mottles. The lower part, from a depth of 75 to 80 inches, is strongly acid, brownish yellow sandy clay loam that has red and light brownish gray mottles.

This soil is well drained. Surface runoff is low. Permeability is moderate and the available water capacity is low. The hazard of water erosion is severe. A water table is generally within a depth of 5 feet during the winter.

Included with this soil in mapping are small areas of Cuthbert, Tonkawa, and Wolfpen soils. The Cuthbert soils are on steeper upper slopes. The Wolfpen and Tonkawa soils are in positions on the landscape similar to those of the Pickton soils. The included soils make up less than 20 percent of the map unit.

This Pickton soil is used mainly as pasture. It is moderately suited to pastures of coastal bermudagrass and lovegrass. Overseeding legumes, such as vetch and arrowleaf clover, into the pasture grass lengthens the grazing season and increases soil fertility by adding nitrogen. Applications of lime and a complete fertilizer are needed for optimum grass production.

Suitability is poor for cropland, mainly because of slope. Close-growing crops, such as small grains, are the most suitable for this soil.

This soil is moderately suited to woodland use. The main limitations are the low available water capacity and droughtiness. Woodland management practices, such as selective cutting; removal of undesirable trees, shrubs, and vines; and protection from uncontrolled burning, increase timber production.

This soil is poorly suited to growing native grasses and is poorly suited to wildlife habitat.

Suitability is poor for most urban uses and moderate for most recreational uses, mainly because of slope.

This soil is in capability subclass VIe, and the woodland ordination symbol is 8S.

Pt—Pits

This map unit consists of pits that were dug to excavate rock, clay, and sandy materials. Areas range from 5 to about 300 acres in size.

Rock pits in the eastern part of the county are the largest and produce crushed limestone used mainly for road materials. This hard limestone is of Cretaceous age. It has been lifted many hundreds of feet to near the surface by the action of local salt domes.

Most clay pits are in the western part of the county in areas of Crockett, Edge, and Tabor soils. These pits are 10 to 25 feet deep and are a source of clay for bricks. Other clay pits are along highways as borrow pits that were dug to excavate road fill material. Some borrow pits hold water most of the time and are shown on the soil map at the back of this publication as water areas.

Sand pits are scattered throughout the county in areas of Silstid, Padina, Pickton, and Wolfpen soils. These pits are generally only a few feet deep and produce sandy materials for a variety of uses.

Pits are in capability subclass VIIIs. A woodland ordination symbol is not assigned.

Pu—Pluck loam, frequently flooded

This nearly level soil is on flood plains of streams. The surfaces are mainly concave. Flooding occurs 1 to 4 times in most years, generally from November through May, for a period of 1 to 6 days after heavy rains. Slopes are less than 1 percent. Areas are

irregular in shape and range from 15 to 300 acres in size.

Typically, the surface layer is about 6 inches thick. It is moderately acid, gray loam that has strong brown mottles. The upper part of the subsoil, from a depth of 6 to 21 inches, is strongly acid, dark gray clay loam that has strong brown mottles. The next part, from a depth of 21 to 47 inches, is moderately acid, gray silty clay loam that has strong brown mottles and strata of light yellowish brown fine sand. The lower part, from a depth of 47 to 60 inches, is slightly acid, dark gray silty clay loam that has strata of very dark gray clay.

This soil is poorly drained. Surface runoff is negligible. Permeability is moderate and the available water capacity is moderate. The hazard of water erosion is slight. A water table is generally at or near the surface during the winter and early spring.

Included in mapping are small areas of Gladewater, Keechi, and Nahatche soils. The Gladewater and Keechi soils are in positions on the landscape similar to those of the Pluck soil. The Nahatche soils are in slightly higher positions. Also included are areas of Pluck soils that have a clay loam surface layer. The included soils make up less than 20 percent of the map unit.

This Pluck soil is used mainly as pasture and wildlife habitat. It is moderately suited to pastures of bermudagrass, fescue, and bahiagrass, and legumes, such as white clover and singletary peas. Applications of lime and a complete fertilizer of nitrogen, phosphorus, and potash are needed for optimum production. This soil is moderately suited to wildlife habitat.

This soil is poorly suited to growing native grasses. It is not suitable for cropland because of flooding.

This soil is moderately suited to growing hardwood; however, wetness is a problem that affects stand development and makes timber management difficult.

Suitability is poor for most urban and recreational uses because of flooding and wetness.

This soil is in capability subclass Vw, and the woodland ordination symbol is 9W.

RaB—Rader fine sandy loam, 0 to 3 percent slopes

This nearly level to gently sloping soil is on stream terraces. The surfaces are mainly smooth. Areas are irregular in shape and range from 10 to about 200 acres in size.

Typically, the surface layer is moderately acid, dark brown fine sandy loam about 7 inches thick. The subsurface layer, from a depth of 7 to 16 inches, is slightly acid, brown fine sandy loam. The upper part of the subsoil, from a depth of 16 to 26 inches, is strongly acid, yellowish brown sandy clay loam that has yellowish red mottles and tongues of pale brown fine sandy loam. The next part, from a depth of 26 to 38 inches, is very strongly acid, mottled light brownish gray, brownish yellow, and red sandy clay. The lower part, from a depth of 38 to 60 inches, is very strongly acid, gray clay that has red mottles.

This soil is moderately well drained. Surface runoff is low to medium. Permeability is very slow and the available water capacity is high. The hazard of water erosion is slight. A perched water table is generally within a depth of 3 feet during the winter.

Included with this soil in mapping are small areas of Derly, Oakwood, and Styx soils. The Derly soils are in depressions and on lower foot slopes. The Oakwood and Styx soils are in slightly higher positions on the landscape. The included soils make up as much as 20 percent of some mapped areas.

This Rader soil is used mainly as pasture. It is well suited to pastures of coastal bermudagrass. Overseeding a legume, such as arrowleaf clover, into the bermudagrass lengthens the grazing season and increases soil fertility by adding nitrogen. Applications of a complete fertilizer are needed for optimum grass production. Applications of lime may be needed, especially when a large amount of fertilizer is applied.

This soil is moderately suitable for cropland. Leaving crop residue on the surface helps to reduce soil erosion and maintain organic matter content. Applications of a complete fertilizer are needed for optimum yields.

This soil is moderately suited to growing native grasses. It is well suited to wildlife habitat.

Suitability is moderate for most urban uses. The main limitations are wetness and the potential for shrinking and swelling. The soil is well suited to recreational development.

This soil is in capability subclass IIe and in the Sandy Loam range site.

RnA—Raino fine sandy loam, 0 to 2 percent slopes

This nearly level to gently sloping soil is on upland foot slopes and saddles. The surfaces are smooth or slightly concave. Areas are irregular in shape and range from 5 to about 200 acres in size.

Typically, the surface layer is strongly acid, dark brown fine sandy loam about 4 inches thick. The subsurface layer, from a depth of 4 to 14 inches, is strongly acid, brown fine sandy loam. The upper part

of the subsoil, from a depth of 14 to 28 inches, is strongly acid, yellowish brown sandy clay loam that has light brownish gray mottles and contains about 15 percent pale brown uncoated sand. The next part, from a depth of 28 to 49 inches, is very strongly acid, mottled grayish brown, yellowish brown, and yellowish red clay. The lower part of the subsoil, from a depth of 49 to 60 inches, is strongly acid, mottled light brownish gray, yellowish brown, and yellowish red clay.

This soil is moderately well drained. Surface runoff is low. Permeability is very slow and the available water capacity is high. The hazard of water erosion is slight. A perched water table is generally within a depth of 3 feet during the winter and spring.

Included with this soil in mapping are small areas of Derly, Oakwood, Rader, and Wolfpen soils. The Derly soils are in depressions and on lower foot slopes. The Oakwood and Wolfpen soils are in slightly higher positions on the landscape. The Rader soils are in positions similar to those of the Raino soil. The included soils make up as much as 20 percent of some mapped areas.

This Raino soil is used mainly as pasture. It is well suited to pastures of coastal bermudagrass. Overseeding legumes, such as arrowleaf clover and Louisiana S-1 clover, into the pasture grass lengthens the grazing season and increases soil fertility by adding nitrogen. Applications of lime and a complete fertilizer are needed for optimum grass production.

This soil is moderately suitable for cropland. Leaving crop residue on or near the surface helps to reduce erosion and maintain organic matter content. Applications of lime and a complete fertilizer are needed for optimum yields.

This soil is well suited to woodland use. Native trees include willow oak, post oak, American elm, hickory, sweetgum, and southern red oak. Understory vegetation consists mainly of winged elm, greenbriar, American beautyberry, wax myrtle and grasses, such as bluestems, longleaf uniola, and panicums. Woodland management practices, such as selective cutting; removal of undesirable trees, shrubs, and vines; and protection from uncontrolled burning, increase timber production.

This soil is moderately suited to growing native grasses. It is well suited to wildlife habitat.

Suitability is poor for most urban uses, mainly because of wetness and the potential for shrinking and swelling. Suitability is moderate for most recreational uses because of very slow permeability.

This soil is in capability subclass IIIs, and the woodland ordination symbol is 9W.

RoA—Robco loamy fine sand, 0 to 2 percent slopes

This nearly level to gently sloping soil is on upland foot slopes and at the head of drainageways. The surfaces are smooth or slightly concave. Areas are elliptical or irregular in shape and range from 5 to 100 acres in size.

Typically, the surface layer is about 12 inches thick. It is moderately acid, dark yellowish brown loamy fine sand that has strong brown mottles. The subsurface layer, from a depth of 12 to 26 inches, is strongly acid, light yellowish brown loamy fine sand that has strong brown mottles. The upper part of the subsoil, from a depth of 26 to 27 inches, is strongly acid, yellowish brown sandy clay loam that has about 35 percent tongues and pockets of light yellowish brown loamy fine sand. The next part, from a depth of 27 to 40 inches, is very strongly acid, grayish brown clay loam that has yellowish brown and reddish yellow mottles. The lower part of the subsoil, from a depth of 40 to 60 inches, is very strongly acid, grayish brown clay loam that has reddish yellow mottles.

This soil is moderately well drained. Surface runoff is low. Permeability is rapid in the surface and subsurface layers and slow in the subsoil. The available water capacity is moderate. The hazard of water erosion is slight. A perched water table is generally within a depth of 1.5 to 3.5 feet during the winter and spring.

Included with this soil in mapping are small areas of Lufkin, Silstid, and Tabor soils. The Lufkin soils are in depressions and on lower foot slopes. The Silstid and Tabor soils are in slightly higher positions on the landscape. Also included is soil that is closely similar to the Robco soil, except it does not have pockets of sandy material in the upper part of the subsoil. The included soils make up as much as 20 percent of the map unit.

This Robco soil is used mainly as pasture and wildlife habitat. It is moderately suited to pastures of coastal bermudagrass. Overseeding legumes, such as arrowleaf clover and white clover, into the bermudagrass lengthens the grazing season and increases soil fertility by adding nitrogen. Applications of lime and a complete fertilizer are needed to increase yields. This soil is moderately suited to wildlife habitat.

This soil is moderately suited to growing native grasses.

Suitability is poor for most urban uses and

moderate for most recreational uses, mainly because of wetness, the potential for shrinking and swelling, and slow permeability.

This soil is in capability subclass IIe and in the Sandy range site.

SaE—Silawa fine sandy loam, 5 to 12 percent slopes

This strongly sloping soil is on side slopes of high stream terraces. The surfaces are slightly convex. Areas are irregular in shape and range from about 10 to 300 acres in size.

Typically, the surface layer is strongly acid, dark brown fine sandy loam about 3 inches thick. The subsurface layer, from a depth of 3 to 8 inches, is moderately acid, pale brown fine sandy loam. The upper part of the subsoil, from a depth of 8 to 29 inches, is very strongly acid, yellowish red sandy clay loam. The lower part, from a depth of 29 to 41 inches, is strongly acid, yellowish red sandy clay loam that has strata and pockets of yellowish brown, light yellowish brown, and red fine sandy loam. The underlying material, from a depth of 41 to 60 inches, is slightly acid, stratified brownish yellow fine sandy loam and very pale brown loamy fine sand.

This soil is well drained. Surface runoff is medium. Permeability is moderate and the available water capacity is moderate. The hazard of water erosion is severe.

Included with this soil in mapping are small areas of Edge, Hearne, and Silstid soils. The Edge soils are in positions on the landscape similar to those of the Silawa soil. The Hearne soils are on steeper upper slopes. The Silstid soils are on more convex lower slopes. The included soils make up less than 20 percent of the map unit.

This Silawa soil is used mainly as pasture and wildlife habitat. It is moderately suited to pastures of coastal bermudagrass and bahiagrass pastures. Overseeding legumes, such as vetch or arrowleaf clover, into the coastal bermudagrass lengthens the grazing season and increases soil fertility by adding nitrogen. Applications of lime and a complete fertilizer are needed to increase grass production. The soil is moderately suited to wildlife habitat.

This soil is not suitable for cropland because of slope and the hazard of erosion. It is moderately suited to growing native grasses.

Suitability is moderate for most urban and recreational uses. The main limitation is slope.

This soil is in capability subclass VIe and in the Sandy Loam range site.

SsB—Silstid loamy fine sand, 1 to 5 percent slopes

This gently sloping soil is on broad uplands. The surfaces are smooth or slightly convex. Areas are irregular in shape and range from about 10 to 500 acres in size.

Typically, the surface layer is neutral, brown loamy fine sand about 10 inches thick. The subsurface layer, from a depth of 10 to 22 inches, is slightly acid, pale brown loamy fine sand. The upper part of the subsoil, from a depth of 22 to 52 inches, is slightly acid, yellowish brown sandy clay loam that has reddish brown mottles. The lower part, from a depth of 52 to 62 inches, is slightly acid, strong brown sandy clay loam that has brown and reddish yellow mottles.

This soil is well drained. Surface runoff is very low. Permeability is rapid in the surface and subsurface layers and moderate in the subsoil. The available water capacity is moderate. The hazard of water erosion is moderate. A water table is generally within a depth of 5 feet during the winter and spring.

Included with this soil in mapping are small areas of Edge, Gasil, Padina, and Robco soils. The Edge soils are in slightly higher positions on the landscape. The Gasil and Padina soils are in positions similar to those of the Silstid soil. The Robco soils are on foot slopes and in slight depressions. Also included are small areas of eroded soils that have a surface layer less than 20 inches thick. The included soils make up less than 20 percent of the map unit.

This Silstid soil is used mainly as pasture. It is moderately suited to pastures of coastal bermudagrass and lovegrass (fig. 8).

Overseeding legumes, such as vetch or arrowleaf clover, into the coastal bermudagrass lengthens the grazing season and increases soil fertility by adding nitrogen. Applications of lime and a complete fertilizer are needed to increase grass production.

This soil is moderately suited to growing crops, such as corn, peas, and watermelons. Leaving crop residue on or near the surface helps to reduce erosion and maintain organic matter content. Applications of lime and a complete fertilizer are needed for optimum yields.

The soil is moderately suited to growing native grasses.

It is poorly suited to wildlife habitat.

This soil is well suited to most urban uses and moderately suited to most recreational uses. The sandy surface layer is the main limitation.

This soil is in capability subclass IIIe and in the Sandy range site.

Figure 8.—Many areas of improved pasture produce hay and provide for grazing. The soil is Silstid loamy fine sand, 1 to 5 percent slopes.

SsD—Silstid loamy fine sand, 5 to 8 percent slopes

This moderately sloping soil is on upland side slopes. The surfaces are slightly convex. Areas are irregular in shape and range from about 10 to 200 acres in size.

Typically, the surface layer is slightly acid, dark brown and brown loamy fine sand 26 inches thick. The upper part of the subsoil, from a depth of 26 to 41 inches, is strongly acid, yellowish brown sandy clay loam that has yellowish red mottles. The lower part, from a depth of 41 to 63 inches, is strongly acid, reddish yellow sandy clay loam that has red mottles.

This soil is well drained. Surface runoff is low. Permeability is rapid in the surface and subsurface layers and moderate in the subsoil. The available water capacity is moderate. The hazard of water erosion is moderate. A water table is generally within a depth of 5 feet during the winter and spring.

Included with this soil in mapping are small areas of Edge, Hearne, and Silawa soils. Also included are small areas of eroded soils that have a surface layer less than 20 inches thick. The included soils make up less than 20 percent of the map unit.

This Silstid soil is used mainly as pasture. It is moderately suited to pastures of coastal bermudagrass and lovegrass. Overseeding legumes, such as vetch or arrowleaf clover, into the bermudagrass lengthens the grazing season and increases soil fertility by adding nitrogen. Applications of lime and a complete fertilizer are needed to increase grass production.

This soil is moderately suited to growing crops, such as corn, peas, and watermelons. Leaving crop residue on or near the surface helps to reduce erosion and maintain organic matter content. Applications of lime and a complete fertilizer are needed to increase yields.

This soil is moderately suited to growing native grasses. It is moderately suited to wildlife habitat.

This soil is well suited to most urban uses and moderately suited to most recreational uses. The sandy surface layer and slope are the main limitations.

This soil is in capability subclass IIIe and in the Sandy range site.

StB—Styx loamy fine sand, 0 to 3 percent slopes

This nearly level to gently sloping soil is on stream terraces. The surfaces are smooth or slightly convex. Areas are irregular in shape and range from about 15 to 300 acres in size.

Typically, the surface layer is slightly acid, dark yellowish brown loamy fine sand about 6 inches thick. The subsurface layer, from a depth of 6 to 33 inches, is loamy fine sand that is slightly acid and brown in the upper part and moderately acid and yellowish brown in the lower part. The upper part of the subsoil, from a depth of 33 to 42 inches, is slightly acid, yellowish brown sandy clay loam. The next part, from a depth of 42 to 62 inches, is slightly acid, mottled red and yellowish red sandy clay loam. The lower part of the subsoil, from a depth of 62 to 80 inches, is slightly acid, mottled yellowish red and strong brown sandy clay loam.

This soil is well drained. Surface runoff is negligible. Permeability is moderately rapid in the surface and subsurface layers and moderate in the subsoil. The available water capacity is moderate. The hazard of water erosion is slight. A perched water table is generally within a depth of 3.5 to 4.5 feet during the winter and spring.

Included with this soil in mapping are small areas of Bienville, Derly, and Rader soils. The Bienville soils are in higher, more convex positions on the landscape. The Derly soils are in depressions. The Rader soils are in positions similar to those of the Styx soil. The included soils make up less than 20 percent of the map unit.

This Styx soil is used mainly as pasture. It is moderately suited to pastures of bermudagrass and lovegrass. Overseeding legumes, such as vetch or arrowleaf clover, into the bermudagrass lengthens the grazing season and increases soil fertility by adding nitrogen. Applications of lime and a complete fertilizer are needed to increase grass production.

This soil is moderately suited to growing crops, such as corn, peas, and watermelons. Leaving crop residue on or near the surface helps to reduce erosion and maintain organic matter content. Applications of lime and a complete fertilizer are needed to increase yields.

The soil is moderately suited to growing native grasses. It is moderately suited to wildlife habitat.

This soil is well suited to most urban uses. It is moderately suited to most recreational uses. The sandy surface layer is the main limitation.

This soil is in capability subclass IIIe and in the Sandy range site.

TaB—Tabor fine sandy loam, 1 to 3 percent slopes

This gently sloping soil is on broad uplands. The surfaces are mainly smooth. Areas are irregular in shape and range from about 10 to 500 acres in size.

Typically, the surface layer is dark brown fine sandy loam about 12 inches thick. It is strongly acid in the upper part and moderately acid in the lower part. The subsoil extends to a depth of 64 inches. From a depth of 12 to 17 inches, it is strongly acid, yellowish brown clay that has light brownish gray and red mottles; from a depth of 17 to 31 inches, it is neutral, yellowish brown clay that has dark grayish brown and yellowish red mottles; from a depth of 31 to 48 inches, it is slightly alkaline, light olive brown clay that has dark grayish brown mottles; and from a depth of 48 to 64 inches, it is moderately alkaline, mottled brownish yellow, red, and light brownish gray clay loam. The underlying material, from a depth of 64 to 80 inches, is moderately alkaline light brownish gray clay loam that has brownish yellow and red mottles.

This soil is moderately well drained. Surface runoff is medium. Permeability is very slow and the available water capacity is high. The hazard of water erosion is moderate.

Included with this soil in mapping are areas of Edge, Gasil, Lufkin, and Silstid soils. The Edge and Silstid soils are in slightly higher positions on the landscape. The Gasil soils are in positions similar to those of the Tabor soil. The Lufkin soils are in small depressions and on foot slopes. The included soils make up less than 20 percent of the map unit.

This Tabor soil is used mainly as pasture. It is moderately suited to pastures of bermudagrass and bahiagrass.

Overseeding legumes, such as vetch, singletary peas and clover, into the bermudagrass lengthens the grazing season and increases soil fertility by adding nitrogen.

This soil is moderately suited to growing cotton, grain sorghum, small grains, and corn. Terracing and contour farming are needed to help control runoff and erosion. Applications of lime and a complete fertilizer of nitrogen, phosphorus, and potassium are needed to increase yields. Specialty crops, such as peaches, are also produced on this soil (fig. 9).

The soil is well suited to growing native grasses. It is moderately suited to wildlife habitat.

Figure 9.—This peach orchard on Tabor fine sandy loam, 1 to 3 percent slopes, is representative of a small, but expanding fruit- and vegetable-growing industry.

Suitability is poor for most urban uses. The soil is well suited to most recreational uses. The potential for shrinking and swelling, very slow permeability, and low strength are the main limitations.

This soil is in capability subclass IIIe and in the Sandy Loam range site.

TfA—Tabor-Lufkin complex, 0 to 1 percent slopes

These nearly level soils are on broad uplands and stream terraces. Surfaces are uneven with circular or elongated low areas that are 0.5 to 1.5 feet lower than the surrounding soils. The circular low areas are 20 to 150 feet in diameter and the elongated low areas are 40 to 100 feet long and 10 to 30 feet wide. Slopes are less than 1 percent. Areas are irregular in shape and range from 10 to about 500 acres in size.

Tabor fine sandy loam ranges from 40 to 75 percent of this map unit, averaging about 53 percent. Lufkin fine sandy loam ranges from 25 to 40 percent, averaging about 33 percent. Other soils range from 0 to 20 percent, averaging about 14 percent. Tabor soils are mainly in the higher convex areas and Lufkin soils are mainly in the lower concave areas. These soils are so intricately mixed that separating them in mapping is not practical.

Typically, the surface layer of the Tabor soil is strongly acid dark brown and yellowish brown fine sandy loam about 18 inches thick. The upper part of the subsoil, from a depth of 18 to 33 inches, is strongly acid, yellowish brown clay that has red and grayish brown mottles. The next part, from a depth of 33 to 46 inches, is moderately acid, mottled grayish brown, yellowish brown, and yellowish red clay. The lower part of the subsoil, from a depth of 46 to 60 inches, is neutral, mottled light brownish gray, yellowish brown, and yellowish red clay.

The Tabor soil is moderately well drained. Surface runoff is low. Permeability is very slow and the

available water capacity is high. The hazard of water erosion is slight.

Typically, the surface layer of the Lufkin soil is slightly acid, dark grayish brown fine sandy loam about 4 inches thick. The subsurface layer, from a depth of 4 to 9 inches, is moderately acid, grayish brown fine sandy loam. The subsoil extends to a depth of 62 inches. From a depth of 9 to 24 inches, it is moderately acid, dark grayish brown clay; from a depth of 24 to 38 inches, it is slightly acid, dark gray clay; from a depth of 38 to 54 inches, it is slightly acid, grayish brown clay; and from a depth of 54 to 62 inches, it is slightly alkaline, light brownish gray clay loam that has reddish yellow mottles. The underlying material, from a depth of 62 to 76 inches, is slightly alkaline, light olive gray clay loam that has brownish yellow and brown mottles.

The Lufkin soil is moderately well drained. Surface runoff is negligible or very low. Permeability is very slow and the available water capacity is high. The surface layer remains wet for as long as 2 to 3 weeks after heavy rains, especially in winter and spring. The hazard of water erosion is slight.

Included in mapping are the Axtell, Edge, and Rader soils. These soils are in the highest positions on the landscape within the areas of Tabor soil. Also included are Derly soils in small low areas in positions similar to those of the Lufkin soil.

The soils of this map unit are used mainly as pasture. They are moderately suited to pastures of improved bermudagrass and bahiagrass. Growing vetch and singletary peas in the winter and spring adds nitrogen to the soil and lengthens the grazing season. Applications of lime and a complete fertilizer are needed for optimum grass production.

These soils are moderately suitable for cropland. Leaving crop residue on or near the surface aids water infiltration and maintains organic matter content. A surface drainage system speeds removal of excess water after heavy rains. Applications of lime and a complete fertilizer are needed to increase yields.

These soils are moderately suited to growing native grasses. They are well suited to wildlife habitat.

Suitability is poor for most urban uses and moderate for most recreational uses. Very slow permeability and the potential for shrinking and swelling are the main limitations.

Tabor soil is in capability subclass IIIs; Lufkin soil is in capability subclass IIIw. Tabor soil is in the Sandy Loam range site; Lufkin soil is in the Claypan Savannah range site.

ToC—Tonkawa fine sand, 1 to 8 percent slopes

This gently sloping to moderately sloping soil is on uplands. The surfaces are slightly convex. Areas are irregular in shape and range from about 20 to several hundred acres in size.

Typically, the surface layer is slightly acid, dark brown fine sand about 6 inches thick. The underlying material, from a depth of 6 to 80 inches, is very pale brown fine sand that is moderately acid in the upper part and slightly acid in the lower part.

This soil is excessively drained. Surface runoff is negligible or very low and permeability is rapid. The available water capacity is low. The hazard of water erosion is slight.

Included with this soil in mapping are areas of Leagueville and Pickton soils. The Leagueville soils are at the heads of drainageways. The Pickton soils are in positions on the landscape similar to those of the Tonkawa soils. The included soils make up about 20 percent of the map unit.

This Tonkawa soil is used mainly as pasture. It is poorly suited to pastures of coastal bermudagrass and lovegrass. Overseeding a legume, such as vetch, into the coastal bermudagrass lengthens the grazing season and increases soil fertility by adding nitrogen. Applications of lime and a complete fertilizer are needed to increase grass production.

Suitability is poor for use as cropland. Excessive drainage and the low available water capacity make this soil droughty. Leaving crop residue on or near the surface helps to reduce erosion, increase organic matter content, and improve the water-holding capacity. Applications of lime and a complete fertilizer are needed to increase yields.

This soil has poor suitability for woodland. The main limitations are the low available water capacity and droughtiness. Native trees include sandjack oak, blackjack oak, post oak, American elm, and hickory. Shortleaf pines are in a few areas. Understory vegetation consists mainly of bluestems, greenbriar, winged elm, sassafras, American beautyberry, oaks, and sweetgum. Woodland management practices, such as selective cutting; protection from burning; and removal of undesirable trees, shrubs, and vines, increase timber production.

The soil is poorly suited to growing native grasses. It is poorly suited to wildlife habitat.

Suitability is moderate for most urban uses and is poor for most recreational uses. The sandy texture is the main limitation.

This soil is in capability subclass IVs, and the woodland ordination symbol is 6S.

ToE—Tonkawa fine sand, 8 to 15 percent slopes

This strongly sloping to moderately steep soil is on upland side slopes. The surfaces are mainly convex. Areas are oblong or irregular in shape and range from about 10 to 100 acres in size.

Typically, the surface layer is strongly acid, brown fine sand about 9 inches thick. The underlying material, from a depth of 9 to 80 inches, is moderately acid, very pale brown fine sand.

This soil is excessively drained. Surface runoff is low. Permeability is rapid and the available water capacity is low. The hazard of water erosion is severe.

Included with this soil in mapping are small areas of Pickton soils. The included soils make up less than 15 percent of the map unit.

This Tonkawa soil is used mainly as pasture. It is poorly suited to pastures of coastal bermudagrass and lovegrass. Overseeding a legume, such as vetch, into the coastal bermudagrass in the fall adds nitrogen to the soil and provides grazing in the early spring. Applications of lime and a complete fertilizer are needed to increase grass production.

This soil is poorly suited to use as cropland. Excessive drainage and the low available water capacity make this soil droughty. Leaving crop residue on or near the surface helps to reduce erosion, increase organic matter content, and improve the water-holding capacity. Applications of lime and a complete fertilizer are needed to increase yields.

This soil is poorly suited to use as woodland. The main limitations are the low available water capacity and droughtiness. Woodland management practices, such as selective cutting; removal of undesirable trees, shrubs, and vines; and protection from burning, increase timber production on this soil.

This soil is poorly suited to growing native grasses. It is poorly suited to wildlife habitat.

Suitability is poor for most urban uses, mainly because of slope. Suitability is poor for most recreational uses. Slope and the sandy texture are the main limitations.

This soil is in capability subclass VIe, and the woodland ordination symbol is 6S.

Tr—Trinity clay, frequently flooded

This nearly level soil is on flood plains of the Trinity River and its larger tributaries. Flooding occurs once or twice in most years, mainly from November through May. Slopes are less than 1 percent. Some areas of this soil occupy most of the flood plain. Areas are very large, ranging from about 1,000 feet to 1 mile in width and up to several thousand acres in size. Other areas occupy only part of a flood plain and range from 50 to 400 acres in size.

Typically, the surface layer is moderately alkaline, very dark gray clay about 36 inches thick. The upper part of the subsoil, from a depth of 36 to 67 inches, is moderately alkaline, dark gray clay that has strong brown and light olive brown mottles. The lower part, from a depth of 67 to 80 inches, is moderately alkaline, dark grayish brown clay that has light olive brown mottles.

This soil is somewhat poorly drained. Surface runoff is low. Permeability is very slow and the available water capacity is high. The hazard of water erosion is slight. A water table is generally within a depth of 4 feet during the winter and spring.

Included with this soil in mapping are small areas of Gladewater, Kaufman, and Whitesboro soils. The Gladewater soils are in old sloughs and in depressions. The Whitesboro soils are on natural levees along stream channels and on alluvial fans adjacent to uplands. The Kaufman soils are in positions on the landscape similar to those of the Trinity soil. Also included are small areas of Trinity soils where flooding occurs only once or twice every 5 years. This soil is in positions on the landscape slightly higher than those of the frequently flooded Trinity soils. The included soils make up as much as 20 percent of the map unit.

This Trinity soil is used mainly as pasture and wildlife habitat. It is well suited to pastures of bermudagrass and fescue. Overseeding legumes, such as white clover or singletary peas, into the bermudagrass lengthens the grazing season and increases soil fertility by adding nitrogen. Applications of a nitrogen and phosphate fertilizer are needed to increase grass production. This soil is poorly suited to wildlife habitat.

This soil is not suitable for cropland because of flooding and wetness. If flooding is controlled, the soil is well suited to this use.

This soil is well suited to growing native grasses. It is poorly suited to producing hardwood timber, mainly because of wetness and the dense, clayey soil. Flooding is a hazard, which limits equipment use and increases plant competition.

Suitability is poor for most urban and recreational uses because of flooding, the potential for shrinking and swelling with changes in moisture, the very slow permeability, and the clayey surface layer.

This soil is in capability subclass Vw and in the

Clayey Bottomland range site. The woodland ordination symbol is 5W.

Wh—Whitesboro fine sandy loam, occasionally flooded

This nearly level soil is on natural levees and alluvial fans on the flood plains of upper Tehuacana Creek. Flooding of shallow depth occurs about once every 3 to 12 years for brief periods, mainly from November through May. Slopes range from 0 to 1 percent. Areas are long and narrow or oblong and range from 20 to 200 acres in size.

Typically, the surface layer is neutral, very dark grayish brown fine sandy loam about 15 inches thick. The upper part of the subsoil, from a depth of 15 to 50 inches, is neutral, very dark gray clay loam. The lower part, from a depth of 50 to 60 inches, is slightly alkaline, dark grayish brown clay loam that has dark brown mottles.

This soil is well drained. Surface runoff is negligible. Permeability is moderate and the available water capacity is high. The hazard of water erosion is slight.

Included with this soil in mapping are small areas of Hatliff soils that are in slightly higher positions on the landscape. Also included are areas of Whitesboro soils that have a clay loam surface layer. They are in slightly lower positions on the landscape. The included soils make up less than 20 percent of the map unit.

This Whitesboro soil is used mainly as pasture. It is well suited to pastures of improved bermudagrass. Overseeding legumes, such as vetch or arrowleaf clover, into the bermudagrass lengthens the grazing season and increases soil fertility by adding nitrogen. Applications of a complete fertilizer are needed for optimum grass production. Native and improved varieties of pecan are produced on this soil.

This Whitesboro soil is well suited to use as cropland. Leaving crop residue on the surface aids water infiltration and helps to maintain organic matter content. Applications of a complete fertilizer are needed for maximum yields.

This soil is well suited to growing native grasses. It is moderately suited to wildlife habitat.

Suitability is poor for most urban uses and moderate for most recreational uses, mainly because of flooding.

This soil is in capability subclass IIw and in the Loamy Bottomland range site. The woodland ordination symbol is 5W.

Wk—Whitesboro clay loam, occasionally flooded

This nearly level soil is on broad flood plains of upper Tehuacana Creek and its tributaries. Flooding of shallow depth occurs about once every 2 to 10 years for brief periods, mainly from November through May. Slopes range from 0 to 1 percent. Areas are long and narrow to oblong and range from 20 to several hundred acres in size.

Typically, the surface layer is slightly acid, very dark grayish brown clay loam about 7 inches thick. The upper part of the subsoil, from a depth of 7 to 26 inches, is neutral, very dark brown clay loam. The next part, from a depth of 26 to 42 inches, is slightly acid, very dark grayish brown clay loam that has dark brown mottles. The lower part, from a depth of 42 to 60 inches, is moderately alkaline, dark grayish brown clay loam.

This soil is well drained. Surface runoff is negligible. Permeability is moderate and the available water capacity is high. The hazard of water erosion is slight.

Included with this soil in mapping are areas of Gladewater, Hatliff, Kaufman, and Nahatche soils. The Gladewater soils are in old sloughs and in depressions. The Hatliff and Nahatche soils are on alluvial fans adjacent to uplands. The Kaufman soils are in positions on the landscape similar to those of the Whitesboro soil. Also included are areas of Whitesboro soils that have a fine sandy loam surface layer. These soils are on natural levees along stream channels. The included soils make up less than 20 percent of the map unit.

This Whitesboro soil is used mainly as pasture. It is well suited to pastures of improved bermudagrass. Overseeding legumes, such as vetch or arrowleaf clover, into the bermudagrass lengthens the grazing season and increases soil fertility by adding nitrogen. Applications of a complete fertilizer are needed for optimum grass production. Native and improved varieties of pecan are produced on this soil.

This soil is well suited to use as cropland. Leaving crop residue on or near the surface aids water infiltration and helps to maintain organic matter content. Applications of a complete fertilizer are needed for optimum yields.

This soil is well suited to growing native grasses. It is moderately suited to wildlife habitat.

Suitability is poor for most urban uses and moderate for most recreational uses, mainly because of flooding.

This soil is in capability subclass IIw and in the

Figure 10.—This pasture of common bermudagrass and the native pecan trees in the background are well suited to Whitesboro clay loam, frequently flooded.

Loamy Bottomland range site. The woodland ordination symbol is 5W.

Wm—Whitesboro clay loam, frequently flooded

This nearly level soil is on broad flood plains of the upper Tehuacana Creek drainage system. Flooding of shallow depth occurs one or more times in most years for brief periods, mainly from November through May. Slopes range from 0 to 1 percent. Areas generally occupy the entire width of the flood plain and range from 100 to several hundred acres in size.

Typically, the surface layer is about 45 inches thick. To a depth of 32 inches, it is slightly alkaline, very dark grayish brown clay loam. From a depth of 32 to 45 inches, it is neutral, black clay loam. The subsoil, from a depth of 45 to 60 inches, is slightly alkaline, dark grayish brown clay loam.

This soil is well drained. Surface runoff is negligible. Permeability is moderate and the available water capacity is high. The hazard of water erosion is slight.

Included in with this soil in mapping are areas of Gladewater, Hatliff, Kaufman, and Nahatche soils. The Gladewater soils are in old sloughs and in depressions. The Hatliff and Nahatche soils are on alluvial fans adjacent to uplands. The Kaufman soils are in positions on the landscape similar to those of the Whitesboro soil. Also included are areas of Whitesboro soils that have a fine sandy loam surface layer. They are on natural levees along stream channels. The included soils make up less than 20 percent of the map unit.

This Whitesboro soil is used mainly as pasture. It is well suited to pastures of improved bermudagrass. Overseeding legumes, such as vetch or arrowleaf clover, into the bermudagrass lengthens the grazing season and increases soil fertility by adding nitrogen. Applications of a complete fertilizer are needed for optimum grass production. Native and improved varieties of pecan are produced on this soil (fig. 10).

This soil is not suitable for cropland because of flooding.

The soil is well suited to growing native grasses. It is poorly suited to wildlife habitat.

Suitability is poor for most urban and recreational uses, mainly because of flooding.

This soil is in capability subclass Vw and in the Loamy Bottomland range site. The woodland ordination symbol is 5W.

WnA—Wilson silty clay loam, 0 to 1 percent slopes

This nearly level soil is on broad, high stream terraces. The surfaces are smooth or slightly concave. Areas are irregular in shape and range from 10 to 250 acres in size.

Typically, the surface layer is moderately acid, very dark gray silty clay loam about 4 inches thick. The upper part of the subsoil, from a depth of 4 to 26 inches, is slightly alkaline, very dark gray clay. The next part, from a depth of 26 to 35 inches, is moderately alkaline, gray clay. The lower part of the subsoil, from a depth of 35 to 62 inches, is moderately alkaline, grayish brown clay that has yellowish brown mottles. The underlying material, from a depth of 62 to 65 inches, is moderately alkaline, light brownish gray clay that has yellowish brown mottles.

This soil is moderately well drained. Surface runoff is low. Permeability is very slow and the available water capacity is high. The hazard of water erosion is slight. The surface layer remains wet for as long as 2 to 3 weeks after heavy rains, especially in winter and spring.

Included with this soil in mapping are small areas of Crockett and Mabank soils. The Crockett soils are in slightly higher positions on the landscape. The Mabank soils are in positions similar to those of the Wilson soil. The included soils make up less than 20 percent of the map unit.

This Wilson soil is used mainly as pasture. It is moderately suited to pastures of bermudagrass and bahiagrass. Overseeding legumes, such as vetch, singletary peas and arrowleaf clover, into the bermudagrass helps to reduce erosion, lengthens the grazing season and increases soil fertility by adding nitrogen. Applications of a nitrogen and phosphate fertilizer are needed for optimum grass yields.

This soil is moderately suited to growing cotton, grain sorghum, and small grains. Leaving crop residue on the surface aids water infiltration and helps to maintain organic matter content. Applications of a nitrogen and phosphorus fertilizer are needed to increase yields.

This soil is moderately suited to growing native grasses. Suitability is moderate for wildlife habitat.

Suitability is poor for most urban and recreational uses, mainly because of low strength, very slow permeability, and the potential for shrinking and swelling with changes in moisture.

This soil is in capability subclass IIIw and in the Claypan Prairie range site.

WnB—Wilson silty clay loam, 1 to 3 percent slopes

This gently sloping soil is on broad, high stream terraces. The surfaces are smooth or slightly concave. Areas are irregular in shape and range from 15 to 150 acres in size.

Typically, the surface layer is moderately acid, very dark grayish brown silty clay loam about 7 inches thick. The upper part of the subsoil, from a depth of 7 to 28 inches, is moderately alkaline, black clay. The next part, from a depth of 28 to 45 inches, is moderately alkaline, dark grayish brown clay that has olive brown mottles. The lower part of the subsoil, from a depth of 45 to 72 inches, is moderately alkaline, light olive brown clay that has yellowish brown and light olive brown mottles. The underlying material, from a depth of 72 to 80 inches, is moderately alkaline, mottled grayish brown, olive, and light yellowish brown clay.

This soil is moderately well drained. Surface runoff is medium. Permeability is very slow and the available water capacity is high. The hazard of water erosion is moderate. The surface layer remains wet for short periods after heavy rains, especially in winter and spring.

Included with this soil in mapping are small areas of Crockett, Leson, and Mabank soils. The Crockett and Leson soils are in slightly higher, more convex positions on the landscape. The Mabank soils are in positions similar to those of the Wilson soil. The included soils make up less than 20 percent of the map unit.

This Wilson soil is used mainly as pasture. It is moderately suited to pastures of bermudagrass and bahiagrass. Overseeding legumes, such as vetch, singletary peas and arrowleaf clover, into the bermudagrass lengthens the grazing season and increases soil fertility by adding nitrogen. Applications of a nitrogen and phosphate fertilizer are needed to increase yields.

This soil is moderately suited to growing cotton, grain sorghum, and small grains. Leaving crop residue on or near the surface helps to reduce water erosion and maintain organic matter content. Terracing and

contour farming help to control runoff and reduce erosion. Applications of a nitrogen and phosphorus fertilizer are needed to increase yields.

This soil is moderately suited to growing native grasses. Suitability is moderate for wildlife habitat.

Suitability is poor for most urban and recreational uses, mainly because of low strength, very slow permeability, and the potential for shrinking and swelling with changes in moisture.

This soil is in capability subclass IIIe, and in the Claypan Prairie range site.

WoB—Wolfpen loamy fine sand, 1 to 5 percent slopes

This gently sloping soil is on uplands. The surfaces are slightly convex. Areas are irregular in shape and range from 5 to several hundred acres in size.

Typically, the surface layer is moderately acid, brown loamy fine sand about 10 inches thick. The subsurface layer, from a depth of 10 to 33 inches, is slightly acid, light yellowish brown loamy fine sand. The upper part of the subsoil, from a depth of 33 to 47 inches, is strongly acid, yellowish brown sandy clay loam that has yellowish red and red mottles. The next part, from a depth of 47 to 56 inches, is strongly acid, yellowish brown sandy clay loam that has red and gray mottles. The lower part of the subsoil, from a depth of 56 to 80 inches, is very strongly acid, mottled red, yellowish red, and light gray sandy clay loam.

This soil is well drained. Surface runoff is very low. Permeability is rapid in the surface and subsurface layers and moderate in the subsoil. The available water capacity is moderate. The hazard of water erosion is moderate. A water table is generally within a depth of 5 feet during the winter and early spring.

Included with this soil in mapping are areas of Kirvin, Leagueville, Oakwood, and Pickton soils. The Kirvin soils are in slightly higher positions on the landscape. The Leagueville soils are in depressions and on toe slopes and foot slopes. The Oakwood soils are in areas that have lower, smoother slopes. The Pickton soils are in positions on the landscape similar to those of the Wolfpen soil. The included soils make up less than 15 percent of the map unit.

This Wolfpen soil is used mainly as pasture. It is moderately suited to pastures of coastal bermudagrass and lovegrass. Overseeding legumes, such as vetch or arrowleaf clover, into the bermudagrass lengthens the grazing season and increases soil fertility by adding nitrogen. Applications of lime and a complete fertilizer are needed to increase grass production.

Suitability is moderate for cropland. Leaving crop residue on the surface helps to reduce soil erosion and maintain organic matter content. Applications of lime and a complete fertilizer are needed to increase yields.

This soil is well suited to use as woodland. Native trees include southern red oak, blackjack oak, post oak, American elm, and hickory and a few scattered areas of shortleaf pine. Shortleaf or loblolly pines are planted in a some areas. Understory vegetation consists mainly of bluestems, greenbriar, winged elm, sassafras, American beautyberry, oaks, and sweetgum. Woodland management practices, such as selective cutting; protection from uncontrolled burning; and removal of undesirable trees, shrubs, and vines, increase timber production (fig. 11).

This soil is moderately suited to growing native grasses. Suitability is moderate for wildlife habitat.

This soil is well suited to most urban uses. It is moderately suited to most recreational uses. The sandy surface layer is the main limitation.

This soil is in capability subclass IIIs, and the woodland ordination symbol is 9S.

WoE—Wolfpen loamy fine sand, 5 to 15 percent slopes

This strongly sloping to moderately steep soil is on uplands. The surfaces are mainly convex. Areas are oblong or irregular in shape and range from about 10 to 300 acres in size.

Typically, the surface layer is moderately acid, brown and light yellowish brown, loamy fine sand about 31 inches thick. The upper part of the subsoil, from a depth of 31 to 47 inches, is very strongly acid, yellowish brown sandy clay loam that has red mottles. The next part, from a depth of 47 to 56 inches, is very strongly acid, brownish yellow sandy clay loam that has red and gray mottles. The lower part of the subsoil, from a depth of 56 to 63 inches, is very strongly acid, strong brown sandy clay loam that has yellowish red and light brownish gray mottles.

This soil is well drained. Surface runoff is low. Permeability is rapid in the surface and subsurface layers and moderate in the subsoil. The available water capacity is moderate. The hazard of water erosion is severe. A water table is generally within a depth of 5 feet during the winter and early spring.

Figure 11.—This pine forest on Wolfpen loamy fine sand, 1 to 5 percent slopes needs thinning to improve productivity.

Included with this soil in mapping are small areas of Cuthbert and Pickton soils. The Cuthbert soils are on higher and steeper slopes. The Pickton soils are in positions on the landscape similar to those of the Wolfpen soil. The included soils make up less than 20 percent of the map unit.

This Wolfpen soil is used mainly as pasture. It is moderately suited to pastures of coastal bermudagrass and lovegrass. Overseeding legumes, such as vetch or arrowleaf clover, into the bermudagrass lengthens the grazing season and increases soil fertility by adding nitrogen. Applications of lime and a complete fertilizer are needed to increase grass production.

This soil is not suitable for cropland because of slope and the hazard of erosion.

This soil is well suited to use as woodland. Native trees include southern red oak, blackjack oak, post oak, American elm, hickory, and a few scattered shortleaf pines. Shortleaf or loblolly pines are planted in a few areas. Understory vegetation consists mainly of bluestems, greenbriar, winged elm, sassafras, American beautyberry, oaks, and sweetgum. Woodland management practices,

such as selective cutting; protection from uncontrolled burning; and removal of undesirable trees, shrubs, and vines, increase timber production.

The soil is moderately suited to growing native grasses. Suitability is moderate for wildlife habitat.

Suitability is poor for most urban uses, mainly because of slope. It is moderate for most recreational uses. The sandy surface layer and slope are the main limitations.

This soil is in capability subclass VIe, and the woodland ordination symbol is 9S.

Prime Farmland

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in meeting the Nation's short- and long-range needs for food and fiber. Because the supply of high-quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. It could be cultivated land, pastureland, forest land, or other land, but it is not urban or built-up land or water areas. The soil qualities, growing season, and moisture supply are those needed for the soil to economically produce sustained high yields of crops when proper management, including water management, and acceptable farming methods are applied. In general, prime farmland soil has an adequate and dependable supply of moisture from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, an acceptable salt and sodium content, and few or no rocks. It is permeable to water and air. It is not excessively erodible or saturated with water for long periods, and it either is not frequently flooded during the growing season or is protected from flooding. The slope ranges mainly from 0 to 5 percent.

The Bigbrown soil has been designated prime farmland in areas where it has slopes of 5 percent or less. The map unit BoC, Bigbrown silty clay loam, 1 to 8 percent slopes, is not included in the list of prime farmland soils because slopes of more than 5 percent were not separated on the soil map.

More detailed information about the criteria for prime farmland is available at the local office of the Natural Resources Conservation Service.

About 63,400 acres in the survey area, or 11 percent of the total acreage, meets the soil requirements for prime farmland. Scattered areas of this land are throughout the county, but most are in General Soil Map Units 3, 8, 10, and 12.

The map units in the survey area that are considered prime farmland are listed in table 6. This list does not constitute a recommendation for a particular land use. On some soils included in the list, measures that overcome a hazard or limitation, such as flooding, wetness, and droughtiness, are needed. Onsite evaluation is needed to determine whether or not the hazard or limitation has been overcome by corrective measures. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps at the back of this publication. The soil qualities that affect use and management are described under the heading "Detailed Soil Map Units."

Use and Management of the Soils

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

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

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

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

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

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

Crops and Pasture

General management needed for crops and pasture is suggested in this section. The estimated yields of the main crops and pasture plants are listed for each soil and the system of land capability classification used by the Natural Resources Conservation Service is explained.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under the heading “Detailed Soil Map Units.” Specific information can be obtained from the local office of the Natural Resources Conservation Service or the Texas Agricultural Extension Service.

Crops

About 26,000 acres, or 5 percent of the survey area, is used for crops. Row crops most commonly grown are grain sorghum, corn, and cotton. Close-growing crops most commonly grown are wheat, oats, and forage sorghum.

Soil erosion is a major problem on nearly all of the cropland where slopes are more than 2 percent. Erosion of the surface layer reduces the quality of the soil. As the topsoil is lost, the less productive subsoil is incorporated into the plow layer, reducing productivity. Erosion also reduces water quality by allowing sediment to enter nearby streams. Controlling erosion protects topsoil and helps to maintain good water quality for municipal use, recreation, and for fish and wildlife.

Managing crop residue helps to control erosion. When a good litter of residue is left on the surface, the soil is protected against pounding raindrops, crusting is reduced, runoff is decreased, and there is less evaporation of soil moisture. In addition, the residue adds organic matter to the soil, improves tilth, and reduces the effects of compaction by farm machinery. Tillage equipment designed to keep large amounts of residue on the surface can be used. Conservation tillage is effective in reducing erosion on sloping land and can be adapted to most of the soils that are suitable for growing crops.

Contour farming and terraces are erosion-control practices that are commonly used within the survey area. These practices are best adapted to soils that have smooth, uniform slopes. They are most practical on very deep to moderately deep, clayey and loamy soils that have slopes of more than 1 percent.

Figure 12.—A coastal bermudagrass pasture in an area of Edge fine sandy loam, 1 to 5 percent slopes.

Pasture and Hayland

About 269,000 acres, or 47 percent of Freestone County, is used for permanent pasture. Forage in excess of grazing needs is harvested for hay in pastures suitable for this purpose. Pasture and hayland are important in Freestone County because raising livestock is the major farm enterprise (fig. 12). The conversion of other land uses to pasture has increased in the past several years. Pastures are mainly planted to introduced grasses that will respond more effectively to good management. The most commonly grown are common bermudagrass, coastal bermudagrass, kleingrass, and bahiagrass. Other suitable grasses include dallisgrass, switchgrass, johnsongrass, and weeping lovegrass. Pastures used for hayland are most commonly planted to coastal bermudagrass. Grazing programs that include overseeding legumes provide good quality forage into the cool season when grasses are dormant. Legumes suitable for this use are burseem clover, button clover, white clover, subterranean clover, lespedeza, vetch, and singletary peas.

Good management practices for pasture include applying fertilizer at the proper time and in the proper amount, rotational grazing to maintain proper grazing height, and control of weeds and brush. Good management practices for hayland include applying fertilizer and cutting forage at the correct height and at the proper stage of growth.

Well managed pastures require adequate fencing for the rotation of grazing and the efficient use of forage. Proper use of forage ensures that plants retain vigor and are able to maintain maximum production. An adequate supply of water that is easily accessible to livestock is essential.

Horticultural Crops

Peaches, pecans, and vegetables are grown commercially in Freestone County. These and many other horticultural crops are also grown for home use. Pecan trees are very popular for use as shade trees around the home as well as for nut production.

Normal problems caused by insects, diseases, and weather must be overcome in order to grow vegetable, nut, and fruit crops successfully. Selecting a site with suitable soils is also important. The soils in Freestone County vary in suitability for growing horticultural crops. Fertility, drainage, permeability, and reaction (pH) are the soil properties that are of most concern because they can limit growth and production.

Vegetables, fruit trees, and pecan trees need well drained soils. Pecan trees can be established and thrive in most parts of the county, but they are best grown on well drained alluvial soils along creeks.

Proper internal drainage of the soil is most important to fruit tree production. A soil that has a sandy or sandy loam surface layer at least 20 inches thick is needed for a fruit orchard site. A permeable subsoil that allows proper drainage and oxidation is even more important. In some soils, the surface layer is suitable but the subsoil has a large amount of clay, which is less permeable and poorly drained. In these soils, the fruit trees become saturated during periods of prolonged wet periods. The roots drown and the tree becomes infected with fungus.

Soils used for growing horticultural crops in Freestone County have moderate to low natural fertility. A few soils are too acid. These problems can be easily corrected by obtaining a soil analysis and applying fertilizer and lime accordingly. Nitrogen is generally the most limited fertilizer element, especially in the sandy soils. Soils that are moderately or strongly acid in the root zone require the application of lime for plants to achieve good growth and high production.

Both fruit and pecan production are long-term ventures requiring thorough planning, careful site selection, and intense management. Success is achieved only if the management program recognizes and overcomes the soil limitations that are present.

Yields per Acre

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

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

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

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

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

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops *(6)*. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, and for engineering purposes.

In the capability system, soils are generally grouped at three levels—capability class, subclass, and unit. Only class and subclass are used in this survey.

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

Class I soils have few limitations that restrict their use.

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

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

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

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

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

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

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

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

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

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

The capability classification of each map unit is given in the section “Detailed Soil Map Units” and in the yields table.

Rangeland

Homer Sanchez, range conservationist, Natural Resources Conservation Service, Temple, Texas, helped prepare this section.

Rangeland is land on which the native vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. In areas having similar climate and topography, the kind and amount of vegetation produced are closely related to the kind of soil. Effective management is based on the relationship of soils, vegetation, and water. Rangeland receives no regular or frequent cultural treatment, such as fertilizer or tillage.

Two major kinds of rangeland are in Freestone County. The Southern Claypan Area, which comprises most of the county, was an oak savannah. It consisted of an open stand of mostly post oak and blackjack oak with an understory of mainly indiangrass, little bluestem, big bluestem, switchgrass, beaked panicum, native legumes, and forbs. The Northern Blackland Prairie, which comprises about 7.5 percent of the county in the extreme western part, was originally a tall grass prairie. Grasses, such as big bluestem, indiangrass, little bluestem, switchgrass, Virginia wildrye, and eastern gamagrass, were dominant. Trees were only along drainageways or in widely scattered motts.

Natural wildfires controlled the spread of trees and shrubs and helped to maintain the ecological balance of native vegetation.

About 186,000 acres or 33 percent of Freestone County is used as rangeland, but only a few small areas are composed entirely of original native vegetation. The original vegetation was altered when wildfires were supressed, domestic livestock were brought in, and land was placed into cultivation or used as pasture. Many areas of cropland, much of it highly erodible, have been reverted back to native vegetation. Because of past management, most of these areas have been invaded by woody plants and weeds. The amount of forage produced is generally less than half of the original potential. Most of the rangeland is in poor to fair condition. Some of the dominant grasses are Texas wintergrass, meadow dropseed, threeawns, and little bluestem. Some introduced species, such as King Ranch bluestem, have invaded or survived prior management.

Range vegetation cannot meet the year-round needs of most livestock operations. Small-grain pasture and protein concentrates are commonly used to supplement winter forage.

Range Sites and Range Condition

Soils vary in their capability to produce grasses and other plants suitable for grazing. Soils that produce about the same kinds and amounts of forage are grouped into a range site.

A range site is a distinctive kind of rangeland. It produces a characteristic natural plant community that differs from those on other range sites in kind, amount, and proportion of range plants. The natural plant community on the range site is also referred to as the climax plant community or climax vegetation because it represents the culmination of the effects of all the factors of the natural environment.

Climax vegetation is the stabilized plant community that reproduces itself and changes very little so long as the environment remains unchanged. It consists of the plants that grew there before the area was first

settled. The most productive combination of native forage plants on a range site is generally the climax vegetation.

Range sites are subject to many influences that modify or even temporarily destroy vegetation. Examples are drought, overgrazing, wild fires, and short-term tillage. If the changes are not too severe, the plant community will recover and return to climax condition. However, severe deterioration may permanently alter the potential of the range site.

Grazing can change the quality and quantity of forage on a range site by changing the proportion of decreaser, increaser, and invader plants in the composition of the plant community.

Decreasers are plants in the climax vegetation that tend to decrease in relative amount under close grazing. They generally are the tallest and most productive perennial grasses and forbs and the most palatable to livestock.

Increasers are plants in the climax vegetation that increase in relative amount as the more desirable decreasers are reduced by close grazing. They are commonly shorter than decreasers and are generally less palatable to livestock.

Invaders are plants that are normally not included in the climax plant community because they cannot compete with the climax vegetation for moisture, nutrients, and light. They invade the site and grow along with increasers only after the climax vegetation has been reduced by continual heavy grazing. Most invader species have little grazing value.

Range management requires a knowledge of the kinds of soil and of the climax or potential natural plant community on a particular range site. The current range condition is assessed and compared to the climax plant community to determine the range condition. The more closely the existing community resembles the climax community, the better the range condition. Range condition is an ecological rating only and does not have a specific meaning relating to the existing plant community in a given use.

Four range condition classes are used to show the degree of departure from the potential or climax vegetation. A range site is in excellent condition if 76 to 100 percent of the present plant community is the same as the climax vegetation; in good condition if the percentage is 51 to 75; in fair condition if the percentage is 26 to 50; and in poor condition if the percentage is 25 or less.

Potential forage production depends on the range site. Current forage production depends on the range condition and the moisture available to plants during their growing season.

A primary objective of good range management is keeping the range in excellent or good condition and thus maintaining optimum forage production, reducing undesirable brush species, providing for wildlife habitat, and protecting soil and water resources. Sometimes, however, a range condition somewhat below the potential can meet these needs.

Good livestock and forage production on rangeland is achieved mainly by managing the time of grazing and limiting the amount of forage removed. Some of the food manufactured by the green parts of plants is used for growth and some is stored for use in re-growth and seed production. Management practices that permit this process to take place are discussed below.

Proper Grazing Use. The objective of this practice is to allow cattle to graze at an intensity that will maintain enough cover to protect the soil and maintain or improve the quantity of desirable vegetation.

Deferred Grazing. This is the deferment or restriction of grazing until the better forage plants have completed most of their seasonal growth or have made seed. This management practice helps keep the desirable plants healthy and vigorous and permits plants that have been depleted to recover. Deferred grazing helps to improve plant cover, conserve water, and reduce soil losses.

Fencing. This practice excludes livestock from areas needing protection from grazing and confines livestock to a specific area. Fencing also subdivides grazing land to permit use of a planned grazing system and protects new seedlings or plantings from grazing.

Prescribed Burning. Livestock operators and wildlife managers use this practice to periodically remove or reduce a dense cover of mature vegetation. When done properly and at the right time, prescribed burning stimulates new succulent growth, helps to restore climax plant species, and reduces infestations of noxious weed and brush. However, desirable plants can be severely damaged or killed if the soil surface is too dry, allowing the fire to reach the plant crowns and roots. Burning is not recommended more often than once every three years to avoid interferring with the regrowth cycle of perennial grasses. Prescribed burning is an effective management tool that can be substituted for chemical or mechanical treatment.

Planned Grazing Systems. The objective of this practice is to rotate the grazing of livestock through two or more pastures in a planned sequence for a specified period of time. A planned grazing system may be relatively simple in design when only two pastures are used, or may be more complex and management intensive when one or two herds and many pastures are used. To be successful, it must be tailored to conditions existing in each ranch unit and

meet the needs of the plants and animals as well as the rancher.

If range is subjected to years of prolonged overuse, the desirable vegetation is eliminated and the source of seed for these plants is lost. In this case, the vegetation must be reestablished before range condition can be improved. Management practices that can be used to improve the range include range seeding, controlling brush, fencing, and developing water sources.

Table 7 shows for each soil in the survey area that supports range vegetation, the range site and the potential annual production in favorable, average, and unfavorable years.

A *range site* is listed for each soil map unit. The relationship between soils and vegetation was established during this survey; thus, range sites generally can be determined directly from the soil map. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the productivity of range plants. Soil reaction, salt content, and a seasonal high water table are also important.

Potential annual production is the amount of vegetation that can be expected to grow annually on well managed rangeland that is supporting the potential natural plant community. It includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year's growth of leaves, twigs, and fruits of woody plants. It does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation for favorable, average, and unfavorable years. In a favorable year, the amount and distribution of precipitation and the temperatures make growing conditions substantially better than average. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

Yields are adjusted to a common percentage of air-dry moisture content. The relationship of green weight to air-dry weight varies according to such factors as exposure, amount of shade, recent rains, and unseasonable dry periods.

The soils of Freestone County have been grouped into 11 range sites. The soils in each range site have similar properties important to growing native grasses. They have the potential of producing about the same kind and amount of vegetation.

The range sites in the Southern Claypan Area include Claypan Savannah, Deep Sand, Loamy Bottomland, Sandy, Sandy Loam, and Very Deep Sand. The range sites in the Northern Blackland Prairie include Blackland, Clayey Bottomland, Clay Loam, Claypan Prairie, and Eroded Blackland. These range sites are described in the following paragraphs.

Blackland range site. The Burleson and Leson soils in map units BuA and LsC are in the Blackland range site. These soils have relatively high natural fertility. The climax plant community is a tall grass prairie with a few large live oaks, elm, and hackberry trees along drainageways and in motts. The composition by weight is 85 percent grasses, 5 percent woody plants, and 10 percent forbs. Little bluestem, indiangrass, and big bluestem produce the bulk of the forage. Other grasses include switchgrass, sideoats grama, Texas wintergrass, Texas cupgrass, tall dropseed, Florida paspalum, eastern gamagrass, and Virginia wildrye. Woody plants are live oak, elm, hackberry, bumelia, and coralberry. Many palatable forbs and legumes are native to the site.

Overgrazing will eventually eliminate tall grasses, such as big bluestem, indiangrass, switchgrass, and eastern gamagrass. These grasses will be replaced by silver bluestem, Texas wintergrass, tall dropseed, and other mid grasses. With continued grazing, buffalograss, Texas grama, tumblegrass, annual weeds, and annual grasses will dominate the site and noxious brush species, such as mesquite, winged elm, honey locust, and osage-orange, will invade.

Clayey Bottomland range site. The Gladewater, Kaufman, and Trinity soils in map units Gh, Ka, Kc, Kd, Kf, and Tr are in the Clayey Bottomland range site. The climax plant community is a tall grass savannah. Oak, elm, hackberry, cottonwood, ash, black willow, some pecan, and other large trees form about 30 percent canopy cover. The canopy is generally more dense near streams or drainageways. Cool-season grasses and sedges grow under the canopy, and warm-season grasses and forbs dominate the open areas. The composition by weight is 70 percent grasses, 25 percent woody plants, and 5 percent forbs. This range site is preferred by livestock.

The main grasses are sedges, Virginia wildrye, Canada wildrye, and rustyseed paspalum, followed by beaked panicum, switchgrass, indiangrass, vine-mesquite, and Florida paspalum. Buffalograss, long leaf uniola, knotroot bristlegrass, and other grasses account for a lesser amount of forage. The forbs are tickclover, snoutbean, lespedeza, and gayfeather.

The warm-season grasses and forbs are reduced when fire is suppressed and heavy grazing is allowed. The brush forms a dense canopy, allowing shade-tolerant grasses to dominate the understory, thereby reducing better quality forage.

Clay Loam range site. The Lamar soil in map unit LaE is in the Clay Loam range site. The climax plant

community is a true tall grass prairie that is highly productive. The composition by weight is 85 percent grasses, 5 percent woody plants, and 10 percent forbs. The main grasses are indiangrass, big bluestem, switchgrass, Virginia and Canada wildrye, and Florida paspalum, followed by sideoats grama, silver bluestem, low panicums, and Texas wintergrass. Short grasses account for a lesser amount of forage. Woody plants include hackberry, elm, pecan, and oak. Many legumes are present. The primary forbs are Maximillian sunflower, Engelmann daisy, penstemon, and bundleflower.

Continuous overgrazing causes tall grasses, such as big bluestem, little bluestem, indiangrass, switchgrass, and Florida paspalum, to decrease. They are replaced by sideoats grama, silver bluestem, low panicums, Texas wintergrass, and tall dropseed. In a deteriorated condition, the site is dominated by plants, such as threeawns, hairy grama, red lovegrass, Texas grama, buffalograss, tumblegrass, western ragweed, broomweed, prairie coneflower, and woody plants, such as mesquite, baccharis, yaupon, and hawthorn.

Claypan Prairie range site. The Crockett, Mabank, and Wilson soils in map units CrA, CrB, CrC, CrC3, CrD, CrD4, MaA, WnA, and WnB are in this range site. In climax condition, this is a true tall grass prairie site with oak, elm, and hackberry trees along drainageways or in motts. The composition by weight is 85 percent grasses, 5 percent woody plants, and 10 percent forbs.

Little bluestem and indiangrass comprise most of the climax plant community. In lesser amounts are switchgrass, big bluestem, Virginia wildrye, Canada wildrye, Florida paspalum, sideoats grama, meadow dropseed, Texas wintergrass, and vine-mesquite, followed by purpletop, brownseed paspalum, longspike tridens, buffalograss, low panicums, fall switchgrass, and sedges. Woody plants include live oak, elm, hackberry, bumelia, coralberry, and a few post oaks. Forbs include Maximillian sunflower, Engelmann daisy, halfshrub sundrop, western indigo, and prairie clover.

Continuous overgrazing decreases big bluestem, little bluestem, indiangrass, and switchgrass. Meadow dropseed, silver bluestem, sideoats grama, and Texas wintergrass increase. Finally, mesquite and prickly-pear invade the site and plants, such as buffalograss, Texas wintergrass, Texas grama, windmillgrass, and weedy forbs, dominate the understory.

Claypan Savannah range site. The Axtell, Derly, Edge, and Lufkin soils in map units AxB, AxD, DrA, EgB, EgE, ErC, and TfA are in this range site. The climax plant community is a post oak, blackjack oak savannah with trees shading 15 to 20 percent of the ground. The composition by weight is about 80 percent grasses, 15 percent woody plants, and 5 percent forbs.

Most of the climax vegetation is made up of little bluestem, indiangrass, and brownseed paspalum. The other grasses are switchgrass, Florida paspalum, purpletop, low panicums, low paspalums, silver bluestem, tall dropseed, and Texas wintergrass. Woody plants include post oak, blackjack oak, elm, yaupon, hawthorn, and American beautyberry. Forbs include dayflower, bundleflower, sensitive briar, tickclover, wildbean, and lespedeza.

When retrogression occurs, little bluestem, indiangrass, and switchgrass are replaced by brownseed paspalum, silver bluestem, arrowfeather threeawn, tall dropseed, purpletop, and low panicums. Woody plants, such as post oak, elm, yaupon, and hackberry, increase and form a dense canopy that suppresses grass and forb production.

Deep Sand range site. The Padina soil in map unit PaB is in the Deep Sand range site. The climax plant community is a post oak, blackjack oak savannah with a 20 to 25 percent canopy. The understory consists of mid to tall grasses. The composition by weight is 80 percent grasses, 15 percent woody plants, and 5 percent forbs.

Little bluestem and indiangrass make up most of the composition. Also present, but in lesser amounts, are purpletop, switchgrass, and sand lovegrass. Other grasses are low panicums, purple lovegrass, sand dropseed, brownseed paspalum, and splitbeard bluestem. Woody plants include blackjack oak and post oak. Woody plants in the understory include shrubs, such as yaupon, hawthorn, and American beautyberry. Forbs include legumes, such as lespedeza, tickclover, and partridge pea.

As retrogression takes place on the site, little bluestem, sand lovegrass, indiangrass, and purpletop decrease and low panicums, low paspalums, purple lovegrass, and woolysheath threeawn increase. Oak and yaupon increase to form a dense canopy. Plants that invade the site include red lovegrass, tumble lovegrass, crabgrass, red sprangletop, sandbur, brackenfern, pricklypear, and queen's delight. Eventually, production drops to a very low level of poor quality forage.

Eroded Blackland range site. The Ellis and Ferris soils in map units EsE and FeD are in this range site. The climax plant community is a tall grass prairie. All forage grasses that make up the climax vegetation have been removed by cultivation and the productive capacity has been permanently reduced by erosion. However, these soils still support the same grass species as the Blackland range site. A minimum of

about 40 years is required to reestablish the original composition of climax vegetation under natural conditions. Composition of the climax plant community is 85 percent grasses, 5 percent woody plants, and 10 percent forbs.

The climax vegetation consists mainly of little bluestem, indiangrass, and big bluestem. Also present in lesser amounts are Virginia wildrye, Canada wildrye, switchgrass, Florida paspalum, sideoats grama, tall dropseed, silver bluestem, Texas wintergrass, and vine-mesquite. Forbs include Maximilian sunflower, Engelmann daisy, and bundleflower.

Most of this site is in some intermediate stage of secondary plant succession. Silver bluestem, tall dropseed, Texas wintergrass, sideoats grama, and buffalograss are dominant in most areas, and they respond as increasers. If overgrazed, buffalograss, Texas wintergrass, or both, will dominate the site.

Loamy Bottomland range site. The Nahatche, Hatliff, and Whitesboro soils in map units Na, NH, Wh, Wk, and Wm are in the Loamy Bottomland range site. The climax plant community is a tall grass savannah with trees shading about 30 percent of the ground. The overstory consists of oak, pecan, hackberry, elm, cottonwood, hickory, and ash. The understory consists of hawthorns, greenbriar, honeysuckle, grape, and peppervines. Cool-season grasses and sedges dominate the shaded areas, while warm-season grasses dominate the openings. The composition by weight is 75 percent grasses, 20 percent woody plants, and 5 percent forbs.

Virginia wildrye, sedges, and rustyseed paspalum grow in the shaded and wet areas. Switchgrass, beaked panicum, indiangrass, big bluestem, little bluestem, eastern gamagrass, vine-mesquite, and purpletop grow in the open areas. Also present in lesser amounts are redtop panicum, gaping panicum, low panicums, uniolas, buffalograss, knotroot bristlegrass, and Texas wintergrass. The forbs are tickclover, lespedeza, snoutbean, partridge pea, and gayfeather.

The forage on this site is preferred by livestock. The amount of warm-season grasses and forbs will be reduced, however, if fire is suppressed and overgrazing is allowed. Shade-tolerant grasses and forbs will become dominant, decreasing forage production.

Sandy range site. The Robco, Silstid, and Styx soils in map units RoA, SsB, SsD, and StB are in the Sandy range site. The climax plant community is an open savannah of post oak and blackjack oak, which shade 20 to 25 percent of the ground. The open spaces are predominantly tall grasses. The composition by weight is 80 percent grasses, 15 percent woody plants, and 5 percent forbs.

Little bluestem and indiangrass make up most of the composition. Also present in lesser amounts are switchgrass, beaked panicum, sand lovegrass, purpletop, and brownseed paspalum, followed by fringeleaf paspalum, purple lovegrass, tall dropseed, splitbeard bluestem, and low panicums. Woody plants include post oak and blackjack oak. Woody plants in the understory are hawthorn, American beautyberry, greenbriar, yaupon, and berry vines. The forbs are lespedeza, tickclover, sensitive briar, snoutbean, tephrosia, partridge pea, and western ragweed.

The taller grasses decrease and the woody plants increase when overgrazing is allowed and fires are suppressed. Little bluestem, indiangrass, and switchgrass are replaced by brownseed paspalum, tall dropseed, fall witchgrass, and others. They, in turn, are grazed out and replaced by red lovegrass, yankeeweed, bullnettle, snakecotton, and croton. Other invading plants are broomsedge bluestem, smutgrass, sandbur, pricklypear, queen's delight, beebalm, pricklypoppy, baccharis, and waxmyrtle. Woody species eventually form dense thickets in some areas.

Sandy Loam range site. The Gasil, Hearne, Rader, Silawa, and Tabor soils in map units DrA, GfB, HeE, RaB, SaE, TaB, and TfA are in this range site. The climax plant community is a post oak and blackjack oak savannah with a 20 to 25 percent canopy. The total composition by weight is 80 percent grasses, 15 percent woody plants, and 5 percent forbs.

Little bluestem is the dominant grass. Indiangrass is also present in a lesser amount, followed by eastern gamagrass, switchgrass, big bluestem, beaked panicum, longleaf uniola, and other grasses. Woody plants include post oak, blackjack oak, elm, yaupon, greenbriar, American beautyberry, and berry vines. The forbs include Engelmann daisy, gayfeather, sensitive briar, and native legumes.

This range site will deteriorate if overgrazing is allowed and wildfires are suppressed. The woody canopy will increase and tall grasses, such as little bluestem, indiangrass, big bluestem, and eastern gamagrass will decrease and be replaced by such plants as brownseed paspalum. An increase in thickets of oak trees and shrubs, carpetgrass, annual grasses, and forbs will further deteriorate the site.

Very Deep Sand range site. The Arenosa soil in map unit ArC is in the Very Deep Sand range site. The climax plant community is a bluejack oak, post oak, blackjack oak, and hickory savannah with about a 30 percent canopy. Scattered yaupon is in the understory

along with mid and tall grasses. The composition by weight is 75 percent grasses, 20 percent woody plants, and 5 percent forbs.

Little bluestem is the main grass, followed by indiangrass, purpletop, and longleaf uniola. Other grasses are purple lovegrass, red lovegrass, sand lovegrass, switchgrass, and woolysheath threeawn. Woody plants in the understory include yaupon, hawthorn, greenbriar, and berry vines. The forbs are lespedeza, tickclover, snoutbean, and partridge pea.

Because of this site's very low soil fertility and very droughty condition, little bluestem, indiangrass, and switchgrass decrease very rapidly under grazing pressure. They are replaced by low panicums, low paspalums, purple lovegrass, red lovegrass, and woolysheath threeawn. As retrogression continues, yaupon increases to form a 60 to 80 percent canopy. Continued overgrazing causes the area under the tree canopy to deteriorate to bare ground or a sparse cover of common selfheal, bracted breweria, bullnettle, curly threeawn, snakecotton, yankeeweed, tumble lovegrass, purple sandgrass, red sprangletop, sandbur, and pricklypear.

Woodland Management and Productivity

Freestone County has only about 8,000 acres of commercial woodland, consisting mostly of small scattered areas of mixed pine-hardwood forest in the eastern part of the county. Loblolly pine is the major commercial tree. The woodland is used not only to produce commercial wood products but also for hunting and other recreational activities.

Many soils in the county have a potential for commercial timber production. Soils on the flood plains of rivers and other major streams are suited to hardwood growth and management, while those on uplands are capable of medium to high production of pines.

Table 8 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for an indicator tree species. The number is based on the site index of the indicator species growing in a pure stand under natural conditions. The larger the number, the greater the potential productivity. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *R* indicates steep slopes; *X*, stoniness or rockiness; *W*, excess water in or on the soil; *T*, toxic substances in the soil; *D*, restricted rooting depth; *C*, clay in the upper part of the soil; *S*, sandy texture; *F*, a high content of rock fragments in the soil; and *L*, low strength. The letter *A* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: R, X, W, T, D, C, S, F, and L. The soils in Freestone County have only those limitations represented by symbols R, W, C, and S.

In table 8, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Erosion hazard is the probability that damage will occur as a result of site preparation and cutting where the soil is exposed along roads, skid trails, and fire lanes and in log-handling areas. Forests that have been burned or overgrazed are also subject to erosion. Ratings of the erosion hazard are based on the percent of the slope. A rating of *slight* indicates that no particular prevention measures are needed under ordinary conditions. A rating of *moderate* indicates that erosion-control measures are needed in certain silvicultural activities. A rating of *severe* indicates that special precautions are needed to control erosion in most silvicultural activities.

Equipment limitation reflects the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. The chief characteristics and conditions considered in the ratings are slope, stones on the surface, rock outcrops, soil wetness, and texture of the surface layer. A rating of *slight* indicates that under normal conditions the kind of equipment and season of use are not significantly restricted by soil factors. Soil wetness can restrict equipment use, but the wet period does not exceed 1 month. A rating of *moderate* indicates that equipment use is moderately restricted because of one or more soil factors. If the soil is wet, the wetness restricts equipment use for a period of 1 to 3 months. A rating of *severe* indicates that equipment use is severely restricted either as to the kind of equipment that can be used or the season of use. If the soil is wet, the wetness restricts equipment use for more than 3 months.

Seedling mortality refers to the death of naturally occurring or planted tree seedlings, as influenced by the kinds of soil, soil wetness, or topographic conditions. The factors used in rating the soils for seedling mortality are texture of the surface layer, depth to a seasonal high water table and the length of the period when the water table is high, rock fragments in the surface layer, and effective rooting depth. A rating of *slight* indicates that seedling

mortality is not likely to be a problem under normal conditions. Expected mortality is less than 25 percent. A rating of *moderate* indicates that some problems from seedling mortality can be expected. Extra precautions are advisable. Expected mortality is 25 to 50 percent. A rating of *severe* indicates that seedling mortality is a serious problem. Extra precautions are important. Replanting may be necessary. Expected mortality is more than 50 percent.

Plant competition ratings indicate the degree to which undesirable species are expected to invade and grow when openings are made in the tree canopy. The main factors that affect plant competition are depth to the water table and the available water capacity. A rating of *slight* indicates that competition from undesirable plants is not likely to prevent natural regeneration or suppress the more desirable species. Planted seedlings can become established without undue competition. A rating of *moderate* indicates that competition may delay the establishment of desirable species. Competition may hamper stand development, but it will not prevent the eventual development of fully stocked stands. A rating of *severe* indicates that competition can be expected to prevent regeneration unless precautionary measures are applied.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index* and as a *volume* number. The site index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

The *volume*, a number, is the yield likely to be produced by the most important trees. This number, expressed as board feet (Doyle Rule) per acre per year, indicates the amount of fiber produced in a fully stocked, even-aged, unmanaged stand. These yields can be significantly increased by applying sound forestry management practices, such as scheduled thinnings.

The first species listed under *common trees* for a soil is the indicator species for that soil. It generally is the most common species on the soil and is the one that determines the ordination class.

Trees to plant are those that are suitable for commercial wood production.

Woodland Understory Vegetation

Understory vegetation consists of grasses, forbs, shrubs, and other plants. If well managed, some woodland can produce enough understory vegetation to support grazing of livestock or wildlife, or both, without damage to the trees.

The quantity and quality of understory vegetation vary with the kind of soil, the age and kind of trees in the canopy, the density of the canopy, and the depth and condition of the litter. The density of the canopy determines the amount of light that understory plants receive.

Table 9 shows, for each soil suitable for woodland, the potential for producing understory vegetation. The total production of understory vegetation includes the herbaceous plants and the leaves, twigs, and fruit of woody plants up to a height of 4.5 feet. It is expressed in pounds per acre of air-dry vegetation in favorable, normal, and unfavorable years. In a favorable year, soil moisture is above average during the optimum part of the growing season; in a normal year, soil moisture is average; and in an unfavorable year, it is below average.

Table 9 also lists the common names of the characteristic vegetation on each soil and the *composition*, by percentage of air-dry weight, of each kind of plant. The table shows the kind and percentage of understory plants expected under a canopy density that is most nearly typical of woodland in which the production of wood crops is highest.

Surface Mine Reclamation

Norman Bade, resource conservationist, Natural Resources Conservation Service, helped prepare this section.

Lignite deposits underlie a large area of Freestone County. Strip-mining this lignite disturbs large areas of land, about 600 acres each year. The mining process includes clearing existing vegetation, removing all overburden, mining the lignite, and replacing the mixed overburden (fig. 13).

Current Texas regulations require all lignite mined soils to be reclaimed according to a pre-approved plan which includes revegetation of the area. The vegetation must be maintained for a designated period. National and state regulations should be considered in the planning, site selection and design, and application of any reclamation procedures.

Land reclamation includes reconstruction and revegetation of mined areas. After replacing the overburden, the spoil is graded to its planned contour and revegetated according to established regulations. Vegetation must be well established before reclamation is completed. Following reclamation, land can be used as cropland, pasture, rangeland, wildlife habitat, recreational areas, woodland, orchard, or

Figure 13.—A large dragline is removing overburden to expose a vein of lignite coal at a surface mine.

residential or industrial development. The postmine land use selected determines which reclamation procedures will be used and the kinds of plants that will be established.

Successful reclamation requires an understanding of the chemical, physical, and biological properties of soils. The soil properties generally are altered when the soil is disturbed. This can affect the alternative land use and productivity. The reclamation process generally requires a higher than normal amount of soil amendments, seeds and sprigs, and subsequent management.

The objectives of reclamation are to restore the soil to a condition capable of its intended use, to prevent permanent damage, and to control erosion and sedimentation.

Surface mining and reconstruction alter soil properties and cause an initial increase in erosion potential, a decrease in fertility, and a strong tendency to crust. Consequently, the method of soil reconstruction is important to the success of reclamation efforts. Methods used in the removal of overburden and reconstruction should place soil material on the surface that is best for plant growth and productivity and assure that geologic materials containing acid-forming pyrites are not mixed into the rooting zone. Chemical testing is needed to ensure that these materials are not present in the reconstructed soil.

The revegetation of mined lands requires a good seedbed, adequate amounts of fertilizer, and selection of plant species that help to control erosion. Plants commonly used for cover and forage include coastal bermudagrass, common bermudagrass, selection 75 kleingrass, Pensacola bahiagrass, and King Ranch bluestem. Other important species include Haskell sideoats grama, T-587 old world bluestem, Alamo switchgrass, and Lometa indiangrass.

Planting legumes, such as Yuchii arrowleaf clover, crimson clover, subterranean clover, and hairy vetch, increases forage production and provides nitrogen. Other forbs and legumes, such as Sabine Illinois bundleflower, singletary pea, Engelmann daisy, and Aztec Maximilian sunflower, provide forage diversity and improve wildlife habitat. The addition of trees, shrubs, and vines also enhances wildlife habitat.

Recreation

Much of Freestone County has soils, topographic conditions, and existing vegetative patterns suitable for outdoor recreational activities.

Fairfield Lake State Park, 6 miles northeast of Fairfield, is adjacent to Lake Fairfield, a cooling lake for the lignite-powered Big Brown generating plant. The 1,460 acre park offers picnicking, camping, hiking, fishing, and other recreational opportunities.

Richland-Chambers Reservoir, in the northern part of the county, also offers boating and fishing activities. There are numerous, smaller private lakes and ponds throughout the county as well. In addition, on the eastern edge of the county, public access points are provided for sportsmen along the Trinity River.

The presence of small game animals, such as mourning dove, bobwhite quail, fox squirrel, various waterfowl, and white-tailed deer, offers an opportunity for hunting in many parts of the county.

The soils of the survey area are rated in table 10 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreational uses by the duration and intensity of flooding and the season when flooding occurs. In planning recreational facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 10, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or a combination of these measures.

The information in table 10 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 13 and interpretations for dwellings without basements and for local roads and streets in table 12.

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

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

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

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

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

Wildlife Habitat

Matthew R. Judy, area biologist, Natural Resources Conservation Service, helped prepare this section.

In Freestone County, wildlife is increasing because of better habitat management and renewed interest in some game species. For instance, the population of whitetail deer has more than doubled within the last 10 years. According to the Texas Parks and Wildlife Department, the current deer population is about 1 deer for every 11 acres of habitat.

The Texas Parks and Wildlife Department reintroduced native wild turkeys in the post oak savannah area during the winter of 1989. The objective is to restore wild turkeys to their native range.

Additional game species found within the county include mourning dove, bobwhite quail, fox squirrel, and various waterfowl.

Other wildlife species common to the area include armadillo, cottontail rabbit, jackrabbit, raccoon, opossum, bats, striped skunk, and spotted skunk. Many species of rodents, the largest of which are nutria and beaver, are in the area. Predators include the coyote, red and gray fox, and bobcat. Many songbirds, hawks, owls, wading birds, reptiles, and amphibians are also native to the county. When managing for game animals, many of these nongame species are also benefitted.

Freestone County has many soils suitable for impounding water. Numerous ponds and lakes have been built to provide livestock water, to help prevent soil erosion, or provide flood control. Many of these have been stocked with largemouth bass, bluegill, and channel catfish to provide fishing as a secondary use. Other fish in streams and in unmanaged ponds and lakes include green sunfish, bullhead catfish, white crappie, and gar.

The frequently flooded bottom lands provide wintering habitat for various waterfowl including wood ducks, mallard, teal, widgeon, gadwall, pintail, and shoveler. Open bodies of water, such as farm ponds, lakes, and rivers, provide resting and feeding areas for waterfowl during migratory periods.

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

In table 11, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

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

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

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

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

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flooding. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, snow-on-the-mountain, croton, western ragweed, and sunflower.

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

Coniferous plants furnish browse and seeds. Soil

properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine and eastern red cedar.

Shrubs are bushy woody plants that produce fruit, buds, twigs, bark, and foliage. Soil properties and features that affect the growth of shrubs are depth of the root zone, available water capacity, salinity, and soil moisture. Examples of shrubs are yaupon, hawthorn, and American beautyberry.

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

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

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

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

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

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

Habitat for rangeland wildlife consists of areas of shrubs and wild herbaceous plants. Wildlife attracted to rangeland include deer, bobcat, wild turkey, dove, and quail.

Engineering

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

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

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

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

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

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank

absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

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

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

Building Site Development

Table 12 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

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

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

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

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 13 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 13 also shows the suitability of the soils for use as daily cover for landfill. A rating of *good*

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

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

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

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

Table 13 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

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

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

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

The ratings in table 13 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

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

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

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

Construction Materials

Table 14 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils

are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help to determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, a low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have a moderate shrink-swell potential, slopes of 15 to 25 percent, many stones, or depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, slopes of more than 25 percent, or they are wet and have a water table at a depth of less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and *gravel* are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. In table 14, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

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

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that has no more than 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

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

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

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

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

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

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

Water Management

Table 15 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed excavated ponds. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. The underlying material is not rated and should be evaluated during an onsite investigation. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

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

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

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

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to control erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind erosion or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts and sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classification, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering Index Properties

Table 16 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

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

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

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

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

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

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 10 inches in diameter and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The

estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

Table 17 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

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

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

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

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems and septic tank absorption fields.

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

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

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

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

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; *high*, more than 6 percent; and *very high*, greater than 9 percent.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from

0.02 to 0.64. The soils in Freestone County have values of K ranging from 0.15 to 0.43. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 17, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained or increased by returning crop residue to the soil. Organic matter has a beneficial effect on the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Table 18 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations. Information about depth to bedrock or cemented pan are not given because none of the soils in Freestone County have bedrock or a cemented pan within a depth of 6 feet.

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep and very deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep to very deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to two hydrologic groups in table 18, the first letter is for drained areas and the second is for undrained areas.

Flooding, the temporary inundation of an area, is caused by overflowing streams or by runoff from adjacent slopes. Water standing for short periods after rainfall or snowmelt is not considered flooding, and water standing in swamps and marshes is considered ponding rather than flooding.

Table 18 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions (the chance of flooding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs, on the average, once or less in 2 years (the chance of flooding is 5 to 50 percent in any year); and *frequent* that it occurs, on the average, more than once in 2 years (the chance of flooding is more than 50 percent in any year). *Common* is used when the occasional and frequent classes are grouped for certain purposes. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, *long* if 7 days to 1 month, and *very long* if more than 1 month. Probable dates are expressed in months. About two-thirds to three-fourths of all flooding occurs during the stated period.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The estimates are based mainly on observations of the water table at selected sites and on the evidence of a saturated zone, namely grayish colors or mottles in

the soil. Indicated in table 18 are the depth to the seasonal high water table; the kind of water table—that is, perched, apparent, or artesian; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 18.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. An *artesian* water table is under hydrostatic head, generally below an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole.

Two numbers in the column showing depth to the water table indicate the normal range in depth to a saturated zone. Depth is given to the nearest half foot. The first numeral in the range indicates the highest water level. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. “More than 6.0” indicates that the water table is below a depth of 6 feet or that it is within a depth of 6 feet for less than a month.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

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

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

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories *(7,8)*. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 19 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Twelve soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Alfisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Udalf (*Ud*, meaning humid, plus *alf*, from Alfisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; type of saturation; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Paleudalfs (*Pale*, meaning excessive development plus *udalf*, the suborder of the Alfisols that has a udic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic subgroup is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other taxonomic class. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. The adjective *Arenic* identifies an intergrade subgroup that has a sandy layer 20 to 40 inches thick above the subsoil. An example is Arenic Paleudalfs.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle size, mineral content, soil temperature regime, soil depth, and reaction. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is loamy, siliceous, thermic, Arenic Paleudalfs.

SERIES. The series consists of soils within a family that have horizons similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. An example is the Wolfpen series, a member of the loamy, siliceous, thermic Arenic Paleudalfs.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. Characteristics of the soil and the material in which it formed are identified for each series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the “Soil Survey Manual” *(8)*. Many of the technical terms used in the descriptions are defined in “Soil Taxonomy” *(7)* and in “Keys to Soil Taxonomy” *(9)*. Unless otherwise indicated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section “Detailed Soil Map Units.”

Arenosa Series

The Arenosa series consists of very deep, somewhat excessively drained, very rapidly permeable soils on broad uplands. These soils formed in thick, sandy sediments. Slopes range from 1 to 8 percent.

Typical pedon of Arenosa fine sand, 1 to 8 percent slopes; from the intersection of Farm Road 80 and Texas Highway 179 in Teague, 3.8 miles east on Texas Highway 179, 0.3 mile southwest and 0.2 mile southeast on county road, 0.45 mile southwest and 0.15 mile southeast on county road, 435 feet southwest on county road, and 100 feet south in post oak woodland:

A—0 to 9 inches; pale brown (10YR 6/3) fine sand; single grained; loose, very friable; many fine roots; slightly acid; clear smooth boundary.
C1—9 to 30 inches; light yellowish brown (10YR 6/4) fine sand; single grained; loose, very friable; common fine roots; moderately acid; diffuse smooth boundary.
C2—30 to 80 inches; very pale brown (10YR 8/3) fine sand; single grained; loose, very friable; few fine roots; moderately acid.

Fine sand extends to a depth of more than 80 inches. Some pedons have a few ironstone pebbles. Reaction ranges from slightly acid to moderately acid.

The A horizon is pale brown, brown, or very pale brown.

The C horizon is light yellowish brown or very pale brown.

Axtell Series

The Axtell series consists of very deep, moderately well drained, very slowly permeable soils on stream terraces. These soils formed in alkaline clayey sediments. Slopes range from 1 to 8 percent.

Typical pedon of Axtell fine sandy loam, 1 to 5 percent slopes; from the intersection of U.S. Highway 79 and U.S. Highway 84 about 23 miles east of Fairfield, 2.2 miles west on U.S. Highway 84, 0.7 mile north on county road, and 150 feet west in idle cropland:

Ap—0 to 7 inches; dark yellowish brown (10YR 4/4) fine sandy loam; weak fine subangular blocky structure; hard, friable; common fine roots; slightly acid; abrupt wavy boundary.
Bt1—7 to 24 inches; red (2.5YR 4/8) clay; many medium prominent light brownish gray (10YR 6/2) and common medium distinct yellowish brown (10YR 5/8) mottles; moderate coarse prismatic structure parting to moderate coarse angular blocky; very hard, very firm; common fine roots along surfaces of peds; common pressure faces; few cracks filled with A horizon material; few fine black concretions; very strongly acid; gradual wavy boundary.
Bt2—24 to 42 inches; mottled red (2.5YR 4/8), light brownish gray (10YR 6/2), and yellowish brown (10YR 5/6) clay; weak coarse prismatic structure parting to weak coarse angular blocky; very hard, very firm; few fine roots; common pressure faces; few slickensides; few fine black concretions; moderately acid; gradual wavy boundary.
Bt3—42 to 49 inches; mottled grayish brown (10YR 5/2), strong brown (7.5YR 5/6), and yellowish red (5YR 5/8) clay; weak coarse angular blocky structure; very hard, very firm; few pressure faces; few slickensides; few fine black concretions; few very fine concretions of calcium carbonate; moderately acid; gradual wavy boundary.
Btk—49 to 80 inches; mottled grayish brown (10YR 5/2), yellowish brown (10YR 5/6), and light olive brown (2.5Y 5/6) clay; weak coarse angular blocky structure; very hard, very firm; few horizontal cleavage planes; common fine and medium black concretions; common fine and medium concretions and soft masses of calcium carbonate; moderately alkaline.

The solum is 60 to more than 80 inches thick. Base saturation of the upper 20 inches of the Bt horizon ranges from 50 to 75 percent. Depth to secondary carbonates ranges from 40 to 60 inches in most pedons.

The A horizon is dark brown or dark yellowish brown. Some pedons have an E horizon that is 1 unit of value and chroma higher than the A horizon. Combined thickness of the A and E horizons ranges from 6 to 10 inches. Reaction ranges from strongly acid to slightly acid.

The upper part of the Bt horizon is red or yellowish red. Yellowish brown, light yellowish brown, light brownish gray, and grayish brown mottles range from common to many. Reaction is very strongly acid.

The lower part of the Bt horizon is mainly yellowish brown, strong brown, grayish brown, and light brownish gray with a few red and yellowish red mottles. Black concretions range from none to common in these layers. Most pedons have few whitish and yellowish neutral salts and few concretions and soft masses of calcium carbonate. Reaction ranges from strongly acid to neutral.

The Btk horizon is mottled yellowish brown, light brownish gray, grayish brown, and light olive brown. Most pedons have a few black concretions and common concretions and soft masses of calcium carbonate. Reaction ranges from neutral to moderately alkaline.

Bienville Series

The Bienville series consists of very deep, somewhat excessively drained, moderately rapidly permeable soils on low stream terraces. These soils formed in acid, sandy alluvium . Slopes range from 1 to 5 percent.

Typical pedon of Bienville loamy fine sand, 1 to 5 percent slopes; from the intersection of U.S. Highway 79 and U.S. Highway 84 about 25 miles east of Fairfield, 0.25 mile west on U.S. Highway 84, then 400 feet south in idle cropland:

Ap—0 to 8 inches; dark yellowish brown (10YR 4/4) loamy fine sand; weak fine subangular blocky structure; soft, very friable; many fine and medium roots; strongly acid; clear smooth boundary.

E—8 to 34 inches; yellowish brown (10YR 5/4) loamy fine sand; single grained; soft, very friable; common fine roots; moderately acid; gradual smooth boundary.

Bt/E—34 to 48 inches; strong brown (7.5YR 5/6) loamy fine sand (Bt); common coarse light yellowish brown (10YR 6/4) spots and streaks of uncoated sand grains (E); weak medium subangular blocky structure; soft, very friable; few fine roots; moderately acid; gradual smooth boundary.

Bt—48 to 74 inches; brown (7.5YR 5/4) loamy fine sand; weak coarse subangular blocky structure; soft, very friable; few fine roots; few thin yellowish red (5YR 5/6) lamellae of fine sandy loam; moderately acid; clear smooth boundary.

C—74 to 80 inches; reddish yellow (7.5YR 6/6) loamy fine sand; single grained; soft, very friable; slightly acid.

The solum is more than 60 inches thick. Reaction ranges from very strongly acid to slightly acid.

The A horizon is dark yellowish brown or dark brown. The E horizon is 1 or 2 units of value higher than the A horizon. Combined thickness of the A and E horizons is 25 to 40 inches.

The Bt horizon is brown or strong brown. Thin lamellae of yellowish red fine sandy loam make up less than 10 percent of this horizon.

Some pedons do not have a C horizon.

Bigbrown Series

The Bigbrown series consists of very deep, well drained, moderately slowly permeable mine soils. They formed in unoxidized overburden materials reclaimed from lignite strip mining. Slopes range from 1 to 8 percent.

Typical pedon of Bigbrown silty clay loam, 1 to 8 percent slopes; from the intersection of U.S. Highway 84 and Farm Road 488 in Fairfield, 5.6 miles north on Farm Road 488, and 300 feet west in pasture.

A—0 to 8 inches; dark grayish brown (10YR 4/2) silty clay loam; weak fine granular and weak platy structure; hard, friable; many very fine and fine roots; few fine fragments of lignite; common fine and medium grayish shale fragments; moderately alkaline; gradual wavy boundary.

C1—8 to 70 inches; dark grayish brown (10YR 4/2) silty clay loam; massive; hard, friable; common fine roots to a depth of 28 inches, few very fine roots below that depth; few fragments of lignite; common fine and medium grayish shale fragments; random strata of lighter and darker materials ranging from silty clay to sandy loam; moderately alkaline; diffuse broken boundary.

C2—70 to 80 inches; strong brown (7.5YR 5/6) sandy clay loam; massive; hard, friable; few very fine roots; common fine and medium grayish shale fragments; few thin layers of fine sandy loam; moderately alkaline.

The soils are mostly loam, silt loam, sandy clay loam, clay loam, silty clay loam, clay, or silty clay that has less than 15 percent material coarser than very fine sand. Fragments of soft shale, fine-grained sandstone, and ironstone range from 0 to 5 percent. Soft lignite fragments range from a trace to about 15 percent. Reaction ranges from moderately acid to moderately alkaline.

The A horizon is dark grayish brown, very dark grayish brown, dark brown, or dark yellowish brown. Fragments or masses of darker or lighter materials range from none to few.

The C horizon has the same colors as the A horizon as well as grayish brown, brown, strong brown, and yellowish brown. This horizon normally has masses or thin layers of varying textures.

Burleson Series

The Burleson series consists of very deep, moderately well drained, very slowly permeable soils on terraces. These soils formed in alkaline clayey sediments. Slopes are 0 to 1 percent.

Typical pedon of Burleson clay, 0 to 1 percent slopes; from the intersection of Farm Road 488 and U.S. Highway 287 about 19 miles north of Fairfield, 2.6 miles northwest on U.S. Highway 287, 0.75 mile southeast on field road, and 50 feet east in cultivated field:

Ap—0 to 8 inches; very dark gray (10YR 3/1) clay;

common fine faint strong brown (7.5YR 5/6) mottles; moderate coarse angular blocky structure parting to weak fine subangular blocky; extremely hard, extremely firm; common fine and medium roots; few fine black concretions; neutral; clear wavy boundary.

A1—8 to 37 inches; very dark gray (10YR 3/1) clay; common fine and medium distinct brown (7.5YR 5/4) mottles; weak coarse prismatic structure parting to weak coarse angular blocky; extremely hard, extremely firm; common fine and medium roots; few very fine black concretions; few slickensides that begin intersecting at 20 inches; neutral; gradual wavy boundary.

A2—37 to 51 inches; dark gray (10YR 4/1) clay; common medium distinct light olive brown (2.5Y 5/4) and few fine faint brown mottles; weak coarse prismatic structure; extremely hard, extremely firm; few fine roots; few very fine black concretions; few very fine concretions and soft masses of calcium carbonate; common intersecting slickensides; common streaks of black (10YR 2/1) and very dark gray (10YR 3/1) material in old cracks; moderately alkaline; gradual wavy boundary.

Bss1—51 to 63 inches; grayish brown (10YR 5/2) clay; common medium distinct light olive brown (2.5Y 5/4) and few fine faint brown mottles; weak coarse prismatic structure; extremely hard, extremely firm; few fine roots; few very fine black concretions; few very fine concretions of calcium carbonate; common intersecting slickensides; few streaks of very dark gray (10YR 3/1) and dark gray (10YR 4/1) material in old cracks; moderately alkaline; clear wavy boundary.

Bss2—63 to 80 inches; light olive brown (2.5Y 5/4) clay; common very fine faint yellowish brown (10YR 5/6) mottles; extremely hard, extremely firm; common very fine concretions and soft masses of calcium carbonate; common intersecting slickensides; moderately alkaline.

Combined thickness of the A and Bss horizons is more than 60 inches. Depth to layers having moist color values higher than 3.5 ranges from 37 to 58 inches. Depth to layers having matrix chroma of 1.5 or more is more than 40 inches. Intersecting slickensides begin at depths of 8 to 24 inches. Black concretions range from none to few. Some pedons have concretions and soft masses of calcium carbonate below a depth of 35 inches.

The A horizon is very dark gray or dark gray. Brown, strong brown, and light olive brown mottles range from none to common. Reaction is slightly acid or neutral in the upper part of the A horizon, ranging to moderately alkaline in the lower part.

The Bss horizon is grayish brown, gray, light olive brown, or light brownish gray. Some pedons have few to common mottles of brown, strong brown, yellowish brown, and light olive brown. Reaction ranges from moderately acid to moderately alkaline.

Crockett Series

The Crockett series consists of moderately well drained, very slowly permeable soils on uplands. These soils are deep to weathered shale. They formed in alkaline shales and clays. Slopes range from 0 to 8 percent.

Typical pedon of Crockett fine sandy loam, 1 to 3 percent slopes; from the intersection of Farm Road 27 and Farm Road 246 about 2 miles east of Wortham, 0.15 mile north on Farm Road 246, and 120 feet east in pasture:

A—0 to 7 inches; dark brown (10YR 4/3) fine sandy loam; weak fine subangular blocky structure; hard, very friable; common fine and medium roots; few siliceous gravel; slightly acid; abrupt wavy boundary.

Bt1—7 to 15 inches; mottled dark grayish brown (2.5Y 4/2), very dark grayish brown (2.5Y 3/2) and red (2.5YR 4/6) clay; weak coarse prismatic structure parting to weak coarse angular blocky; extremely hard, very firm; common fine and medium roots; few siliceous pebbles; common pressure faces; slightly acid; gradual wavy boundary.

Bt2—15 to 25 inches; dark grayish brown (2.5Y 4/2) clay; common medium distinct light olive brown (2.5Y 5/4) and prominent red (2.5YR 4/6) mottles; weak coarse angular blocky structure; extremely hard, very firm; few fine roots; few siliceous pebbles; common pressure faces; few slickensides; few fine black concretions; neutral; clear wavy boundary.

Bt3—25 to 39 inches; dark grayish brown (2.5Y 4/2) clay; weak coarse angular blocky structure; extremely hard, very firm; few fine roots; few siliceous pebbles; common slickensides; few fine black concretions; neutral; clear wavy boundary.

BC—39 to 46 inches; light olive brown (2.5Y 5/4) clay; common fine distinct brownish yellow (10YR 6/6) mottles; weak coarse angular blocky structure; extremely hard, very firm; few fine roots; few fine black concretions; few concretions and soft masses of calcium carbonate; moderately alkaline; clear wavy boundary.

C—46 to 60 inches; mottled dark grayish brown

(2.5Y 4/2), grayish brown (10YR 5/2) and reddish yellow (7.5YR 6/8) shale; massive; very hard, firm; few black concretions; few concretions and soft masses of calcium carbonate; few lenses of brownish silty clay loam; moderately alkaline.

The solum is more than 40 inches thick. The number of siliceous pebbles ranges from none to few. The soil has dry weather cracks up to 2 inches wide that extend from the surface downward through the solum.

The A horizon is brown, dark brown, or dark grayish brown. Thickness averages less than 8 inches, but is as much as 15 inches over subsoil troughs. The lower boundary is abrupt and wavy. Reaction ranges from moderately acid to neutral.

The upper part of the Bt horizon is extremely variable in color and is typically mottled in shades of red and brown, with or without shades of olive and gray. The lower part of the Bt horizon typically has a matrix color in shades of brown or olive with mottles in shades of gray ranging from none to many. Some pedons have few to common concretions of calcium carbonate below a depth of 35 inches. Reaction ranges from moderately acid to neutral in the upper part of the Bt horizon and from slightly acid to moderately alkaline in the lower part.

The C horizon is clay loam, silty clay loam, or weathered shale in shades of brown, yellow, and gray. Concretions and soft masses of calcium carbonate range from none to many. Reaction is slightly alkaline or moderately alkaline.

Cuthbert Series

The Cuthbert series consists of well drained, moderately slowly permeable soils on uplands. These soils are moderately deep to weakly consolidated shale. They formed in acidic, interbedded sandy, loamy, and shaly materials. Slopes range from 5 to 40 percent.

Typical pedon of Cuthbert fine sandy loam, 5 to 15 percent slopes; from the intersection of U.S. Highway 84 and Farm Road 489 about 13 miles east of Fairfield, 5.0 miles northeast on Farm Road 489, 3.7 miles northward on county road, then 100 feet west in woodland.

A—0 to 3 inches; dark grayish brown (10YR 4/2) fine sandy loam; weak fine subangular blocky structure; slightly hard, very friable; many fine and medium roots; about 2 percent by volume flat and angular fragments of ironstone; strongly acid; clear wavy boundary.

E—3 to 7 inches; brown (10YR 5/3) fine sandy loam; weak fine subangular blocky structure; slightly hard, very friable; common fine roots; about 1 percent by volume flat angular fragments of ironstone; strongly acid; clear wavy boundary.

Bt1—7 to 14 inches; red (2.5YR 4/6) clay; moderate fine subangular blocky structure; very hard, very firm; few fine roots; thin continuous clay films on surface of peds; few ironstone pebbles; about 2 percent by volume flat angular fragments of ironstone; very strongly acid; gradual smooth boundary.

Bt2—14 to 26 inches; red (2.5YR 4/8) clay; common medium distinct yellowish brown (10YR 5/8) mottles; moderate fine subangular blocky structure; very hard, very firm; few fine roots; thin continuous clay films on surface of peds; few flat angular fragments of ironstone; very strongly acid; gradual smooth boundary.

BC—26 to 31 inches; red (2.5YR 4/6) clay loam; common medium prominent yellowish brown (10YR 5/8) and yellowish red (5YR 5/8) mottles; common light brownish gray (10YR 6/2) shale fragments; weak coarse angular blocky structure; very hard, very firm; few fine and medium roots; few strata of yellowish brown fine sandy loam; few flat fragments of ironstone; very strongly acid; gradual smooth boundary.

C—31 to 65 inches; stratified red (2.5YR 4/8) fine sandy loam, yellowish red (5YR 5/8) clay loam, and light brownish gray (10YR 6/2) shale; common medium distinct yellowish brown (10YR 5/8) mottles; massive; hard, friable; few fine roots along cleavage planes; few thin strata of yellowish brown sandy materials; very strongly acid.

The solum is 20 to 40 inches thick. Base saturation in the B and C horizons ranges from 10 to 25 percent. Ironstone fragments range from 0 to 30 percent in the surface layer and from 0 to 15 percent in the subsoil.

The A horizon is dark yellowish brown, dark brown, dark grayish brown, or brown. The E horizon is 1 or 2 units of value higher than the A horizon. These horizons are fine sandy loam or gravelly fine sandy loam. Reaction ranges from very strongly acid to slightly acid. Combined thickness of the A and E horizons ranges from 5 to 9 inches.

The Bt horizon is red, dark red, or yellowish red clay or sandy clay. Mottles of brownish yellow and yellowish brown range from none to common. Reaction ranges from extremely acid to strongly acid.

Some pedons have a BC horizon. Colors and reaction are the same as those of the Bt horizon. This horizon is sandy clay loam or clay loam. Most pedons

have up to 40 percent weathered grayish shale and yellowish and brownish sandy materials.

The C horizon is extremely variable and is typically weakly consolidated yellowish, brownish, and reddish loamy and sandy materials interbedded with grayish shale. Reaction is extremely acid or very strongly acid.

Derly Series

The Derly series consists of very deep, poorly drained, very slowly permeable soils on stream terraces. These soils formed in clayey alluvium. Slopes are less than 1 percent.

Typical pedon of Derly loam, in an area of Derly-Rader complex, 0 to 1 percent slopes; from the intersection of U.S. Highway 79 and U.S. Highway 84 about 23 miles east of Fairfield, 0.75 mile west on U.S. Highway 84, and 150 feet south in pasture:

Ap—0 to 7 inches; grayish brown (10YR 5/2) loam; weak medium subangular blocky structure; hard, friable; common fine roots; strongly acid; clear irregular boundary.

Btg/Eg—7 to 12 inches; grayish brown (10YR 5/2) clay loam (Btg); few fine distinct yellowish brown (10YR 5/8) and yellowish red (5YR 5/8) mottles; weak medium subangular blocky structure; hard, firm; common fine roots; about 20 percent by volume tongues and interfingers of light brownish gray (10YR 6/2) loam (Eg); strongly acid; clear irregular boundary.

Btg1—12 to 30 inches; grayish brown (10YR 5/2) clay; common fine distinct yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; very hard, very firm; few fine roots; about 5 percent by volume vertical coatings of light brownish gray (10YR 6/2) loam; few pressure faces; moderately acid; clear wavy boundary.

Btg2—30 to 60 inches; grayish brown (10YR 5/2) clay; common fine distinct yellowish brown (10YR 5/8) mottles; weak medium subangular and angular blocky structure; very hard, very firm; few fine roots; few streaks of uncoated sand; few black concretions; common slickensides; moderately acid.

The solum is more than 60 inches thick.

The A horizon is grayish brown, brown, dark brown, or dark grayish brown. Mottles in these colors range from none to common. Some pedons have an E horizon that is 1 unit of value higher than the A horizon. Combined thickness of the A and E horizons ranges from 6 to 11 inches. Reaction ranges from strongly acid to slightly acid in the A horizon and strongly acid or moderately acid in the E horizon.

The Btg/Eg horizon is 4 to 10 inches thick. The Btg component makes up 70 to 85 percent of this layer. It is dark grayish brown, grayish brown, or light brownish gray clay loam or clay. Yellowish red, strong brown, and yellowish brown mottles range from few to common. The Eg component is grayish brown or light grayish brown loam that makes up the remaining 15 to 30 percent of the layer as tongues and interfingers. Reaction is strongly acid or moderately acid.

The Btg horizon is grayish brown, dark grayish brown, or light brownish gray clay or silty clay. Yellowish brown and strong brown mottles range from few to common. Interfingers of light brownish gray loam make up as much as 10 percent of the upper part of the Btg horizon and less than 2 percent of the lower part. Reaction ranges from very strongly acid to moderately acid.

Edge Series

The Edge series consists of well drained, very slowly permeable soils on uplands. These soils are deep to weathered shale. They formed in stratified clayey and loamy sediments. Slopes range from 5 to 12 percent.

Typical pedon of Edge fine sandy loam, 5 to 12 percent slopes; from the intersection of Farm Road 489 and the Interstate 45 west service road in Dew, 4.15 miles south on the Interstate 45 west service road, 0.8 mile south on county road, 0.4 mile northwest on county road, and 100 feet north in post oak woodland.

A—0 to 5 inches; dark brown (10YR 4/3) fine sandy loam, weak fine subangular blocky structure; slightly hard, very friable; many fine, medium, and coarse roots; few fine ironstone pebbles; about 1 inch of pale brown (10YR 6/3) material at lower boundary; moderately acid; abrupt wavy boundary.

Bt1—5 to 18 inches; red (2.5YR 4/6) clay; moderate medium prismatic structure parting to moderate medium angular blocky; very hard, very firm; common fine and medium roots; common pressure faces; few slickensides; common clay flows along prism surfaces; strongly acid; gradual wavy boundary.

Bt2—18 to 30 inches; red (2.5YR 5/8) clay; common fine and medium distinct brownish yellow (10YR 6/8) mottles; weak medium angular blocky and subangular blocky structure; very hard, very firm; few fine roots; few fine ironstone pebbles; few

pressure faces; strongly acid; gradual wavy boundary.

BC—30 to 40 inches; mottled red (2.5YR 5/8) and brownish yellow (10YR 6/8) clay loam; weak medium and coarse subangular blocky structure; very hard, firm; few fine, medium, and coarse roots; about 40 percent by volume fragments of light brownish gray (10YR 6/2) shale that has clay loam texture; moderately acid; gradual wavy boundary.

C—40 to 60 inches; light brownish gray (10YR 6/2) shale with clay loam texture; common medium distinct brownish yellow (10YR 6/8) and common medium prominent red (2.5YR 5/8) mottles; massive; hard, firm; few thin interbedded layers of pale brown (10YR 6/3) sandy material; few fine crystals of whitish neutral salts; moderately acid.

The solum is 40 to 55 inches thick. Potential linear extensibility of the upper 50 inches of the subsoil is less than 6 centimeters, and cation exchange capacity exceeds 24 milliequivalents per 100 grams of clay in the Bt horizons.

The A horizon is dark brown, dark yellowish brown, or brown fine sandy loam. Ironstone gravel ranges from 0 to 3 percent. Some pedons have an E horizon that is 1 or 2 units of value lighter than the A horizon. Combined thickness of the A and E horizons is 5 to 10 inches. Reaction ranges from strongly acid to slightly acid.

The Bt horizon is 21 to 35 inches thick. It is red or yellowish red clay or sandy clay. Mottles of these colors and yellowish brown and brownish yellow range from none to common. Reaction is very strongly acid or strongly acid.

Most pedons have a BC horizon that is red or yellowish red, or is mottled in these colors as well as yellowish brown and brownish yellow. Light brownish gray mottles are present in some pedons below a depth of 30 inches. The BC horizon is sandy clay loam or clay loam. Unweathered fragments of yellowish and brownish sandy and loamy material, grayish and reddish shaly material, and ironstone gravel make up 15 to 40 percent of this horizon. Reaction ranges from very strongly acid to moderately acid.

The C horizon is variable and consists of interbedded layers of brownish yellow, pale brown, yellowish red, and white sandy and loamy materials; light grayish brown, brownish yellow, very dark grayish brown, and red shaly material; and ironstone fragments ranging up to 4 inches wide. Whitish neutral salts and black concretions range from none to few. Reaction ranges from strongly acid to neutral.

Ellis Series

The Ellis series consists of well drained, very slowly permeable soils on erosional uplands. These soils are moderately deep to weathered shale. They formed in alkaline shales and clays. Slopes range from 3 to 12 percent.

Typical pedon of Ellis clay, 3 to 12 percent slopes; from the intersection of Farm Road 27 and Texas Highway 14 in Wortham, 1.9 miles north on Texas Highway 14, then 150 feet west in pasture:

A—0 to 7 inches; dark grayish brown (2.5Y 4/2) clay; moderate fine subangular blocky structure; very hard, firm; many fine roots; few fine black concretions; neutral; clear wavy boundary.

Bw1—7 to 20 inches; olive brown (2.5Y 4/4) clay; common fine distinct olive (5Y 5/4) and yellowish brown (10YR 5/6) mottles; moderate medium angular blocky structure; very hard, very firm; common fine roots; few fine black concretions; few slickensides; slightly alkaline; gradual wavy boundary.

Bw2—20 to 30 inches; light olive brown (2.5Y 5/4) clay; few fine faint yellowish brown and common medium distinct olive (5Y 5/4) mottles; moderate medium angular blocky structure; very hard, very firm; few fine roots; few fine black concretions; few slickensides; moderately alkaline; gradual wavy boundary.

BC—30 to 37 inches; mottled light olive brown (2.5Y 5/4), olive gray (5Y 5/2), and yellowish brown (10YR 5/8) silty clay; weak medium angular blocky structure; very hard, very firm; few fine roots; few fine black concretions; few shale fragments; few fine concretions of calcium carbonate; moderately alkaline; gradual wavy boundary.

C—37 to 60 inches; mottled light yellowish brown (2.5Y 6/4), grayish brown (2.5Y 5/2), and yellowish brown (10YR 5/8) shale that has clay texture; massive; very hard, very firm; moderately alkaline.

The solum is 20 to 40 inches thick. Some pedons have indurated ironstone concretions up to 6 inches in diameter. Dry weather cracks close when the soil becomes moist.

The A horizon is very dark grayish brown or dark

grayish brown. When dry, the surface has a hard crust 5 to 15 millimeters thick. Reaction ranges from slightly acid to slightly alkaline.

The Bw horizon is grayish brown, olive brown, or light olive brown. Mottles of these colors, as well as yellowish brown and brownish yellow range from none to common. Nonintersecting slickensides range from few to common. Few concretions and soft masses of calcium carbonate are present in some pedons. Reaction ranges from neutral to moderately alkaline.

Most pedons have a BC horizon that is mottled in the same colors as the B horizon. It is clay or silty clay. Unweathered shale fragments with clay texture make up as much as 10 percent of this layer. Some pedons have up to 3 percent concretions and soft masses of calcium carbonate.

The C horizon is mottled in the same colors as the B horizon. It has a few concretions and soft masses of calcium carbonate in crevices.

Ferris Series

The Ferris series consists of very deep, well drained, very slowly permeable soils on erosional uplands. These soils formed in calcareous clays and marls. Slopes range from 3 to 8 percent.

Typical pedon of Ferris clay, 3 to 8 percent slopes; from the intersection of U.S. Highway 287 and Farm Road 488 about 19 miles north of Fairfield, 0.2 mile south on Farm Road 488, and 500 feet east in pasture:

A—0 to 8 inches; very dark grayish brown (2.5Y 3/2) clay; moderate fine subangular blocky structure; very hard, very firm; many fine and medium roots; few fine concretions of calcium carbonate; moderately alkaline; clear wavy boundary.

Bw1—8 to 18 inches; olive brown (2.5Y 4/4) clay; many fine and medium faint dark grayish brown (2.5Y 4/2) stains; moderate medium angular blocky structure; very hard, very firm; few fine roots; common fine concretions of calcium carbonate; moderately alkaline; diffuse wavy boundary.

Bw2—18 to 38 inches; light olive brown (2.5Y 5/4) clay; weak coarse angular blocky structure; very hard, very firm; few fine roots; few intersecting slickensides; common fine concretions of calcium carbonate; moderately alkaline; diffuse wavy boundary.

C—38 to 60 inches; light olive brown (2.5Y 5/4) clay; massive; very hard, very firm; few fine roots; few fine concretions and soft masses of calcium carbonate; moderately alkaline.

The solum is 30 to 60 inches thick. Concretions of calcium carbonate range from few to common.

The A horizon is very dark grayish brown or dark grayish brown. A horizons that are very dark grayish brown are less than 10 inches thick.

The Bw horizon is olive, olive brown, or light olive brown. Stains of dark grayish brown range from few to many in the upper part of the Bw horizon, and from none to few in the lower part.

The C horizon is light olive brown, light yellowish brown, yellowish brown, or light gray. The C horizon in most pedons is mottled in these colors. In some pedons, the C horizon contains fragments of shale material.

Gasil Series

The Gasil series consists of very deep, well drained, moderately permeable soils on upland interstream divides. These soils formed in acidic loamy sediments. Slopes range from 1 to 5 percent.

Typical pedon of Gasil fine sandy loam, 1 to 5 percent slopes; from the intersection of Texas Highway 14 and Farm Road 27 in Wortham, 5.7 miles east on Farm Road 27, 5.0 miles south on Farm Road 1366, and 75 feet west in native pasture.

A—0 to 9 inches; yellowish brown (10YR 5/4) fine sandy loam; weak fine subangular blocky structure; slightly hard, very friable; common fine and medium roots; few fine pebbles, moderately acid; clear wavy boundary.

E—9 to 16 inches; light yellowish brown (10YR 6/4) fine sandy loam; weak fine subangular blocky structure; hard, friable; common fine and medium roots; few fine pebbles; slightly acid; clear wavy boundary.

Bt1—16 to 38 inches; brownish yellow (10YR 6/6) sandy clay loam; common medium prominent red (2.5YR 4/8) mottles; weak medium subangular blocky structure; hard, friable; common fine and medium roots; nearly continuous clay films along surfaces of peds; few fine ironstone pebbles; moderately acid; gradual wavy boundary.

Bt2—38 to 49 inches; brownish yellow (10YR 6/6) sandy clay loam; common coarse prominent red (2.5YR 4/8) mottles; weak medium and coarse subangular blocky structure; hard, firm; few fine roots; nearly continuous clay films along surfaces of peds; few fine ironstone pebbles; strongly acid; gradual wavy boundary.

Bt3—49 to 62 inches; brownish yellow (10YR 6/6) sandy clay loam; common medium and coarse prominent red (2.5YR 4/8) and yellowish red (5YR 5/8) mottles; weak coarse subangular blocky

structure; hard, friable; few fine roots; patchy clay films along surfaces of peds; few fine ironstone pebbles; about 3 percent vertical streaks of pale brown (10YR 6/3) sandy material; strongly acid.

The solum is more than 60 inches thick. Base saturation in the Bt horizon ranges from 50 to 75 percent. Ironstone gravel ranges from 0 to 3 percent.

The A horizon is dark brown, dark yellowish brown, yellowish brown, or brown. The E horizon is 1 or 2 units higher in value than the A horizon. Combined thickness of the A and E horizons ranges from 8 to 17 inches. Reaction ranges from moderately acid to neutral.

The Bt horizon is yellowish brown, brownish yellow, strong brown, or reddish yellow sandy clay loam or loam. Red and pale brown mottles range from none to common in the upper part of the Bt horizon, and from few to many in the lower part. Most pedons have a few light brownish gray or light gray mottles below a depth of 30 inches. Most pedons have 2 to 5 percent streaks of pale brown uncoated sand in the lower part of the horizon. Reaction ranges from strongly acid to slightly acid.

Gladewater Series

The Gladewater series consists of very deep, poorly drained, very slowly permeable soils on flood plains of large streams. These soils formed in clayey alluvium. Slopes are less than 1 percent.

Typical pedon of Gladewater clay, frequently flooded; from the intersection of Farm Road 416 and Farm Road 488 about 15 miles north of Fairfield, 1.05 miles south on Farm Road 488, and 200 feet east in pasture:

A—0 to 8 inches; very dark grayish brown (10YR 3/2) clay; moderate very fine subangular blocky structure; extremely hard, very firm; common fine and medium roots; moderately acid; clear wavy boundary.

Bg1—8 to 23 inches; dark gray (10YR 4/1) clay; common fine faint dark brown (10YR 4/3) and distinct strong brown (7.5YR 5/6) mottles; weak medium angular blocky structure; very hard, very firm; common fine roots; common slickensides; moderately acid; gradual wavy boundary.

Bg2—23 to 46 inches; dark gray (10YR 4/1) clay; common fine faint dark brown (10YR 4/3) and medium distinct strong brown (7.5YR 5/6) mottles; weak coarse angular blocky structure; very hard, very firm; few fine roots; few slickensides; strongly acid; gradual wavy boundary.

Cg—46 to 63 inches; very dark gray (10YR 3/1) clay; few fine distinct strong brown (7.5YR 5/6) mottles; massive; very hard, very firm; few thin strata of brownish silty clay loam; moderately acid.

The solum is 24 to 50 inches thick. Dry weather cracks from 1 to 5 centimeters wide extend throughout the solum.

The A horizon is very dark gray, dark gray, very dark grayish brown, or black. Reaction is moderately acid or slightly acid.

The Bg horizon is dark gray, gray, grayish brown, light brownish gray, or olive gray. Dark brown, strong brown, and yellowish brown mottles range from few to common. Reaction ranges from strongly acid to slightly acid.

The Cg horizon is very dark gray, dark gray, or gray. Yellowish brown and strong brown mottles range from few to many. Most pedons contain few thin strata of silty clay loam or clay loam material. Reaction ranges from moderately acid to moderately alkaline.

Hatliff Series

The Hatliff series consists of very deep, moderately well drained, moderately rapidly permeable soils on pointbars, natural levees, and alluvial fans on the flood plains of streams. These soils formed in sandy and loamy alluvium. Slopes are less than 1 percent.

Typical pedon of Hatliff fine sandy loam, in an area of Nahatche-Hatliff association, frequently flooded; from the intersection of Farm Roads 1124 and 2570 about 8 miles northeast of Fairfield, 1.6 miles northeast on Farm Road 2570 to end of road, 0.75 mile northeast on county road, 1.4 miles northwest on private road, and 200 feet southwest in pasture:

A—0 to 6 inches; dark brown (10YR 4/3) fine sandy loam; few fine distinct strong brown (7.5YR 5/8) mottles and stains in root channels; weak fine subangular blocky structure; slightly hard, very friable; common fine and medium roots; slightly acid; clear smooth boundary.

C1—6 to 21 inches; yellowish brown (10YR 5/4) fine sandy loam; few medium distinct light brownish gray (10YR 6/2) mottles; massive; slightly hard, very friable; common fine and medium roots; strongly acid; gradual smooth boundary.

C2—21 to 38 inches; yellowish brown (10YR 5/4) loam; common fine and medium distinct light brownish gray (10YR 6/2) mottles; massive; hard, friable; common fine roots; about 5 percent thin strata of dark yellowish brown (10YR 4/4) fine sandy loam; moderately acid; clear smooth boundary.

C3—38 to 50 inches; dark yellowish brown (10YR 4/4)

fine sandy loam; common medium distinct light gray (10YR 7/2) mottles; massive; slightly hard, very friable; few fine roots; few thin strata of light gray (10YR 7/2) loamy fine sand; moderately acid; clear smooth boundary.

C4—50 to 65 inches; light gray (10YR 7/2) loamy fine sand; common medium distinct dark yellowish brown (10YR 4/4) mottles; single grained; slightly hard, very friable; slightly acid.

The lower part of the A horizon and the C horizons are stratified loamy fine sand, fine sandy loam, fine sand, and loam, with weighted average clay content of the 10- to 40-inch control section ranging from 10 to 18 percent. Reaction ranges from strongly acid to neutral, but is moderately acid to neutral in some subhorizon in the control section.

The A horizon is dark grayish brown, dark brown, or brown. Light brownish gray, strong brown, and yellowish brown mottles range from none to common.

The C horizon is brown, dark brown, dark yellowish brown, pale brown, yellowish brown, or light yellowish brown. Mottles of these colors as well as light brownish gray, light gray, and strong brown range from few to common in the upper part of the C horizon, and from common to many in the lower part. Most pedons have horizons with matrix colors of light brownish gray or light gray below a depth of 40 inches.

The Hatliff soils in Freestone County are considered a taxadjunct to the Hatliff series because they have mixed mineralogy. Behavior, use, and management of these soils are closely similar to Hatliff soils in other areas.

Hearne Series

The Hearne series consists of very deep, well drained, slowly permeable soils on uplands. These soils formed in acidic, stratified marine sediments. Slopes range from 5 to 15 percent.

Typical pedon of Hearne fine sandy loam, 5 to 15 percent slopes; from the intersection of Texas Highway 164 and Farm Road 80 in Donie, 1.7 miles east on Texas Highway 164, 1.6 miles southeast and east on county road, and 25 feet north in post oak woodland:

A—0 to 4 inches; dark brown (7.5YR 4/4) fine sandy loam; weak fine subangular blocky structure; slightly hard, very friable; common fine and medium roots; about 2 percent by volume flat cobble-size fragments of ironstone; few ironstone pebbles; moderately acid; clear wavy boundary.

E—4 to 8 inches; brown (7.5YR 5/4) fine sandy loam; weak fine subangular blocky structure; slightly hard, very friable; common fine and medium roots; few flat angular fragments of ironstone; strongly acid; clear smooth boundary.

Bt1—8 to 19 inches; dark red (2.5YR 3/6) clay; moderate fine subangular blocky structure; very hard, very firm; few fine and medium roots; continuous clay films on surfaces of peds; few medium ironstone pebbles; very strongly acid; gradual smooth boundary.

Bt2—19 to 23 inches; yellowish red (5YR 4/6) clay; common medium distinct yellowish brown (10YR 5/8) and red (2.5YR 4/6) mottles; moderate medium subangular blocky structure; very hard, very firm; few fine roots; continuous clay films on surfaces of peds; few fine ironstone pebbles; very strongly acid; gradual smooth boundary.

BC—23 to 33 inches; mottled red (2.5YR 4/6), yellowish red (5YR 5/6) and yellowish brown (10YR 5/8) clay; moderate medium subangular blocky structure parting to weak fine platy; very hard, very firm; few fine roots; continuous clay films on surfaces of peds; few light gray (10YR 7/2) shale fragments; few thin strata of yellowish red fine sandy loam; very strongly acid; gradual wavy boundary.

C—33 to 65 inches; mottled red (2.5YR 4/8), yellowish red (5YR 5/8), yellowish brown (10YR 5/8) stratified sandy clay loam; massive; hard, firm; few fine roots along cleavage planes; few light brownish gray (10YR 6/2) shale fragments; few thin strata of yellowish red fine sandy loam; very strongly acid.

The solum is 20 to 35 inches thick. Base saturation in the Bt and C horizons ranges from 13 to 35 percent. Ironstone gravel and cobbles make up as much as 10 percent of the A and E horizons, and as much as 5 percent of the Bt and C horizons.

The A horizon is dark brown or brown. Most pedons have an E horizon that is 1 unit of value higher than the A horizon. Combined thickness of the A and E horizons ranges from 5 to 10 inches. Reaction ranges from very strongly acid to slightly acid.

The Bt horizon is red, yellowish red, or dark red clay or sandy clay. Mottles of these colors as well as yellowish brown range from none to few in the upper part of the Bt horizon and from few to many in the lower part. Reaction is extremely acid or very strongly acid.

Most pedons have a BC horizon that is clay, clay loam, or sandy clay loam. It has the same colors and reaction as the Bt horizon. Fragments of partly weathered grayish shale and yellowish, brownish, and

reddish weakly consolidated sandy materials make up as much as 40 percent of this horizon.

The C horizon is interbedded reddish, yellowish, and brownish sandy and loamy materials and grayish shale. The relative amounts of these components are variable, and any may be absent in some pedons. Reaction is extremely acid or very strongly acid.

Kaufman Series

The Kaufman series consists of very deep, somewhat poorly drained, very slowly permeable soils on the flood plains of large streams. These soils formed in alkaline clayey alluvium. Slopes are less than 1 percent.

Typical pedon of Kaufman clay, frequently flooded; from the intersection of U.S. Highway 84 and Farm Road 489 about 13 miles east of Fairfield, 1.8 miles northwest and 3.2 miles northeast on Farm Road 489, 0.8 mile northeast on county road, 2.8 miles north and northeast on county road, and 0.3 mile east in pasture:

A1—0 to 8 inches; very dark gray (5Y 3/1) clay; weak medium granular structure; very hard, very firm; common fine and medium roots; slightly alkaline; gradual wavy boundary.

A2—8 to 42 inches; very dark gray (5Y 3/1) clay; moderate medium angular blocky structure; extremely hard, very firm; common fine roots; common intersecting slickensides; slightly alkaline; clear wavy boundary.

Bg1—42 to 53 inches; dark gray (5Y 4/1) clay; few fine faint dark grayish brown mottles; moderate medium angular blocky structure; extremely hard, very firm; few fine roots; many intersecting slickensides; slightly alkaline; clear wavy boundary.

Bg2—53 to 70 inches; dark grayish brown (2.5Y 4/2) clay; few fine faint light olive brown mottles; moderate medium angular blocky structure; extremely hard, very firm; few fine roots; many intersecting slickensides; slightly alkaline.

Reaction ranges from slightly acid to moderately alkaline in the solum. Some pedons have concretions and soft masses of calcium carbonate below a depth of 34 inches. Depth to color values of 4 or more ranges from 26 to more than 60 inches. Clay content of the control section exceeds 60 percent.

The A horizon is black or very dark gray. Light olive brown, dark grayish brown, and brown mottles range from none to common.

The Bg horizon is dark gray, dark grayish brown, very dark gray, or very dark grayish brown. Mottles of these colors as well as yellowish brown and light olive brown range from none to many. Matrix colors with chroma of 2 occur below a depth of 40 inches.

The Kaufman soil (Map unit Ka, Kaufman clay loam, overwash, occasionally flooded) is outside the range in characteristics for the series. It has a clay loam surface layer 6 to 16 inches thick. Colors are very dark grayish brown, very dark gray, very dark brown, or black. Reaction is slightly acid or neutral. The rest of the profile is the same as described for the Kaufman series. This map unit is in the Loamy Bottomland range site; otherwise, behavior, use, and management are similar to other Kaufman soils.

The Kaufman soil (Map unit Kf, Kaufman clay, loamy substratum, frequently flooded) is outside the range in characteristics for the series. Between depths of 20 to 40 inches, it is underlain by stratified materials that have textures of fine sandy loam, loam, sandy clay loam, and clay loam. Colors are very dark grayish brown, dark brown, and dark yellowish brown. These differences do not significantly change the behavior, use, and management of the soil.

Keechi Series

The Keechi series consists of very deep, poorly drained, slowly permeable soils on flood plains of streams. These soils formed in sandy and loamy alluvium. Slopes are less than 1 percent.

Typical pedon of Keechi loamy fine sand, frequently flooded; from the intersection of U.S. Highway 75 and Farm Road 489 in Dew, 9 miles east on Farm Road 489, 3.5 miles south on county road, and 300 feet west in woodland:

A—0 to 7 inches; light yellowish brown (10YR 6/4) loamy fine sand; common fine distinct grayish brown (10YR 5/2) and dark yellowish brown (10YR 4/6) mottles; weak fine granular structure; soft, very friable; many fine and medium roots; few thin strata of sandy clay loam; slightly acid; clear smooth boundary.

Ag—7 to 16 inches; gray (10YR 5/1) loamy fine sand; common medium and coarse distinct yellowish red (5YR 4/6) and dark yellowish brown (10YR 3/4) mottles; weak medium granular and subangular blocky structure; slightly hard, very friable; many fine and medium roots; few thin strata of sandy clay loam; moderately acid; clear smooth boundary.

Bg—16 to 50 inches; gray (10YR 5/1) loam; common coarse distinct dark yellowish brown (10YR 4/4) and few fine prominent dark gray (N 4/0) mottles; weak coarse subangular blocky structure; hard,

friable; many fine roots decreasing to common in lower part; few thin strata of sandy clay loam; moderately acid; gradual smooth boundary.

Cg—50 to 80 inches; dark gray (10YR 4/1) clay; common coarse prominent yellowish red (5YR 4/6, 5/8) and common medium distinct light gray (10YR 7/1) mottles; massive; extremely hard, firm; few fine roots; slightly acid.

The reaction typically ranges from moderately acid to slightly alkaline, but is strongly acid in some subhorizons of some pedons.

The A horizon is light yellowish brown, yellowish brown, dark yellowish brown, dark gray, very dark gray, very dark grayish brown, dark grayish brown, grayish brown, dark brown, or brown. Where value is 3, the horizon is less than 6 inches thick. The Ag horizon is gray, olive gray, light gray, light brownish gray, or grayish brown. Mottles range from few to many in shades of gray, brown, red, or yellow.

The Bg horizon is gray, light gray, or light brownish gray fine sandy loam, sandy loam, or loam with thin strata of loamy fine sand, sand, or sandy clay loam. Mottles range from few to many in shades of red, yellow, brown, and gray.

The 2Cg horizon is gray, dark gray, or very dark gray clay, sandy clay, clay loam, or sandy clay loam. Mottles in shades of red, yellow, brown, and gray range from few to many. Depth to the 2Cg horizon ranges from 40 to 80 inches.

Kirvin Series

The Kirvin series consists of well drained, moderately slowly permeable soils on upland divides. These soils are deep to stratified sandstone and shale. They formed in acidic, stratified loamy and shaly materials. Slopes range from 1 to 8 percent.

Typical pedon of Kirvin gravelly fine sandy loam, 2 to 8 percent slopes; from the intersection of U.S. Highway 75 and Farm Road 489 in Dew, 4.9 miles east on Farm Road 489, 1.0 mile south on Farm Road 1848, 0.8 mile east on pasture road, and 1,200 feet south in pasture:

A—0 to 4 inches; dark brown (7.5YR 4/4) gravelly fine sandy loam; weak fine subangular blocky structure; slightly hard, very friable; common fine and medium roots; about 20 percent by volume ironstone gravel; slightly acid; clear wavy boundary.

E—4 to 7 inches; light brown (7.5YR 6/4) gravelly fine sandy loam; weak fine subangular blocky structure; slightly hard, very friable; common fine and medium roots; about 25 percent by volume ironstone gravel; few flat ironstone fragments up to 4 inches across at lower boundary; slightly acid; clear wavy boundary.

Bt1—7 to 19 inches; red (2.5YR 4/8) clay; few fine faint yellowish brown mottles; moderate fine and medium subangular blocky structure; very hard, very firm; common fine and medium roots; continuous clay films on surfaces of peds; very strongly acid; clear wavy boundary.

Bt2—19 to 31 inches; red (2.5YR 4/8) clay; common medium distinct brownish yellow (10YR 6/8) mottles; weak medium subangular blocky structure; very hard, very firm; common fine roots; nearly continuous clay films on surfaces of peds; very strongly acid; clear wavy boundary.

BC—31 to 44 inches; red (2.5YR 4/8) clay; weak coarse subangular blocky structure; very hard, very firm; few fine roots; about 35 percent by volume light brownish gray (10YR 6/2) unweathered shale fragments; about 10 percent by volume yellowish brown (10YR 5/8) loamy material; patchy clay films on surfaces of peds; very strongly acid; clear wavy boundary.

C—44 to 60 inches; interbedded layers of pale brown (10YR 6/3) and yellowish brown (10YR 5/8) sandstone with fine sandy loam texture and mottled red (2.5YR 4/8) and light brownish gray (10YR 6/2) shale with clay texture; hard, friable; extremely acid.

The solum is 40 to 52 inches thick. Base saturation of the B and C horizons ranges from 15 to 25 percent.

The A horizon is dark brown, brown, or dark grayish brown fine sandy loam or gravelly fine sandy loam. Ironstone gravel ranges from 0 to 35 percent. Most pedons have an E horizon that has values 1 or 2 units higher than the A horizon. Combined thickness of the A and E horizons is 6 to 11 inches. Reaction ranges from strongly acid to slightly acid.

The Bt horizon is red, dark red, or yellowish red. Yellowish brown, brownish yellow, and strong brown mottles range from none to common. Ironstone gravel and fragments range from 0 to 50 percent. Reaction ranges from extremely acid to strongly acid.

Most pedons have a BC horizon. It is clay, sandy clay, or sandy clay loam, with the same colors as the Bt horizon. Unweathered fragments and pockets of sandy, loamy, and shaly C material make up 10 to 45 percent of the composition. Reaction is extremely acid or very strongly acid.

The C horizon is variable and consists of yellowish brown, pale brown, and brownish yellow soft sandstone and loamy materials interbedded with light brownish gray, light gray, red, and dark red shale. In

some pedons, flat ironstone fragments up to 8 inches wide make up as much as 10 percent of the composition. Reaction is extremely acid or very strongly acid.

Lamar Series

The Lamar series consists of very deep, well drained, moderately permeable soils on upland side slopes. These soils formed in calcareous loamy sediments. Slopes range from 5 to 12 percent.

Typical pedon of Lamar clay loam, 5 to 12 percent slopes; from the intersection of Farm Road 27 and Farm Road 246 about 2 miles east of Wortham, 3.5 miles northeast on Farm Road 246, and 100 feet northwest in pasture:

A—0 to 5 inches; dark brown (10YR 4/3) clay loam; weak medium subangular blocky structure; hard, friable; common fine and medium roots; few siliceous pebbles; neutral; clear wavy boundary.

Bw—5 to 21 inches; light olive brown (2.5Y 5/4) clay loam; few fine faint strong brown mottles; weak medium subangular blocky structure; hard, friable; common fine and medium roots; few very fine soft masses of calcium carbonate; moderately alkaline; gradual wavy boundary.

Bk—21 to 38 inches; light olive brown (2.5Y 5/4) clay loam; few fine faint strong brown mottles; weak coarse subangular blocky structure; hard, friable; few fine and medium roots; about 5 percent concretions and soft masses of calcium carbonate; calcareous; moderately alkaline; clear wavy boundary.

C—38 to 60 inches; light olive brown (2.5Y 5/4) silty clay loam; common fine and medium distinct strong brown (7.5YR 5/8) mottles; weak medium platy structure; very hard, firm; about 2 percent concretions and soft masses of calcium carbonate; calcareous; moderately alkaline.

The solum is 25 to 48 inches thick. The reaction is neutral to moderately alkaline in the A horizon and moderately alkaline in the B and C horizons. Soft masses and concretions of calcium carbonate range from few to common in the B and C horizons.

The A horizon is dark brown or very dark grayish brown and is 4 to 6 inches thick.

The B horizon is light olive brown, olive brown, brownish yellow, light brownish gray, or light yellowish brown clay loam or silty clay loam. Mottles of these colors as well as strong brown range from none to common.

The C horizon has the same colors as the B horizon. It is clay loam, loam, or silty clay loam, or the horizon is stratified in these textures.

Leagueville Series

The Leagueville series consists of very deep, poorly drained, moderately permeable soils along narrow drainageways and in depressions on uplands. These soils formed in sandy and loamy sediments. Slopes range from 1 to 5 percent.

Typical pedon of Leagueville loamy fine sand, 1 to 5 percent slopes; from the west side of the cemetery north of the school in Oakwood, 0.85 mile west-southwest along the county line, then 800 feet north-northwest into a drainageway in a pasture:

A—0 to 4 inches; dark brown (10YR 4/3) loamy fine sand; weak fine subangular blocky structure; soft, very friable; common fine and medium roots; strongly acid; clear wavy boundary.

E1—4 to 15 inches; light brownish gray (10YR 6/2) loamy fine sand; single grained; soft, very friable; common fine and medium roots; common brownish stains along root channels; moderately acid; clear wavy boundary.

E2—15 to 34 inches; light brownish gray (10YR 6/2) loamy fine sand; single grained; soft, very friable; common fine and medium roots; moderately acid; clear wavy boundary.

Btg—34 to 52 inches; light gray (10YR 6/1) sandy clay loam; many coarse distinct brownish yellow (10YR 6/8) and common medium prominent yellowish red (5YR 5/8) mottles; weak coarse subangular blocky structure; hard, friable; few fine roots; patchy clay films on surfaces of peds; few streaks of pale brown uncoated sand; extremely acid; gradual wavy boundary.

Btg/E´—52 to 72 inches; light brownish gray (10YR 6/2) sandy clay loam; many coarse prominent strong brown (7.5YR 5/8) and red (2.5YR 4/8) mottles; weak coarse subangular blocky structure; hard, friable; few fine roots; patchy clay films on surfaces of peds; about 30 percent by volume pockets and vertical streaks of pale brown (10YR 6/3) uncoated sand (E´); few soft black masses; extremely acid.

The solum is more than 60 inches thick. Base saturation is less than 35 percent at a depth of 50 inches below the top of the Btg horizon.

The A horizon is dark brown or dark grayish brown. Some pedons have common strong brown mottles. Reaction is strongly acid or moderately acid.

The E horizon is light brownish gray, pale brown, or grayish brown loamy fine sand. Some pedons have strong brown or brownish yellow mottles. Reaction ranges from strongly acid to slightly acid.

The Btg horizon is light gray or light brownish gray and is prominently mottled in colors of red, yellowish red, and brownish yellow. Reaction is extremely acid or very strongly acid.

Most pedons have a Btg/E´ horizon below a depth of 50 inches. Colors, texture, and reaction of the Btg component of this layer are the same as those of the Btg horizon. The E´ component is light brownish gray or pale brown uncoated sand that occurs as pockets and vertically oriented streaks. E´ material makes up 20 to 40 percent of this horizon.

Leson Series

The Leson series consists of moderately well drained, very slowly permeable soils on uplands. These soils are deep to weathered shale. They formed in alkaline shales and clays. Slopes range from 3 to 5 percent.

Typical pedon of Leson clay, 3 to 5 percent slopes; from the intersection of Texas Highway 14 and Farm Road 27 in Wortham, 2.8 miles east on Farm Road 27, 0.55 mile southwest on county road, and 100 feet east in pasture:

Ap—0 to 3 inches; black (10YR 2/1) clay; weak medium subangular blocky structure; very hard, firm; common fine roots; few siliceous pebbles; slightly acid; clear wavy boundary.

A1—3 to 20 inches; black (10YR 2/1) clay; weak coarse prismatic structure parting to weak medium angular blocky; very hard, very firm; common fine roots; few siliceous gravel; common streaks of surface material along old cracks; common pressure faces; few slickensides; slightly alkaline; clear wavy boundary.

A2—20 to 30 inches; black (10YR 2/1) clay; weak coarse prismatic structure parting to weak medium angular blocky; very hard, very firm; common fine roots; few siliceous gravel; common intersecting slickensides; slightly alkaline; clear wavy boundary.

Bw1—30 to 41 inches; dark grayish brown (2.5Y 4/2) clay; weak coarse angular blocky structure; very hard, very firm; few fine roots; few siliceous pebbles; common streaks of black (10YR 2/1) and very dark gray (10YR 3/1) material along old cracks; common intersecting slickensides; few concretions and soft masses of calcium carbonate; few fine black concretions; moderately alkaline; gradual wavy boundary.

Bw2—41 to 58 inches; olive brown (2.5Y 4/4) clay; weak coarse angular blocky structure; very hard, very firm; few streaks of very dark gray (10YR 3/1) material along old cracks; few gypsum crystals; few black concretions; few concretions and soft masses of calcium carbonate; moderately alkaline; gradual wavy boundary.

C—58 to 75 inches; mottled yellowish brown (10YR 5/6), grayish brown (10YR 5/2), and reddish yellow (7.5YR 6/6) shale with clay texture; massive; very hard, very firm; slightly alkaline.

The solum is 36 to more than 60 inches thick. It is clay or silty clay. Intersecting slickensides are below a depth of about 16 inches. When the soil is dry, cracks up to 2 inches wide extend throughout the solum. Siliceous pebbles range from none to few.

The A horizon is black or very dark gray. Reaction ranges from slightly acid to moderately alkaline.

The Bw horizon is dark grayish brown, very dark grayish brown, or olive brown. Some pedons have mottles in these colors as well as olive, olive gray, and dark yellowish brown. Few to common streaks of black and very dark gray material are present along old cracks. Gypsum crystals, black concretions, and concretions and soft masses of calcium carbonate range from none to few. Reaction is slightly alkaline or moderately alkaline.

The C horizon is mottled in colors of olive gray, yellowish brown, grayish brown, and light yellowish brown. Reaction is slightly alkaline or moderately alkaline.

Lufkin Series

The Lufkin series consists of very deep, moderately well drained, very slowly permeable soils on high stream terraces. These soils formed in alkaline clayey sediments. Slopes are less than 1 percent.

Typical pedon of Lufkin fine sandy loam, in an area of Tabor-Lufkin complex, 0 to 1 percent slopes; from the intersection of Farm Road 488 and Farm Road 416 about 15 miles north of Fairfield, 3.5 miles west on Farm Road 416, 0.5 mile northwest on county road, and 870 feet west in pasture:

A—0 to 4 inches; dark grayish brown (10YR 4/2) fine sandy loam; weak fine subangular blocky structure; hard, very friable; many fine and medium roots; slightly acid; clear wavy boundary.

E—4 to 9 inches; grayish brown (10YR 5/2) fine sandy loam; weak fine subangular blocky structure; hard, friable; common fine and medium roots; moderately acid; abrupt wavy boundary.

Btg1—9 to 24 inches; dark grayish brown (10YR 4/2) clay; few fine faint dark brown mottles; moderate medium angular blocky structure; very hard, very firm; few fine roots; common pressure faces; very strongly acid; gradual wavy boundary.
Btg2—24 to 38 inches; dark gray (10YR 4/1) clay; few medium distinct dark yellowish brown (10YR 4/4) mottles; moderate medium angular blocky structure; very hard, very firm; few fine roots; common pressure faces; few fine black concretions; slightly acid; gradual wavy boundary.
Btg3—38 to 54 inches; grayish brown (2.5Y 5/2) clay; few medium and coarse distinct dark yellowish brown (10YR 4/4) mottles; moderate fine angular blocky structure; very hard, very firm; few fine roots; few fine black concretions; few neutral salts; slightly acid; gradual wavy boundary.
BC—54 to 62 inches; light brownish gray (2.5Y 6/2) clay loam; many medium distinct reddish yellow (7.5YR 6/6) mottles; weak coarse angular blocky structure; very hard, firm; few fine black concretions; slightly alkaline; gradual wavy boundary.
C—62 to 76 inches; light olive gray (5Y 6/2) clay loam; common fine and medium distinct brownish yellow (10YR 6/6) and few fine distinct brown (7.5YR 5/4) mottles; massive; very hard, firm; slightly alkaline.

The solum is more than 58 inches thick. The gray and grayish brown colors are considered to be relict and not due to current wetness conditions.

The A horizon is dark grayish brown or grayish brown. Most pedons have an E horizon that is 1 unit of value higher than the A horizon. Combined thickness of the A and E horizons ranges from 6 to 11 inches, averaging less than 10 inches in most pedons. Reaction ranges from strongly acid to slightly acid.

The Btg horizon is dark grayish brown, grayish brown, dark gray, or gray. Dark brown and dark yellowish brown mottles range from none to common. The Btg horizon decreases in clay content below a depth of 40 inches. The upper part of the Btg horizon is very strongly acid or strongly acid, and the lower part ranges from slightly acid to slightly alkaline.

Most pedons have a BC horizon below a depth of 48 inches. It is light brownish gray, grayish brown, or dark grayish brown clay loam or clay that has common to many yellowish brown, reddish yellow, or brownish yellow mottles.

The C horizon is light olive gray, light brownish gray, or light gray clay loam or clay that has common to many mottles of brownish yellow, reddish yellow, or brown. Reaction is slightly alkaline or moderately alkaline, with or without few concretions of calcium carbonate.

Mabank Series

The Mabank series consists of very deep, moderately well drained, very slowly permeable soils on broad upland divides. These soils formed in alkaline clays and shales. Slopes are less than 1 percent.

Typical pedon of Mabank fine sandy loam, 0 to 1 percent slopes, about 5 miles northwest of Teague on U.S. Highway 84, 0.8 mile north on Farm Road 1366 to Cotton Gin community then 0.9 mile west, 0.6 mile north, and 325 feet west on county roads, then 50 feet south in a pasture:

A—0 to 9 inches; dark grayish brown (10YR 4/2) fine sandy loam; massive; hard, friable; few fine roots; few siliceous pebbles; moderately acid; abrupt wavy boundary.
Btg1—9 to 28 inches; very dark gray (10YR 3/1) clay; weak medium angular blocky structure; extremely hard, very firm; few very fine roots; common pressure faces; slightly acid; gradual wavy boundary.
Btg2—28 to 36 inches; dark gray (10YR 4/1) clay; weak medium angular blocky structure; extremely hard, very firm; few very fine roots; common pressure faces; common slickensides; few siliceous pebbles; few very fine black concretions; moderately alkaline; gradual wavy boundary.
Btg3—36 to 50 inches; grayish brown (10YR 5/2) clay; weak coarse angular blocky structure; extremely hard, very firm; few very fine roots; common pressure faces; few siliceous pebbles; few black concretions; few very fine soft masses of calcium carbonate and gypsum crystals; moderately alkaline; gradual smooth boundary.
BC—50 to 68 inches; light gray (10YR 7/2) clay; common medium distinct olive yellow (2.5Y 6/6) and many fine and medium faint grayish brown (10YR 5/2) mottles; weak coarse angular blocky structure; very hard, very firm; few very fine roots; few siliceous pebbles; few pressure faces; common soft masses and few concretions of calcium carbonate and gypsum crystals; few black concretions; moderately alkaline; gradual wavy boundary.
Ck—68 to 72 inches; mottled light gray (10YR 7/2) and brownish yellow (10YR 6/6) shale with clay texture; massive; very hard, very firm; common fine pores; few siliceous pebbles; few black concretions; few fine and very fine concretions

and soft masses of calcium carbonate; moderately alkaline.

The solum is more than 60 inches thick. Most pedons have a few siliceous pebbles throughout the solum. Depth to secondary carbonates ranges from 22 to 36 inches. The gray and grayish brown colors are considered to be relict and not due to current wetness conditions.

The A horizon is dark grayish brown or very dark grayish brown. It is 6 to 10 inches thick. Reaction is moderately acid or slightly acid.

The upper part of the Btg horizon is very dark gray. Reaction is slightly acid or neutral. The lower part is dark gray, very dark gray, very dark grayish brown, dark grayish brown, or grayish brown. Some pedons have few to common dark brown mottles. Reaction is moderately alkaline.

Some pedons have a BC horizon that is light gray, light brownish gray, or grayish brown, with mottles of these colors as well as olive yellow and light olive brown.

The C or Ck horizon is shale or clay with shale texture that is mottled in colors of light gray, brownish yellow, olive yellow, grayish brown, light olive brown, and light yellowish brown. Visible carbonates range from few to common.

Nahatche Series

The Nahatche series consists of very deep, somewhat poorly drained, moderately permeable soils on flood plains of streams. These soils formed in acidic loamy alluvium. Slopes are less than 1 percent.

Typical pedon of Nahatche clay loam, in an area of Nahatche-Hatliff association, frequently flooded; from the intersection of Farm Road 1124 and Farm Road 2570 about 8 miles northeast of Fairfield, 1.6 miles northeast on Farm Road 2570 to end of road, 0.75 mile northeast on county road, 3.7 miles northwest on private road, and 150 feet west in woodland:

A1—0 to 4 inches; dark brown (10YR 4/3) clay loam; common medium distinct light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; hard, friable; common fine, medium, and coarse roots; slightly acid; clear smooth boundary.

A2—4 to 14 inches; brown (10YR 5/3) clay loam; many medium distinct light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; hard, friable; common fine, medium, and coarse roots; common yellowish red (5YR 5/8) stains along root channels; slightly acid; clear smooth boundary.

Cg1—14 to 35 inches; grayish brown (10YR 5/2) clay loam; many coarse distinct brown (7.5YR 5/4) mottles; massive; hard, friable; common fine and medium roots; common yellowish red (5YR 4/6) stains along roots channels; about 5 percent thin horizontal strata of brown (10YR 5/3) loamy fine sand; moderately acid; abrupt smooth boundary.

Cg2—35 to 44 inches; mottled grayish brown (10YR 5/2) and yellowish brown (10YR 5/4) fine sandy loam; massive; slightly hard, very friable; few fine and medium roots; strongly acid; abrupt smooth boundary.

Cg3—44 to 50 inches; light brownish gray (10YR 6/2) clay loam; common medium prominent strong brown (7.5YR 5/8) mottles; massive; hard, friable; few fine roots; moderately acid; abrupt smooth boundary.

Cg4—50 to 60 inches; mottled grayish brown (10YR 5/2) and yellowish brown (10YR 5/4) fine sandy loam; massive; slightly hard, very friable; strongly acid.

The weighted average clay content of the 10- to 40-inch control section ranges from 18 to 30 percent, with more than 15 percent particles that are fine sand or coarser texture. Reaction ranges from strongly acid to slightly alkaline, but is moderately acid to slightly alkaline in some subhorizon in the control section.

The A horizon is brown, dark brown, grayish brown, or dark grayish brown. Mottles of these colors as well as light brownish gray, light gray, and gray range from few to many.

The Cg horizon is stratified in textures of clay loam, sandy clay loam, silty clay loam, loam, and fine sandy loam. Some pedons have thin strata of sandier textures. Colors are gray, dark gray, light gray, grayish brown, or light brownish gray. Mottles in these colors as well as brown, strong brown, yellowish brown, and dark brown range from common to many. In some pedons the matrix is mottled in these colors.

Oakwood Series

The Oakwood series consists of very deep, moderately well drained, moderately slowly permeable soils on broad upland divides. These soils formed in acidic loamy sediments. Slopes range from 1 to 5 percent.

Typical pedon of Oakwood fine sandy loam, 1 to 5 percent slopes; from the courthouse in Fairfield, 12.8 miles east on U.S. Highway 84, 1.65 miles northwest on Farm Road 489, then 255 feet west in pasture:

A—0 to 8 inches; dark brown (10YR 4/3) fine sandy

loam; weak fine subangular blocky structure; slightly hard, very friable; common fine roots; neutral; clear smooth boundary.

E—8 to 15 inches; brown (10YR 5/3) fine sandy loam; few fine faint pale brown mottles; weak fine subangular blocky structure; slightly hard, very friable; common fine roots; few rounded ironstone concretions; neutral; clear smooth boundary.

Bt1—15 to 34 inches; yellowish brown (10YR 5/6) sandy clay loam; moderate medium subangular blocky structure; very hard, firm; few fine roots; few small rounded ironstone concretions; common thin clay films on surfaces of peds; neutral; gradual smooth boundary.

Bt2—34 to 46 inches; brownish yellow (10YR 6/6) sandy clay loam; few fine and medium faint pale brown (10YR 6/3) and reddish yellow (7.5YR 6/6) mottles; weak coarse subangular blocky structure; very hard, firm; few fine roots; few patchy clay films on surfaces of peds; about 2 percent by volume nodular plinthite; slightly acid; gradual smooth boundary.

Btv—46 to 64 inches; mottled reddish yellow (7.5YR 6/6), yellowish red (5YR 5/6), and light gray (N 7/0) sandy clay loam; weak coarse subangular blocky structure; very hard, firm; few fine roots; few patchy clay films on surfaces of peds; about 10 percent by volume nodular plinthite; few pockets of uncoated sand grains; few fine sandstone fragments; moderately acid; gradual smooth boundary.

C—64 to 80 inches; mottled reddish yellow (7.5YR 6/6), light gray (N 7/0), red (2.5YR 5/6), and yellowish red (5YR 5/6) fine sandy loam; massive; hard, friable; about 5 percent by volume nodular plinthite; about 5 percent by volume fine sandstone fragments; moderately acid.

The solum is more than 60 inches thick. The clay content of the upper 20 inches of the Bt horizon ranges from 20 to 35 percent. Plinthite ranges from 5 to 20 percent in some layer within a depth of 30 to 50 inches. Base saturation ranges from 45 to 75 percent 50 inches below the E horizon. Siliceous pebbles and ironstone concretions range from none to about 10 percent.

The combined thickness of the A and E horizons ranges from 10 to 20 inches. The A horizon is dark grayish brown, dark brown, brown, or pale brown. The E horizon is 1 or 2 units of value and chroma higher than the A horizon. Reaction ranges from moderately acid to neutral.

The upper part of the Bt horizon is yellowish brown, brownish yellow, or dark yellowish brown. Mottles in shades of red and brown range from none to common. Reaction ranges from strongly acid to neutral.

The lower part of the Bt horizon has the same colors as the upper part, in addition to strong brown, reddish yellow, and brown. Mottles range from few to many in shades of brown, red, yellow, and gray. Depth to horizons having mottles with chroma of 2 or less is more than 30 inches. The lower part of the Bt horizon is typically sandy clay loam, but ranges from sandy loam to clay loam. In some pedons, up to 10 percent of this horizon is brittle, mainly in colors of red and yellowish brown. Reaction ranges from very strongly acid to slightly acid.

The C horizon has a yellowish or grayish matrix that is mottled in these colors as well as in shades of red and brown. It ranges from loamy fine sand to clay loam. Some pedons have weakly consolidated sandstone fragments. Reaction ranges from very strongly acid to slightly acid.

Padina Series

The Padina series consists of very deep, well drained, moderately permeable soils on upland divides. These soils formed in thick sandy sediments. Slopes range from 1 to 5 percent.

Typical pedon of Padina loamy fine sand, 1 to 5 percent slopes; from the courthouse in Fairfield, 2.0 miles northeast on Farm Road 488, 5.5 miles northeast on Farm Road 1124, then 65 feet north in post oak woodland:

A—0 to 4 inches; dark grayish brown (10YR 4/2) loamy fine sand; single grained; loose, very friable; many fine and medium roots; neutral; clear wavy boundary.

E1—4 to 30 inches; brown (10YR 5/3) loamy fine sand; single grained; loose, very friable; common fine, medium, and coarse roots; slightly acid; gradual wavy boundary.

E2—30 to 58 inches; light yellowish brown (10YR 6/4) loamy fine sand; single grained; loose, very friable; few fine and medium roots; moderately acid; clear wavy boundary.

Bt1—58 to 62 inches; yellowish brown (10YR 5/6) fine sandy loam; common medium distinct light gray (10YR 6/1) and prominent red (2.5YR 4/6) mottles; weak medium subangular blocky structure; hard, friable; few fine roots; few thin patchy clay films; moderately acid; clear wavy boundary.

Bt2—62 to 72 inches; mottled red (2.5YR 4/6), brownish yellow (10YR 6/6) and light gray (10YR

7/1) sandy clay loam; weak medium subangular blocky structure; hard, firm; few fine roots; few thin patchy clay films; strongly acid.

The solum is more than 72 inches thick.

The A horizon is dark grayish brown, dark brown, dark yellowish brown, or brown. The E horizon is 1 or 2 units of value higher than the A horizon. The A and E horizons are loamy fine sand and range from 40 to 72 inches in thickness. Reaction ranges from moderately acid to neutral.

The Bt1 horizon is yellowish brown, brownish yellow, strong brown, or light yellowish brown fine sandy loam or sandy clay loam that has few to many red, gray, light gray, light brownish gray, and grayish brown mottles. The lower part of the Bt horizon is typically mottled in these colors. The upper 20 inches of the Bt horizon has 18 to 35 percent clay. Reaction ranges from strongly acid to slightly acid.

Pickton Series

The Pickton series consists of very deep, well drained, moderately permeable soils on uplands. These soils formed in sandy sediments. Slopes range from 1 to 15 percent.

Typical pedon of Pickton loamy fine sand, 1 to 8 percent slopes; from the intersection of U.S. Highway 79 and U.S. Highway 84 about 23 miles east of Fairfield, 4.2 miles west on U.S. Highway 84, 0.6 mile southeast on county road, and 900 feet southwest in abandoned cropland:

A1—0 to 7 inches; dark brown (10YR 4/3) loamy fine sand; weak fine subangular blocky structure; loose, very friable; few fine roots; moderately acid; clear smooth boundary.

E1—7 to 27 inches; dark yellowish brown (10YR 4/4) loamy fine sand; single grained; loose, very friable; few fine roots; slightly acid; gradual smooth boundary.

E2—27 to 54 inches; yellowish brown (10YR 5/4) loamy fine sand; single grained; loose, very friable; few fine roots; slightly acid; clear smooth boundary.

Bt1—54 to 61 inches; strong brown (7.5YR 5/6) sandy clay loam; common fine distinct reddish brown (5YR 4/4) mottles; moderate medium subangular blocky structure; hard, friable; few fine roots; thin patchy clay films on surfaces of peds; slightly acid; gradual smooth boundary.

Bt2—61 to 80 inches; mottled strong brown (7.5YR 5/6), yellowish red (5YR 4/6), and light gray (10YR 6/1) sandy clay loam; moderate medium subangular blocky structure; hard, friable; few fine roots; thin patchy clay films on surfaces of peds; few streaks of pale brown (10YR 6/3) uncoated sand; strongly acid.

The solum is more than 80 inches thick.

The A horizon is brown, dark brown, pale brown, or dark yellowish brown. The E horizon is 1 or 2 units of value higher than the A horizon. Combined thickness of the A and E horizons ranges from 42 to about 72 inches. Reaction ranges from moderately acid to neutral.

The upper part of the Bt horizon is strong brown, brownish yellow, or yellowish brown. Red and yellowish red mottles range from none to common. The lower part of the Bt horizon has the same colors as well as mottles of gray, light gray, and light brownish gray, or the matrix is mottled in these colors. Streaks and pockets of pale brown uncoated sand make up as much as 10 percent of the lower part of the Bt horizon. Reaction ranges from strongly acid to slightly acid.

Pluck Series

The Pluck series consists of very deep, poorly drained, moderately permeable soils in backswamp areas of flood plains. These soils formed in loamy alluvium. Slopes are less than 1 percent.

Typical pedon of Pluck loam, frequently flooded; from the intersection of U.S. Highway 84 and Farm Road 1364 about 5 miles east of Fairfield, 1.0 mile west on U.S. Highway 84, 3.3 miles south on county road, 800 feet east in an unimproved area in pasture:

A—0 to 6 inches; gray (10YR 5/1) loam; many medium distinct strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; very hard, firm; many fine and medium roots; moderately acid; clear smooth boundary.

Bg1—6 to 21 inches; dark gray (10YR 4/1) clay loam; many medium distinct strong brown (7.5YR 5/8) mottles; weak medium subangular blocky structure; very hard, firm; common fine and medium roots; few thin strata of light brownish gray fine sandy loam; common strong brown stains along root channels; strongly acid; gradual smooth boundary.

Bg2—21 to 47 inches; gray (10YR 5/1) silty clay loam; many medium distinct strong brown (7.5YR 5/8) mottles; weak medium subangular blocky structure; very hard, firm; common fine roots; about 15 percent by volume strata of light yellowish brown (10YR 6/4) fine sand; common strong brown stains along root channels; moderately acid; clear smooth boundary.

Bg3—47 to 60 inches; dark gray (10YR 4/1) silty clay loam with strata of very dark gray (10YR 3/1) clay (35 percent by volume); common medium distinct strong brown (7.5YR 4/6) mottles; weak medium subangular blocky structure; very hard, very firm; few fine roots; slightly acid.

The A horizon is gray or dark gray. Most pedons have few to many strong brown mottles. Reaction ranges from strongly acid to slightly acid.

The Bg horizon is clay loam, silty clay loam, or fine sandy loam that has strata of material that is more sandy and more clayey. The weighted average clay content ranges from 25 to 35 percent. The matrix is gray or dark gray. Strong brown and reddish yellow mottles range from none to many. Most pedons have strata of clay textures below a depth of 40 inches. Reaction ranges from strongly acid to slightly alkaline.

Rader Series

The Rader series consists of very deep, moderately well drained, very slowly permeable soils on stream terraces. These soils formed in acidic, loamy and clayey alluvium. Slopes range from 0 to 3 percent.

Typical pedon of Rader fine sandy loam, in an area of Derly-Rader complex, 0 to 1 percent slopes; from the intersection of U.S. Highway 79 and U.S. Highway 84 about 23 miles east of Fairfield, 0.75 mile west on U.S. Highway 84, and 450 feet south in pasture:

A—0 to 12 inches; dark yellowish brown (10YR 4/4) fine sandy loam; weak medium subangular blocky structure; slightly hard, very friable; common fine and medium roots; moderately acid; clear wavy boundary.

E—12 to 25 inches; yellowish brown (10YR 5/4) fine sandy loam; weak fine subangular blocky structure; slightly hard, very friable; common fine roots; moderately acid, gradual wavy boundary.

Bt/E—25 to 38 inches; brownish yellow (10YR 6/6) sandy clay loam; common fine distinct light brownish gray (10YR 6/2) and yellowish red (5YR 5/8) mottles (Bt); about 25 percent tongues and interfingers of pale brown (10YR 6/3) fine sandy loam (E); common fine roots; patchy clay films on surfaces of peds; few fine black concretions; strongly acid; gradual wavy boundary.

Bt1—38 to 55 inches; mottled light brownish gray (10YR 6/2), brownish yellow (10YR 6/8), and red (2.5YR 4/8) sandy clay; weak coarse subangular blocky structure; hard, firm; few fine roots; patchy clay films on surfaces of peds; few fine black concretions; few vertical streaks and pockets of pale brown (10YR 6/3) fine sandy loam; strongly acid; gradual wavy boundary.

Bt2—55 to 80 inches; mottled light brownish gray (10YR 6/2), grayish brown (10YR 5/2), red (2.5YR 4/8), and brownish yellow (10YR 6/8) clay; weak coarse subangular blocky structure; very hard, very firm; few fine roots; patchy clay films on surfaces of peds; few fine black concretions; moderately acid.

The solum is more than 60 inches thick. Clay content of the control section ranges from 28 to 35 percent.

The A horizon is dark yellowish brown, dark brown, or dark grayish brown. The E horizon is 1 or 2 units of value higher than the A horizon. Combined thickness of the A and E horizons ranges from 13 to 28 inches. Reaction ranges from strongly acid to slightly acid.

The Bt component of the Bt/E horizon is yellowish brown or brownish yellow. Yellowish red, light brownish gray, and light gray mottles range from none to common. The E component makes up 15 to 30 percent as tongues and interfingers. Texture and colors are the same as those of the E horizon.

The Bt horizon is light brownish gray or grayish brown clay loam, sandy clay, or clay. Yellowish brown, brownish yellow, strong brown, reddish yellow, yellowish red, and red mottles range from common to many, or the matrix is mottled in these colors. It is clay loam, sandy clay, or clay, and typically becomes more clayey with depth. Reaction is very strongly acid or strongly acid in the upper part of the Bt horizon, and strongly acid or moderately acid in the lower part.

Raino Series

The Raino series consists of very deep, moderately well drained, very slowly permeable soils on saddles and foot slopes. These soils formed in acidic, clayey alluvium. Slopes range from 0 to 2 percent.

Typical pedon of Raino fine sandy loam, 0 to 2 percent slopes; from the intersection of U.S. Highway 75 and Farm Road 489 in Dew, 2.2 miles east on Farm Road 489, 1.6 miles southeast on county road to gate, 0.6 mile southeast and 0.2 mile east on private lane, and 300 feet southeast in woods:

A—0 to 4 inches; dark brown (10YR 4/3) fine sandy loam; weak fine subangular blocky structure; hard, very friable; common fine, medium, and coarse roots; strongly acid; clear wavy boundary.

E—4 to 14 inches; brown (10YR 5/3) fine sandy loam; common fine and medium distinct yellowish brown (10YR 5/8) mottles; weak fine subangular blocky structure; hard, very friable; common fine,

medium, and coarse roots; strongly acid; gradual wavy boundary.

Bt/E—14 to 28 inches; yellowish brown (10YR 5/8) sandy clay loam (Bt); many medium distinct light brownish gray (10YR 6/2) mottles; weak medium subangular blocky structure; hard, friable; common fine and medium roots; about 15 percent by volume interfingers of pale brown (10YR 6/3) uncoated sand (E); strongly acid; clear wavy boundary.

Btg1—28 to 49 inches; mottled grayish brown (10YR 5/2), yellowish brown (10YR 5/8), and yellowish red (5YR 4/8) clay; weak coarse subangular blocky structure; very hard, very firm; common fine roots; nearly continuous clay films on surfaces of peds; few vertical streaks of pale brown (10YR 6/3) uncoated sand; very strongly acid; gradual wavy boundary.

Btg2—49 to 60 inches; mottled light brownish gray (10YR 6/2), yellowish brown (10YR 5/8), and yellowish red (5YR 4/8) clay; weak coarse subangular blocky structure; very hard, very firm; few fine roots; patchy clay films on surfaces of peds; few vertical streaks of pale brown (10YR 6/3) uncoated sand; few neutral salts; strongly acid.

The solum is more than 60 inches thick.

The A horizon is dark brown, dark yellowish brown, or yellowish brown. Most pedons have an E horizon that is 1 or 2 units of value higher than the A horizon. Reaction is strongly acid or moderately acid.

The Bt component of the Bt/E horizon is yellowish brown or brownish yellow loam or sandy clay loam that has common to many yellowish red, light brownish gray, and red mottles. The E component is pale brown uncoated sand or fine sandy loam that makes up 10 to 45 percent of this horizon as pockets and vertical tongues and interfingers. The Bt/E horizon is 6 to 15 inches thick. Clay content ranges from 18 to 25 percent. Reaction is very strongly acid or strongly acid.

The Btg horizon is gray, grayish brown, light brownish gray, or dark grayish brown clay that has common to many yellowish brown, yellowish red, and red mottles, or the matrix is mottled in various combinations of these colors. The clay content ranges from 45 to 55 percent. Reaction is strongly acid or very strongly acid. Some pedons are moderately acid to neutral below a depth of 60 inches.

Robco Series

The Robco series consists of very deep, moderately well drained, slowly permeable soils on upland foot slopes and at heads of drainageways. These soils formed in sandy and clayey sediments. Slopes range from 0 to 2 percent.

Typical pedon of Robco loamy fine sand, 0 to 2 percent slopes; from the intersection of Farm Road 27 and the Interstate 45 west service road in Fairfield, 2.25 miles north on the Interstate 45 west service road, and 200 feet west in post oak woodland:

A—0 to 12 inches; dark yellowish brown (10YR 4/4) loamy fine sand; common fine faint strong brown (7.5YR 5/6) mottles; weak fine subangular blocky structure; loose, very friable; common fine and medium roots; moderately acid; clear smooth boundary.

E—12 to 26 inches; light yellowish brown (10YR 6/4) loamy fine sand; common medium distinct strong brown (7.5YR 5/6) mottles; weak fine subangular blocky structure; loose, very friable; common fine and medium roots; strongly acid; clear smooth boundary.

B/E—26 to 27 inches; yellowish brown (10YR 5/4) sandy clay loam (B part); common medium distinct reddish yellow (7.5YR 6/6) mottles; about 35 percent light yellowish brown (10YR 6/4) loamy fine sand (E part); weak fine subangular blocky structure; slightly hard, friable; common fine and medium roots; common fine and very fine black concretions; strongly acid; clear smooth boundary.

Bt1—27 to 40 inches; grayish brown (10YR 5/2) clay loam; many medium distinct yellowish brown (10YR 5/8) and reddish yellow (5YR 6/8) mottles; weak coarse subangular blocky structure; very hard, firm; common fine and medium roots; continuous clay films on surfaces of peds; very strongly acid; gradual smooth boundary.

Bt2—40 to 60 inches; grayish brown (10YR 5/2) clay loam; common medium distinct reddish yellow (5YR 6/8) mottles; weak coarse subangular blocky structure; very hard, firm; few fine roots; patchy clay films on surfaces of peds; few pockets of uncoated sand; few neutral salts; few fine black concretions; very strongly acid.

The solum is more than 60 inches thick. Weighted average clay content of the upper 20 inches of the argillic horizon ranges from 35 to 45 percent.

The A horizon is dark brown or dark yellowish brown. The E horizon is 1 or 2 units of value higher than the A horizon. Strong brown mottles range from none to common in these horizons. Combined thickness of the A and E horizons ranges from 20 to 30 inches. Reaction is strongly acid or moderately acid.

The B/E horizon is 1 to 5 inches thick. The B material is sandy clay loam in colors of the Bt horizons. The E material consists of tongues, interfingers, and pockets of loamy fine sand in colors of the overlying E horizon. Reaction ranges from very strongly acid to moderately acid.

The Bt horizon is grayish brown or light brownish gray clay loam or sandy clay loam that has common to many red, yellowish red, reddish yellow, strong brown, and yellowish brown mottles. Some pedons have few streaks and pockets of pale brown uncoated sand. Reaction ranges from very strongly acid to moderately acid.

Silawa Series

The Silawa series consists of very deep, well drained, moderately permeable soils on high stream terraces. These soils formed in stratified sandy and loamy sediments. Slopes range from 5 to 12 percent.

Typical pedon of Silawa fine sandy loam, 5 to 12 percent slopes; from the intersection of U.S. Highway 75 and Farm Road 833 about 8 miles northwest of Fairfield, 2.75 miles east on Farm Road 833, 2.9 miles northwest on county road, and 75 feet east in woodland:

A—0 to 3 inches; dark brown (10YR 4/3) fine sandy loam; weak fine subangular blocky structure; slightly hard, very friable; many fine, medium, and coarse roots; strongly acid; clear wavy boundary.

E—3 to 8 inches; pale brown (10YR 6/3) fine sandy loam; weak fine subangular blocky structure; slightly hard, very friable; common fine, medium, and coarse roots; moderately acid; clear wavy boundary.

Bt1—8 to 14 inches; yellowish red (5YR 4/6) sandy clay loam; moderate medium subangular blocky structure; very hard, firm; common fine and medium roots; nearly continuous clay films on surfaces of peds; very strongly acid; gradual wavy boundary.

Bt2—14 to 29 inches; yellowish red (5YR 4/6) sandy clay loam; moderate medium subangular blocky structure; hard, friable; common fine, medium, and coarse roots; patchy clay films on surfaces of peds; very strongly acid; gradual wavy boundary.

BC—29 to 41 inches; yellowish red (5YR 5/8) sandy clay loam; weak medium subangular blocky structure; hard, friable; common fine roots; few patchy clay films on surfaces of peds; about 30 percent by volume discontinuous strata and pockets of light yellowish brown (10YR 6/4), yellowish brown (10YR 5/8), and red (2.5YR 4/8) sandy material; strongly acid; gradual wavy boundary.

C—41 to 60 inches; brownish yellow (10YR 6/6) fine sandy loam interbedded with about 30 percent by volume strata of very pale brown (10YR 7/4) loamy fine sand; massive; slightly hard, very friable; few crystals of white neutral salts; slightly acid.

The solum is 40 to 60 inches thick. Base saturation ranges from 35 to 75 percent in the Bt horizons.

The A horizon is dark brown or dark yellowish brown. Most pedons have an E horizon that is 1 or 2 units of value higher than the A horizon. Combined thickness of the A and E horizons ranges from 6 to 12 inches. Reaction ranges from strongly acid to slightly acid.

The Bt horizon is yellowish red, red, or reddish yellow. Reaction is very strongly acid or strongly acid.

The BC horizon is yellowish red, reddish yellow, or red sandy clay loam or fine sandy loam. Unweathered sandy and loamy materials in shades of yellow and brown make up as much as 35 percent of this horizon. Reaction is strongly acid or moderately acid.

The C horizon is made up of stratified sandy and loamy materials in colors of brownish yellow, yellowish brown, very pale brown, and red. Reaction ranges from strongly acid to slightly acid.

Silstid Series

The Silstid series consists of very deep, well drained, moderately permeable soils on uplands. These soils formed in sandy sediments. Slopes range from 1 to 8 percent.

Typical pedon of Silstid loamy fine sand, 1 to 5 percent slopes; from the intersection of Farm Road 80 and U.S. Highway 84 about 1 mile northwest of Teague, 1.25 miles west on U.S. Highway 84, and 60 feet north in pasture:

A—0 to 10 inches; brown (10YR 5/3) loamy fine sand; single grained; loose, very friable; many fine and medium roots; neutral; clear smooth boundary.

E—10 to 22 inches; pale brown (10YR 6/3) loamy fine sand; single grained; loose, very friable; many fine and medium roots; slightly acid; clear smooth boundary.

Bt1—22 to 52 inches; yellowish brown (10YR 5/4) sandy clay loam; few medium distinct reddish brown (5YR 5/4) mottles; moderate medium subangular blocky structure; slightly hard, friable; common fine roots; patchy clay films on surfaces of peds; slightly acid; clear smooth boundary.

Bt2—52 to 62 inches; strong brown (7.5YR 5/6) sandy clay loam; common medium distinct reddish yellow (5YR 6/8) and few fine faint brown mottles; weak coarse subangular blocky structure; slightly hard, friable; few fine roots; thin patchy clay films on surfaces of peds; slightly acid.

The solum is more than 60 inches thick.

The A horizon is dark brown, brown, or dark grayish brown. The E horizon is 1 to 2 units of value higher than the A horizon. Combined thickness of the A and E horizons ranges from 20 to 40 inches. Reaction ranges from moderately acid to neutral.

The Bt horizon is yellowish brown, strong brown, reddish yellow, brownish yellow, or light yellowish brown. Red, pale brown, dark brown, and yellowish red mottles range from none to many. Reaction ranges from very strongly acid to slightly acid.

Styx Series

The Styx series consists of very deep, well drained, moderately permeable soils on stream terraces. These soils formed in sandy and loamy alluvial sediments. Slopes range from 0 to 3 percent.

Typical pedon of Styx loamy fine sand, 0 to 3 percent slopes; from the intersection of U.S. Highway 75 and Farm Road 833 about 8 miles northwest of Fairfield, 2.75 miles east on Farm Road 833, 3.25 miles northwest on county road, and 50 feet west in pasture:

A—0 to 6 inches; dark yellowish brown (10YR 4/4) loamy fine sand; weak fine subangular blocky structure; soft, very friable; common fine and medium roots; slightly acid; clear wavy boundary.

E1—6 to 23 inches; brown (10YR 5/3) loamy fine sand; single grained; soft, very friable; common fine roots; slightly acid; clear wavy boundary.

E2—23 to 33 inches; yellowish brown (10YR 5/4) loamy fine sand; weak fine subangular blocky structure; loose, very friable; common fine roots; moderately acid; clear wavy boundary.

Bt1—33 to 42 inches; yellowish brown (10YR 5/8) sandy clay loam; few fine faint strong brown mottles; weak medium subangular blocky structure; hard, friable; common fine roots; patchy clay films on surfaces of peds; slightly acid; clear wavy boundary.

Bt2—42 to 62 inches; mottled red (2.5YR 4/6) and yellowish red (5YR 5/8) sandy clay loam; moderate medium prismatic structure parting to weak medium subangular blocky; hard, friable; common fine roots; patchy clay films on surfaces of peds; coatings 1 to 3 millimeters thick of light brownish gray (10YR 6/2) uncoated sand grains on vertical ped faces; slightly acid; gradual wavy boundary.

BC—62 to 80 inches; mottled yellowish red (5YR 5/6) and strong brown (7.5YR 5/8) sandy clay loam; weak medium prismatic structure; hard, friable; few fine roots; patchy clay films on surfaces of peds; few mica flakes; 5 to 10 percent coatings and small pockets of pale brown (10YR 6/3) uncoated sand grains; slightly acid.

The solum is more than 60 inches thick.

The A horizon is dark yellowish brown, brown, or dark brown. The E horizon is 1 or 2 units of value higher than the A horizon. Reaction ranges from moderately acid to neutral. Combined thickness of the A and E horizons ranges from 21 to 40 inches.

The Bt1 horizon is yellowish brown, brownish yellow, or reddish yellow sandy clay loam or clay loam. The Bt2 and BC horizons have the same colors as the Bt1 horizon with many red, gray, light brownish gray, and yellowish red mottles, or the matrix is mottled in these colors. Vertical streaks and pockets of light brownish gray or pale brown uncoated sand range from 0 to 10 percent in the Bt2 and BC horizons. Reaction ranges from strongly acid to slightly acid.

Tabor Series

The Tabor series consists of very deep, moderately well drained, very slowly permeable soils on broad upland divides and high stream terraces. These soils formed in clayey and loamy sediments. Slopes range from 0 to 3 percent.

Typical pedon of Tabor fine sandy loam, 1 to 3 percent slopes; from the intersection of Interstate 45 west service road and Texas Highway 179 in Dew, 1.5 miles west on Texas Highway 179, 0.4 mile southeast on county road, and 75 feet northeast in pasture:

Ap—0 to 5 inches; dark brown (10YR 4/3) fine sandy loam; weak fine subangular blocky structure; hard, very friable; common fine and medium roots; strongly acid; clear smooth boundary.

A1—5 to 12 inches; dark brown (10YR 4/3) fine sandy loam; common fine and medium faint dark brown (7.5YR 4/4) mottles; weak medium subangular blocky structure; hard, very friable; common fine and medium roots; moderately acid; clear wavy boundary.

Bt1—12 to 17 inches; yellowish brown (10YR 5/6) clay; common fine and medium distinct light brownish gray (10YR 6/2) and many fine and

medium prominent red (2.5YR 4/8) mottles; weak medium angular blocky structure; very hard, very firm; common fine and medium roots; few fine quartz pebbles; common pressure faces; strongly acid; clear wavy boundary.

Bt2—17 to 31 inches; yellowish brown (10YR 5/6) clay; common coarse distinct dark grayish brown (2.5Y 4/2) and few medium distinct yellowish red (5YR 5/8) mottles; weak medium angular blocky structure; very hard, very firm; common fine roots; common slickensides; few fine soft black masses; neutral; gradual wavy boundary.

Bt3—31 to 48 inches; light olive brown (2.5Y 5/4) clay; many coarse distinct dark grayish brown (2.5Y 4/2) mottles; weak medium and coarse angular blocky structure; very hard, very firm; few fine roots; common pressure faces; few slickensides; few fine black concretions and soft masses; slightly alkaline; gradual wavy boundary.

BC—48 to 64 inches; mottled brownish yellow (10YR 6/8), red (2.5YR 4/8), and light brownish gray (10YR 6/2) clay loam; weak coarse angular blocky and subangular blocky structure; very hard, firm; few fine roots; few fine black concretions and soft masses; few fine concretions of calcium carbonate; about 30 percent shale that has clay loam texture; moderately alkaline; gradual wavy boundary.

C—64 to 80 inches; light brownish gray (10YR 6/2) clay loam; many medium distinct brownish yellow (10YR 6/8) and common medium prominent red (2.5YR 4/8) mottles; massive; hard, firm; moderately alkaline.

The solum is more than 60 inches thick. Potential linear extensibility of the upper 50 inches is greater than 6 centimeters. A few siliceous pebbles are in most pedons.

The A horizon is dark brown, brown, dark grayish brown, or grayish brown. An E horizon that is 1 or 2 units of value higher than the A horizon is in some pedons. Combined thickness of the A and E horizons ranges from 11 to 18 inches. Reaction ranges from strongly acid to slightly acid.

The Bt horizon is yellowish brown, brownish yellow, or light olive brown, with mottles in these colors as well as light brownish gray, light gray, grayish brown, gray, brown, dark yellowish brown, dark grayish brown, yellowish red, and red. Black concretions and soft masses range from none to few in these layers. Reaction ranges from very strongly acid to strongly acid in the upper part of the Bt horizon, and from strongly acid to slightly alkaline in the lower part.

Most pedons have a BC horizon that has the colors of the Bt horizon. It is clay loam, sandy clay, or sandy clay loam. Unweathered light brownish gray, brownish yellow, and red shaly materials make up as much as 35 percent of this layer. Most pedons have few black concretions and soft masses as well as few concretions and soft masses of calcium carbonate. Reaction ranges from neutral to moderately alkaline.

The C horizon is light brownish gray or light gray sandy clay, clay, sandy clay loam, or clay loam that has red, yellowish red, reddish yellow, brownish yellow, and yellowish brown mottles. Some pedons have interbedded shaly materials. Most pedons have few gypsum crystals and concretions of calcium carbonate.

Tonkawa Series

The Tonkawa series consists of very deep, excessively drained, rapidly permeable soils on uplands. These soils formed in thick sandy sediments. Slopes range from 1 to 15 percent.

Typical pedon of Tonkawa fine sand, 1 to 8 percent slopes; from the intersection of Farm Road 489 and Farm Road 1848 about 5 miles east of Dew, 2.0 miles south on Farm Road 1848, 2.8 miles east and 0.9 mile south on county road, and 2,000 feet east in pasture:

A—0 to 6 inches; dark brown (10YR 4/3) fine sand; single grained; loose, very friable; common fine roots; moderately acid; gradual wavy boundary.

C1—6 to 60 inches; very pale brown (10YR 7/4) fine sand; single grained; loose; very friable; common fine roots decreasing to few in lower part; strongly acid; gradual wavy boundary.

C2—60 to 80 inches; very pale brown (10YR 8/3) fine sand; single grained; loose, very friable; few fine roots; strongly acid.

The thickness of the sand exceeds a depth of 80 inches.

The A horizon is brown, dark brown, or grayish brown. It ranges from 3 to 20 inches thick.

The C horizon is very pale brown, yellowish brown, brownish yellow, or white. Some pedons have a few thin reddish lamellae below a depth of 72 inches.

Trinity Series

The Trinity series consists of very deep, somewhat poorly drained, very slowly permeable soils on the flood plains of the Trinity River and its large tributaries.

These soils formed in alkaline clayey alluvium. Slope is less than 1 percent.

Typical pedon of Trinity clay, frequently flooded; from the intersection of Farm Road 488 and U.S. Highway 287 about 19 miles north of Fairfield, 1.5 miles southeast on U.S. Highway 287, 250 feet north on private gravel road, and 100 feet east in hardwoods:

A1—0 to 7 inches; very dark gray (10YR 3/1) clay; moderate medium angular blocky structure; extremely hard, extremely firm; common fine, medium, and coarse roots; common pressure faces; calcareous; moderately alkaline; clear wavy boundary.

A2—7 to 36 inches; very dark gray (5Y 3/1) clay; weak coarse prismatic structure parting to moderate medium and coarse angular blocky; extremely hard, extremely firm; common fine, medium, and coarse roots; common pressure faces; common slickensides that begin intersecting at 25 inches; calcareous; moderately alkaline; gradual wavy boundary.

Bw1—36 to 51 inches; dark gray (5Y 4/1) clay; common fine distinct strong brown (7.5YR 5/6) mottles; weak coarse prismatic structure parting to moderate coarse angular blocky; extremely hard, extremely firm; common fine and medium roots; common intersecting slickensides; few very fine concretions of calcium carbonate; calcareous; moderately alkaline; gradual wavy boundary.

Bw2—51 to 67 inches; dark gray (5Y 4/1) clay; common fine distinct light olive brown (2.5Y 5/6) mottles; weak coarse prismatic structure parting to moderate coarse angular blocky; extremely hard, extremely firm; few fine and medium roots; many intersecting slickensides; few fine concretions of calcium carbonate; calcareous; moderately alkaline; clear wavy boundary.

Bw3—67 to 80 inches; dark grayish brown (10YR 4/2) clay; common fine distinct light olive brown (2.5Y 5/6) mottles; moderate coarse angular blocky structure; extremely hard, extremely firm; few fine roots; about 2 percent fine concretions of calcium carbonate; calcareous; moderately alkaline.

The solum is more than 60 inches thick. Clay content ranges from 60 to 75 percent. Concretions of calcium carbonate range from none to common. Reaction is slightly or moderately alkaline.

The A horizon is very dark gray or black. Most pedons have few to common mottles of yellowish brown or brown below a depth of 20 inches. Depth to horizons having values greater than 3.5 or chromas greater than 1.5 exceeds 30 inches. Intersecting slickensides begin below a depth of 24 inches and typically increase in size and abundance with depth.

The Bw horizon is very dark grayish brown, dark gray, or dark grayish brown. Mottles of yellowish brown, brown, or strong brown range from few to common.

Whitesboro Series

The Whitesboro series consists of very deep, well drained, moderately permeable soils on the flood plains of streams. These soils formed in loamy alluvial sediments. Slopes are less than 1 percent.

Typical pedon of Whitesboro clay loam, frequently flooded; from the intersection of Texas Highway 14 and Farm Road 27 in Wortham, 2.75 miles east on Farm Road 27, 1.6 miles northeast on county road, and 170 feet southeast in woodland:

A1—0 to 3 inches; very dark grayish brown (10YR 3/2) clay loam; moderate fine granular structure; slightly hard, friable; many fine and medium roots; slightly alkaline; clear smooth boundary.

A2—3 to 32 inches; very dark grayish brown (10YR 3/2) clay loam; moderate medium subangular blocky structure; slightly hard, friable; many fine and medium roots; slightly alkaline; clear smooth boundary.

A3—32 to 45 inches; black (10YR 2/1) clay loam; moderate medium subangular blocky structure; slightly hard, friable; common fine roots; neutral; clear smooth boundary.

Bw—45 to 60 inches; dark grayish brown (2.5Y 4/2) clay loam; weak coarse angular blocky structure; slightly hard, friable; few fine roots; few thin strata of horizontally bedded fine sandy loam; slightly alkaline.

Thickness of surface horizons having moist color values less than 3.5 ranges from 26 to more than 60 inches.

The A horizon is very dark grayish brown, dark brown, very dark brown, very dark gray, or black. Surface texture is fine sandy loam or clay loam. In pedons where the surface layer is fine sandy loam, thickness of this horizon ranges from 10 to 15 inches. Reaction ranges from neutral to slightly alkaline.

The Bw and C horizons have the same colors as the A horizon in addition to dark grayish brown and dark brown. Some pedons have few mottles of brown, dark brown, and strong brown. Texture is dominantly

clay loam. Some pedons have thin strata of fine sandy loam, loam, sandy clay loam, or clay. Reaction ranges from neutral to moderately alkaline.

Wilson Series

The Wilson series consists of very deep, moderately well drained, very slowly permeable soils on stream terraces. These soils formed in alkaline clayey sediments. Slopes range from 0 to 3 percent.

Typical pedon of Wilson silty clay loam, 0 to 1 percent slopes; from the intersection of Farm Road 27 and Farm Road 246 about 2 miles east of Wortham, 0.7 mile southeast on Farm Road 27; 1.3 miles southwest on county road; 1.1 miles northwest on county road, and 75 feet south in pasture:

A—0 to 4 inches; very dark gray (10YR 3/1) silty clay loam; weak fine subangular blocky structure when moist, massive when dry; very hard, firm; many fine and medium roots; few very fine siliceous pebbles; moderately acid; abrupt wavy boundary.

Btg1—4 to 26 inches; very dark gray (10YR 3/1) clay; moderate medium subangular blocky structure; extremely hard, very firm; common fine roots; few vertical cracks filled with dark gray material from A horizon; few fine brown concretions; few fine siliceous pebbles; slightly alkaline; gradual wavy boundary.

Btg2—26 to 35 inches; gray (10YR 5/1) clay; moderate medium angular blocky structure; extremely hard, very firm; few fine roots; few pressure faces; few fine black concretions; few fine siliceous pebbles; moderately alkaline; gradual wavy boundary.

BCg—35 to 62 inches; grayish brown (2.5Y 5/2) clay; common medium distinct yellowish brown (10YR 5/4) mottles; moderate medium angular blocky structure; extremely hard, very firm; few fine roots; few fine gypsum crystals; few fine concretions of calcium carbonate; few fine siliceous pebbles; moderately alkaline; gradual smooth boundary.

C—62 to 65 inches; light brownish gray (2.5Y 6/2) clay; common medium distinct yellowish brown (10YR 5/4) mottles; massive; extremely hard, very firm; few medium soft masses of calcium carbonate; few fine black concretions; moderately alkaline.

The solum is 60 to more than 80 inches thick. Cracks up to 0.75 inch wide extend from the top of the Btg1 horizon to a depth of 24 inches or more during dry periods. The gray and grayish brown colors are considered to be relict and not due to current wetness conditions.

The A horizon is very dark gray, very dark grayish brown, or black. It typically ranges from 4 to 10 inches thick, but can be as much as 15 inches thick over subsoil troughs. Reaction ranges from moderately acid to neutral.

The Btg1 horizon is black or very dark gray. Reaction ranges from neutral to moderately alkaline.

The Btg2 horizon is dark gray, gray, dark grayish brown, light brownish gray, or grayish brown. Mottles of these colors as well as very dark grayish brown, olive, light olive brown, olive brown, light yellowish brown, and yellowish brown range from none to common. Reaction is slightly alkaline or moderately alkaline.

The BCg and C horizons have the same colors as the Btg2 horizon but have a larger number of mottles.

Wolfpen Series

The Wolfpen series consists of very deep, well drained, moderately permeable soils on uplands. These soils formed in sandy sediments. Slopes range from 1 to 15 percent.

Typical pedon of Wolfpen loamy fine sand, 1 to 5 percent slopes; from the intersection of Farm Road 489 and U.S. Highway 84 about 13 miles east of Fairfield, 3.1 miles southeast on U.S. Highway 84, 0.4 mile north on county road, 0.6 mile northeast on county road, and 100 feet south in pasture:

A—0 to 10 inches; brown (10YR 5/3) loamy fine sand; weak medium subangular blocky structure; soft, very friable; common fine roots; few fine ironstone pebbles; moderately acid; clear smooth boundary.

E—10 to 33 inches; light yellowish brown (10YR 6/4) loamy fine sand; weak fine subangular blocky structure; soft, very friable; common fine roots; few fine ironstone pebbles; slightly acid; clear wavy boundary.

Bt1—33 to 47 inches; yellowish brown (10YR 5/6) sandy clay loam; few medium prominent yellowish red (5YR 5/6) and red (2.5YR 5/8) mottles; weak medium subangular blocky structure; hard, friable; few fine roots; patchy clay films on surfaces of peds; strongly acid; clear smooth boundary.

Bt2—47 to 56 inches; yellowish brown (10YR 5/8) sandy clay loam; few medium prominent red

(2.5YR 5/8) and few fine faint gray mottles; weak medium subangular blocky structure; hard, friable; few fine roots; patchy clay films on surfaces of peds; strongly acid; gradual wavy boundary.

Bt3—56 to 80 inches; mottled red (2.5YR 4/8), yellowish red (5YR 5/8), and light gray (10YR 6/1) sandy clay loam; weak coarse subangular blocky structure; hard, friable; common fine roots; few fine ironstone pebbles; patchy clay films on surfaces of peds; few streaks of pale brown (10YR 6/3) uncoated sand; very strongly acid.

The solum is more than 60 inches thick. Ironstone pebbles range from none to few.

The A horizon is dark brown, brown, or dark yellowish brown. The E horizon is 1 or 2 units of value higher than the A horizon. Combined thickness of the A and E horizons ranges from 20 to 40 inches. Reaction ranges from moderately acid to slightly acid.

The upper part of the Bt horizon is yellowish brown, brownish yellow, or strong brown sandy clay loam or clay loam. Red and yellowish red mottles range from few to common. The lower part of the Bt horizon has gray, light brownish gray, and grayish brown mottles as well, or the matrix is mottled in these colors. Streaks and pockets of pale brown uncoated sand range from 0 to 10 percent by volume in the lower part of the Bt horizon. Reaction of the Bt horizon ranges from very strongly acid to slightly acid.

Formation of the Soils

In this section the factors of soil formation are discussed and related to the soils in the survey area. In addition, the processes of horizon differentiation and surface geology are described.

Factors of Soil Formation

The characteristics of the soil at any given point are determined by the physical and mineral composition of the parent material; the climate under which the parent material accumulated and has existed since accumulation; the plant and animal life on and in the soil; the relief, or lay of the land; and the length of time the forces of soil formation have acted on the soil material. All five of these factors influence the present characteristics of every soil, but the significance of each factor varies from one place to another. In one area, one factor may dominate the formation of a soil, and in another area a different factor may be more important.

The interrelationship among these five factors is complex, and the effects of any one factor cannot be isolated and completely evaluated.

Parent Material

Parent material is the unconsolidated mass from which a soil forms. It greatly influences the chemical and mineral content of the soil. In Freestone County, the parent material consists of unconsolidated sediments of Eocene, Pleistocene, and Holocene age. The section titled “Surface Geology” gives general information on the physical and chemical characteristics of the geologic formations in which the soils in the county formed, and relates each formation to the soils that are typically associated with it.

Climate

Freestone County has a warm and humid climate, which influences soil development mainly through the amount and distribution of rainfall. The moderate amount of rainfall promotes rapid soil development. Climate is uniform throughout the area, although its effect on the formation of soils is modified locally by runoff. The differences between the soils within the survey area are not directly attributed to climatic differences.

Plant and Animal Life

In Freestone County, plants, animals, micro-organisms, earthworms, and other forms of living organisms have contributed to the development of the soils. Gains in organic matter and nitrogen in the soil, gains or losses in plant nutrients, and changes in structure and porosity are some of the changes caused by plant and animal life.

Vegetation, dominantly trees, has affected soil formation in the survey area more than animals. Soils that form under trees are generally low in organic-matter content.

Relief

Relief or topography affects soil formation through its effect on drainage, erosion, plant cover, and soil temperature.

In Freestone County, the degree of profile development or horizonation, depends mainly on slope. The nearly level Derly soils, receive excess water and have developed gleyed characteristics. Because this soil is somewhat poorly drained and has wet characteristics, it has horizons that show little development. Soils in more sloping areas, such as Wolfpen, Gasil, and Crockett soils, exhibit characteristics of better drained soils which have distinct horizonation throughout. Soils that have steep slopes, such as Cuthbert soils, in the eastern part of the county, have very distinct horizonation. Plant cover is thinner than normal in many of the more sloping areas. The risk of erosion is increased, and the soils are developed to a lesser depth than those in other, less sloping areas.

Time

The length of time that the soil-forming factors have acted on the parent material determines, to a large degree, the characteristics of the soil. The differences in the length of time that the parent material has been in place are commonly reflected in the degree of development of soil horizons. Young

soils have very little horizon development, and old soils have well-expressed horizons. In Freestone County, Trinity and Kaufman soils are examples of young soils. These soils retain most of the characteristics of their clayey parent material. Cuthbert soils are an example of older soils that have well developed horizons. The Cuthbert soils have distinct A and Bt horizons that bear little resemblance to the original parent material.

Processes of Horizon Differentiation

Several processes were involved in the formation of horizons in the soils of Freestone County: accumulation of organic matter, leaching of calcium carbonates and bases, and formation and translocation of silicate clay minerals. In most soils, more than one of these processes have been active in the development of horizons.

Accumulation of organic matter in the upper part of the profile helps to form an A horizon. The soils in the survey area range from low to medium in organic matter content.

Leaching of carbonates and bases has occurred in most of the soils. The amount of rainfall has been great enough to cause this leaching, and this condition contributes to the formation of horizons. Once this leaching has taken place, the soils tend to become acid.

In many soils of the survey area, such as Crockett, Edge, and Cuthbert soils, the downward translocation of clay minerals has contributed to horizon development. The Bt horizon contains appreciably more silicate clay than the A horizon.

Prior to the downward movement of silicate clays, the parent materials were leached of some carbonates and soluble salts. The leaching and movement of these materials are among the more important processes in horizon development in the soils of the survey area.

Surface Geology

Freestone County is located on the western flank of the East Texas Embayment *(5)*. This geologic structure is a large syncline (a unit of folded strata that is concave upward) within the Gulf Coastal Plain Geomorphic Province. The strike and dip of the Eocene-age strata in Freestone and surrounding counties are governed by this feature. The strike of the strata is generally north-northeast as is the general orientation of the outcrops. The dip of these strata ranges from east to east-southeast at 20 to 100 feet per mile *(10, 12)*. The dip and thickness of a geologic formation generally determines the outcrop width. Formation strike, dip, thickness, and lithology determine outcrop patterns, locations, and orientations which likewise influence soil parent material.

A salt dome in extreme southeastern Freestone County, known as Butler Dome, uplifted and drastically altered the strike and dip of strata in the local area. Local faulting associated with the dome occurred. Faulting is also mapped within the Wills Point Formation in the northwestern part of the county *(12)*. Faults have only local effects on soils in Freestone County.

Soils in the county developed from Cretaceous and Eocene age strata, and in Pleistocene and Holocene fluvial sediments *(5, 10, 11, 12)*. Cretaceous strata uplifted and cropping out in concentric rings around the Butler Dome have only local influence on soil parent material. However, Eocene strata crop out throughout the county, consequently having a widespread affect on soil development.

The Wills Point Formation, uppermost formation in the Midway Group, is the oldest Eocene-age formation cropping out in Freestone County. Its outcrop is in the northwestern part of the county. The Crockett general soil map unit generally corresponds to the outcrop of the Wills Point Formation. It is dominantly massive, poorly bedded, silty claystone containing significant fine-grained sand near its contact with the overlying Hooper Formation. The major soils on this formation are Crockett, Mabank, and Wilson.

The Wilcox Group outcrop occurs adjacent to, and southeast of, the Wills Point Formation. From oldest to youngest, the Wilcox Group is comprised of the Hooper Formation, Simsboro Formation, and Calvert Bluff Formation. Collectively, these formations crop out on about 70 percent of the upland area of the county. The Hooper and Calvert Bluff formations are lithologically similar. They are dominantly mudstone with lenses of sandstone. Glauconite and ironstone concretions are locally present. Edge and Tabor soils developed on the Hooper and Calvert Bluff formations. The Edge-Tabor general soil map unit generally corresponds to the outcrops of these formations. Lignite is minor in the Hooper Formation. However, economically important lignite seams, 1 foot to 20 feet thick, are in the lower part of the Calvert Bluff Formation. The Bigbrown general soil map unit mostly delineates soils reclaimed after lignite surface mining. The Simsboro Formation, between the Hooper and Calvert Bluff formations, is mainly poorly indurated sand, mudstone, and mudstone

conglomerate from which Silstid, Padina, and Arenosa soils were formed. Most of the Padina-Silstid general soil map unit overlies the Simsboro Formation.

The Carrizo Sand outcrop is a band about 0.25 mile to 4 miles wide and lies east and southeast of the Hooper Formation *(11)*. It is dominantly very fine-grained sand with interbedded thin lenses of silty clay *(3)*. Pickton and Wolfpen soils developed over the Carrizo Sand. Parts of the Padina-Silstid, Wolfpen-Cuthbert-Pickton and Pickton-Tonkawa general soil map units correspond to the Carrizo Sand outcrop.

The Reklaw Formation outcrop is in southern and southeastern Freestone County. The lower Newby Member and the upper Marquez Member comprise the formation. The Newby Member is mostly quartz sand and glauconitic clay. The Marquez Member is clay and silt with lentils of glauconite and ironstone *(3)*. Cuthbert, Kirvin, and Oakwood soils are major soils formed over the Reklaw Formation. The Oakwood-Kirvin and Cuthbert general soil map units and parts of the Wolfpen-Cuthbert-Pickton general soil map unit correspond to the Reklaw Formation outcrop.

The Queen City Sand is the youngest Eocene formation cropping out in the county. It is mainly fine-grained quartz sand with thin lenses of glauconitic clay and silt. Wolfpen, Pickton, and Tonkawa soils developed over this formation. Parts of the Wolfpen-Cuthbert-Pickton and Pickton-Tonkawa general soil map units correspond to the Queen City Sand outcrop.

During the Pleistocene time, the Trinity River deposited flood plain sediments that are now manifested as isolated terrace remnants. These relict Pleistocene terraces are on areas adjacent to and above Holocene flood plain elevations of the Trinity River and major creeks. Sediments supporting these surface remnants are highly diverse, ranging from sand to clay. Axtell, Bienville, Burleson, Derly, Rader, Silawa, and Styx soils formed in these sediments. The Rader-Derly-Axtell and Burleson-Wilson general soil map units and parts of the Silawa-Gasil-Tabor general soil map unit correspond to Pleistocene terrace areas.

Incisement of the Trinity River channel and differential erosion of the Pleistocene flood plain resulted in Holocene sediment deposition below the older terrace remnants. Holocene deposition also occurs on the flood plains of Tehuacana Creek, Caney Creek, Cottonwood Creek, and other smaller streams in the county.

Characteristics of flood plain sediments vary according to their origin. The Trinity River flood plain is made up of alkaline clayey sediments derived primarily from the Blackland Prairies. Major soils formed in these sediments are Trinity and Kaufman. These soils make up the majority of the Kaufman-Trinity general soil map unit. Upper Tehuacana Creek drains mixed clayey and loamy upland soils; consequently its flood plain deposition is dominantly neutral, loamy sediments. Soils of the Whitesboro general soil map unit formed in these sediments. Other major creeks in the county drain mixed sandy and loamy uplands. Deposition on their flood plains is mainly acid to neutral, sandy and loamy sediments. Soils of the Nahatche-Hatliff general soil map unit formed on these flood plains.

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Glossary

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Animal unit month (AUM). The amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

Aquic conditions. Current soil wetness characterized by saturation, reduction, and redoximorphic features.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Argillic horizon. A subsoil horizon characterized by an accumulation of illuvial clay.

Association, soil. A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Back slope. The geomorphic component that forms the steepest inclined surface and principal element of many hillsides. Back slopes in profile are commonly steep, are linear, and may or may not include cliff segments.

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Bedding planes. Fine strata, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediment.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bottom land. The normal flood plain of a stream, subject to flooding.

Brush management. Use of mechanical, chemical, or biological methods to make conditions favorable for reseeding or to reduce or eliminate competition from woody vegetation and thus allow understory grasses and forbs to recover. Brush management increases forage production and thus reduces the hazard of erosion. It can improve the habitat for some species of wildlife.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Canopy. The leafy crown of trees or shrubs. (See Crown.)

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Chemical treatment. Control of unwanted vegetation

through the use of chemicals.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Climax plant community. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse textured soil. Sand or loamy sand.

Cobble (or cobblestone). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Colluvium. Soil material or rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Compressible (in tables). Excessive decrease in volume of soft soil under load.

Concretions. Cemented bodies with crude internal symmetry organized around a point, a line, or a plane. They typically take the form of concentric layers visible to the naked eye. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up concretions. If formed in place, concretions of iron oxide or manganese oxide are generally considered a type of redoximorphic concentration.

Conservation cropping system. Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the effects of the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil. Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to compression. Terms describing consistence are defined in the “Soil Survey Manual.”

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosion. Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cropping system. Growing crops according to a planned system of rotation and management practices.

Crop residue management. Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

Crown. The upper part of a tree or shrub, including the living branches and their foliage.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Dense layer (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depth, soil. Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized—*excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained,* and *very poorly drained*. These classes are defined in the "Soil Survey Manual."

Drainage, surface. Runoff, or surface flow of water, from an area.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as a fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity*.

Fine textured soil. Sandy clay, silty clay, or clay.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Forb. Any herbaceous plant not a grass or a sedge.

Forest cover. All trees and other woody plants (underbrush) covering the ground in a forest.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gilgai. Commonly, a succession of microbasins and microknolls in nearly level areas or of microvalleys and microridges parallel with the slope. Typically, the microrelief of clayey soils that shrink and swell considerably with changes in moisture content.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 35 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.

Ground water. Water filling all the unblocked pores of the material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

High-residue crops. Such crops as small grain and

corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.

Hill. A natural elevation of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline; hillsides generally have slopes of more than 15 percent. The distinction between a hill and a mountain is arbitrary and is dependent on local usage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the "Soil Survey Manual." The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff potential. The soil properties that influence this potential are those that affect the minimum rate of water infiltration on a bare soil during periods after prolonged wetting when the soil is not frozen. These properties are depth to a seasonal high water table, the infiltration rate and permeability after prolonged wetting, and depth to a very slowly permeable layer. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intermittent stream. A stream, or reach of a stream, that flows for prolonged periods only when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, plants invade following disturbance of the surface.

Knoll. A small, low, rounded hill rising above adjacent landforms.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Low-residue crops. Such crops as corn used for silage, peas, beans, and potatoes. Residue from these crops is not adequate to control erosion until the next crop in the rotation is established. These crops return little organic matter to the soil.

Low strength. The soil is not strong enough to support loads.

Marl. An earthy, unconsolidated deposit consisting chiefly of calcium carbonate mixed with clay in approximately equal amounts.

Masses. Concentrations of substances in the soil matrix that do not have a clearly defined boundary with the surrounding soil material and cannot be removed as a discrete unit. Common compounds making up masses are calcium carbonate, gypsum or other soluble salts, iron oxide, and manganese oxide. Masses consisting of iron oxide or manganese oxide generally are considered a type of redoximorphic concentration.

Mechanical treatment. Use of mechanical equipment for seeding, brush management, and other management practices.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Mollic epipedon. A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Descriptive terms are as follows: abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse,* more than 15 millimeters (about 0.6 inch).

Mudstone. Sedimentary rock formed by induration of silt and clay in approximately equal amounts.

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR $^{6}/_{4}$ is a color with hue of 10YR, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value of 6.6 to 7.3. (See Reaction, soil.)

Nodules. Cemented bodies lacking visible internal structure. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up nodules. If formed in place, nodules of iron oxide or manganese oxide are considered types of redoximorphic concentrations.

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Very low	less than 0.5 percent
Low	0.5 to 1.0 percent
Moderately low	1.0 to 2.0 percent
Moderate	2.0 to 4.0 percent
High	4.0 to 8.0 percent
Very high	more than 8.0 percent

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan*.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called “a soil.” A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water

through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affects the specified use.

Permeability. The quality of the soil that enables water or air to move downward through the profile. The rate at which a saturated soil transmits water is accepted as a measure of this quality. In soil physics, the rate is referred to as "saturated hydraulic conductivity," which is defined in the "Soil Survey Manual." In line with conventional usage in the engineering profession and with traditional usage in published soil surveys, this rate of flow continues to be expressed as "permeability." Terms describing permeability, measured in inches per hour, are as follows:

Extremely slow	0.0 to 0.01 inch
Very slow	0.01 to 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plinthite. The sesquioxide-rich, humus-poor, highly weathered mixture of clay with quartz and other diluents. It commonly appears as red mottles, usually in platy, polygonal, or reticulate patterns. Plinthite changes irreversibly to an ironstone hardpan or to irregular aggregates on repeated wetting and drying, especially if it is exposed also to heat from the sun. In a moist soil, plinthite can be cut with a spade. It is a form of laterite.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid or very rapid permeability, the soil may not adequately filter effluent from a waste disposal system.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Potential native plant community. See Climax plant community.

Potential rooting depth (effective rooting depth). Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Prescribed burning. Deliberately burning an area for specific management purposes, under the appropriate conditions of weather and soil moisture and at the proper time of day.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Proper grazing use. Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This practice increases the vigor and reproduction capacity of the key plants and promotes the accumulation of litter and mulch necessary to conserve soil and water.

Range condition. The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor on the basis of how much the present plant community has departed from the potential.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Range site. An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to

pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Ultra acid	less than 3.5
Extremely acid	3.5 to 4.4
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Rill. A steep-sided channel resulting from accelerated erosion. A rill generally is a few inches deep and not wide enough to be an obstacle to farm machinery.

Road cut. A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Saturation. Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by induration of a clay, silty clay, or silty clay loam deposit and having the tendency to split into thin layers.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shrink-swell (in tables). The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slippage (in tables). Soil mass susceptible to movement downslope when loaded, excavated, or wet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then

multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the material below the solum. The living roots and plant and animal activities are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the E horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Surface layer. Technically, the A horizon in mineral soils. Generally refers to the uppermost mineral layer of soil. Includes the Ap horizon or "plow layer."

Surface soil. The A, E, AB, and EB horizons, considered collectively. It includes all subdivisions of these horizons.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior. Soils are recognized as taxadjuncts only when one or more of their characteristics are slightly outside the range defined for the family of the series for which the soils are named.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field generally is built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material that is too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Unstable fill (in tables). Risk of caving or sloughing on banks of fill material.

Upland. Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Tables

Table 1.--Temperature and Precipitation

(Recorded in the period 1961-90 at Fairfield, Texas)

Month	Temperature						Precipitation				
				2 years in 10 will have--				2 years in 10 will have--			
	Average daily maximum	Average daily minimum	Average daily	Maximum temperature higher than--	Minimum temperature lower than--	Average number of growing degree days*	Average	Less than--	More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January	57.5	35.5	46.5	80	10	95	2.53	0.86	3.91	4	0.5
February	62.8	39.2	51.0	83	16	129	3.20	1.66	4.55	5	0.2
March	71.2	46.8	59.0	87	23	304	3.22	1.46	4.72	5	0.0
April	78.8	55.3	67.1	91	32	506	3.69	1.33	5.65	4	0.0
May	84.2	62.3	73.3	94	46	690	4.98	2.01	7.49	5	0.0
June	91.1	68.8	79.9	100	53	887	3.04	0.87	4.79	4	0.0
July	95.4	71.6	83.5	105	61	1019	1.87	0.53	3.21	3	0.0
August	95.9	71.0	83.4	106	59	1019	2.30	0.68	3.61	3	0.0
September	89.0	65.8	77.4	100	45	805	4.08	1.97	5.90	4	0.0
October	79.9	55.4	67.6	94	30	527	4.06	1.58	6.14	4	0.0
November	70.0	47.0	58.5	87	24	279	3.64	1.93	5.15	4	0.0
December	61.1	37.9	49.5	81	11	117	3.21	1.70	4.53	5	0.1
Yearly:											
Average	78.1	54.7	66.4	---	---	---	---	---	---	---	---
	---	---	---	---	---	---	---	---	---	---	---
Extreme	---	---	---	107	8	---	---	---	---	---	---
Total	---	---	---	---	---	6,376	39.82	30.21	46.11	50	0.8

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minumum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50 degrees F).

Table 2.--Freeze Dates in Spring and Fall

(Recorded in the period 1961-90 at Fairfield, Texas)

Probability	Temperature		
	24 °F or lower	28 °F or lower	32 °F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	March 6	March 27	April 11
2 years in 10 later than--	February 29	March 19	April 4
5 years in 10 later than--	February 18	March 5	March 21
First freezing temperature in fall:			
1 yr in 10 earlier than--	November 25	November 6	October 30
2 yrs in 10 earlier than--	December 2	November 14	November 4
5 yrs in 10 earlier than--	December 16	November 29	November 15

Table 3.--Growing Season

(Recorded during the period 1961-90 at Fairfield, Texas)

Probability	Daily minimum temperature during growing season		
	Higher than 24 °F	Higher than 28 °F	Higher than 32 °F
	Days	Days	Days
9 years in 10	258	237	213
8 years in 10	266	245	222
5 years in 10	281	261	238
2 years in 10	295	276	253
1 year in 10	303	284	262

Table 4.--Acreage and Proportionate Extent of the Soils

Map symbol	Soil name	Acres	Percent
ArC	Arenosa fine sand, 1 to 8 percent slopes	650	0.1
AxB	Axtell fine sandy loam, 1 to 5 percent slopes	760	0.1
AxD	Axtell fine sandy loam, 5 to 8 percent slopes	1,100	0.2
BnB	Bienville loamy fine sand, 1 to 5 percent slopes	308	0.1
BoC	Bigbrown silty clay loam, 1 to 8 percent slopes	9,250	1.6
BuA	Burleson clay, 0 to 1 percent slopes	670	0.1
CrA	Crockett fine sandy loam, 0 to 1 percent slopes	4,420	0.8
CrB	Crockett fine sandy loam, 1 to 3 percent slopes	22,050	3.9
CrC	Crockett fine sandy loam, 3 to 5 percent slopes	3,180	0.6
CrC3	Crockett fine sandy loam, 2 to 5 percent slopes, eroded	3,660	0.6
CrD	Crockett fine sandy loam, 5 to 8 percent slopes	470	0.1
CrD4	Crockett fine sandy loam, 3 to 8 percent slopes, severely eroded	3,250	0.6
CtE	Cuthbert fine sandy loam, 5 to 15 percent slopes	22,370	3.9
CvF	Cuthbert gravelly fine sandy loam, 15 to 30 percent slopes	5,390	0.9
CxE	Cuthbert soils, graded, 5 to 15 percent slopes	2,010	0.4
CzG	Cuthbert gravelly fine sandy loam, 15 to 40 percent slopes, very stony	2,530	0.4
DrA	Derly-Rader complex, 0 to 1 percent slopes	5,540	1.0
EgB	Edge fine sandy loam, 1 to 5 percent slopes	47,230	8.2
EgE	Edge fine sandy loam, 5 to 12 percent slopes	62,750	11.0
ErC	Edge-Gullied land complex, 2 to 8 percent slopes	2,330	0.4
EsE	Ellis clay, 3 to 12 percent slopes	1,180	0.2
FeD	Ferris clay, 3 to 8 percent slopes	610	0.1
GfB	Gasil fine sandy loam, 1 to 5 percent slopes	31,110	5.4
Gh	Gladewater clay, frequently flooded	3,560	0.6
HeE	Hearne fine sandy loam, 5 to 15 percent slopes	3,030	0.5
Ka	Kaufman clay loam, overwash, occasionally flooded	2,380	0.4
Kc	Kaufman clay, occasionally flooded	1,740	0.3
Kd	Kaufman clay, frequently flooded	20,170	3.5
Kf	Kaufman clay, loamy substratum, frequently flooded	960	0.2
Kh	Keechi loamy fine sand, frequently flooded	1,710	0.3
KrB	Kirvin fine sandy loam, 1 to 5 percent slopes	2,720	0.5
KyC	Kirvin gravelly fine sandy loam, 2 to 8 percent slopes	2,010	0.4
LaE	Lamar clay loam, 5 to 12 percent slopes	730	0.1
LgB	Leagueville loamy fine sand, 1 to 5 percent slopes	1,610	0.3
LsC	Leson clay, 3 to 5 percent slopes	620	0.1
MaA	Mabank fine sandy loam, 0 to 1 percent slopes	1,220	0.2
Na	Nahatche clay loam, frequently flooded	5,370	0.9
NH	Nahatche-Hatliff association, frequently flooded	49,280	8.6
OkB	Oakwood fine sandy loam, 1 to 5 percent slopes	13,400	2.3
PaB	Padina loamy fine sand, 1 to 5 percent slopes	19,190	3.4
PkC	Pickton loamy fine sand, 1 to 8 percent slopes	16,470	2.9
PkE	Pickton loamy fine sand, 8 to 15 percent slopes	5,040	0.9
Pt	Pits	500	0.1
Pu	Pluck loam, frequently flooded	560	0.1
RaB	Rader fine sandy loam, 0 to 3 percent slopes	4,760	0.8
RnA	Raino fine sandy loam, 0 to 2 percent slopes	1,580	0.3
RoA	Robco loamy fine sand, 0 to 2 percent slopes	670	0.1
SaE	Silawa fine sandy loam, 5 to 12 percent slopes	27,250	4.8
SsB	Silstid loamy fine sand, 1 to 5 percent slopes	25,980	4.5
SsD	Silstid loamy fine sand, 5 to 8 percent slopes	10,210	1.8
StB	Styx loamy fine sand, 0 to 3 percent slopes	810	0.1
TaB	Tabor fine sandy loam, 1 to 3 percent slopes	40,120	7.0
TfA	Tabor-Lufkin complex, 0 to 1 percent slopes	7,290	1.3
ToC	Tonkawa fine sand, 1 to 8 percent slopes	2,650	0.5
ToE	Tonkawa fine sand, 8 to 15 percent slopes	330	0.1
Tr	Trinity clay, frequently flooded	13,390	2.3
Wh	Whitesboro fine sandy loam, occasionally flooded	3,210	0.6
Wk	Whitesboro clay loam, occasionally flooded	3,930	0.7
Wm	Whitesboro clay loam, frequently flooded	2,420	0.4
WnA	Wilson silty clay loam, 0 to 1 percent slopes	610	0.1
WnB	Wilson silty clay loam, 1 to 3 percent slopes	2,100	0.4
WoB	Wolfpen loamy fine sand, 1 to 5 percent slopes	15,520	2.7
WoE	Wolfpen loamy fine sand, 5 to 15 percent slopes	20,370	3.6
	Water greater than 40 acres in size	3,149	0.6
	Total	571,437	100.0

Table 5.--Land Capability and Yields per Acre of Crops and Pasture

(Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil)

Soil name and map symbol	Land capability	Cotton lint	Grain sorghum	Corn	Wheat	Improved bermuda-grass	Common bermudagrass	Bahiagrass
		Lbs	Bu	Bu	Bu	AUM*	AUM*	AUM*
ArC---------- Arenosa	IVs	---	---	---	---	5.0	3.0	---
AxB---------- Axtell	IVe	---	35	45	30	6.0	5.0	5.0
AxD---------- Axtell	VIe	---	---	---	---	5.0	4.0	4.0
BnB---------- Bienville	IIIs	---	---	70	---	8.0	5.5	6.5
BoC---------- Bigbrown	IVe	---	---	---	25	7	4.5	---
BuA---------- Burleson	IIw	500	95	85	40	6.0	5	5
CrA---------- Crockett	IIIs	300	60	50	35	6.5	5.0	5.0
CrB---------- Crockett	IIIe	300	55	50	35	6.5	5.0	5.0
CrC---------- Crockett	IVe	200	45	50	20	5.5	4.0	4.0
CrC3---------- Crockett	IVe	200	45	35	20	5.0	4.0	4.0
CrD---------- Crockett	VIe	---	---	---	---	5.0	4.0	4.0
CrD4---------- Crockett	VIe	---	---	---	---	4.0	3.0	3.0
CtE---------- Cuthbert	VIe	---	---	---	---	3	2	2
CvF---------- Cuthbert	VIIe	---	---	---	---	---	---	---
CxE---------- Cuthbert	VIe	---	---	---	---	2.0	1.0	---
CzG---------- Cuthbert	VIIe	---	---	---	---	---	---	---
DrA**:								
Derly----------	IVw	200	45	---	---	---	---	---
Rader----------	IIs	---	70	65	30	7.0	6.0	6.0
EgB---------- Edge	IVe	---	35	30	25	6.0	5.0	5.0

See footnote at end of table.

Table 5.--Land Capability and Yields per Acre of Crops and Pasture--Continued

Soil name and map symbol	Land capability	Cotton lint	Grain sorghum	Corn	Wheat	Improved bermuda-grass	Common bermudagrass	Bahiagrass
		Lbs	Bu	Bu	Bu	AUM*	AUM*	AUM*
EgE--Edge	VIe	---	---	---	---	4.0	3.0	3.0
ErC**:								
Edge	VIe	---	---	---	---	4.0	3.0	3.0
Gullied land	VIIe	---	---	---	---	---	---	---
EsE--Ellis	IVe	100	25	50	15	5.0	4.0	4.0
FeD--Ferris	VIe	---	---	---	---	4.5	3.0	---
GfB--Gasil	IIIe	250	50	---	25	7.0	6	6
Gh--Gladewater	Vw	---	---	---	---	---	---	---
HeE--Hearne	VIe	---	---	---	---	3.5	2.0	---
Ka, Kc--Kaufman	IIw	500	100	65	40	5.0	4.0	4.0
Kd, Kf--Kaufman	Vw	---	---	---	---	4.0	3.0	3.0
Kh--Keechi	VIIw	---	---	---	---	---	---	---
KrB--Kirvin	IIIe	---	---	75	---	5	3	4
KyC--Kirvin	IVe	---	---	50	---	4	2	3
LaE--Lamar	VIe	---	---	---	---	4.0	3.0	---
LgB--Leagueville	IVw	---	---	---	---	5.5	3.5	4.5
LsC--Leson	IIIe	350	60	50	---	6	---	---
MaA--Mabank	IIIw	330	55	55	---	5.0	4.0	4.0
Na--Nahatche	Vw	---	---	---	---	8.0	6.0	6.0
NH**:								
Nahatche	Vw	---	---	---	---	8.0	6.0	6.0
Hatliff	Vw	---	---	---	---	8.0	5.5	6.0
OkB--Oakwood	IIIe	300	50	85	---	8.0	7.0	7.0

See footnote at end of table.

Table 5.--Land Capability and Yields per Acre of Crops and Pasture--Continued

Soil name and map symbol	Land capability	Cotton lint	Grain sorghum	Corn	Wheat	Improved bermuda-grass	Common bermudagrass	Bahiagrass
		Lbs	Bu	Bu	Bu	AUM*	AUM*	AUM*
PaB---------- Padina	IIIe	---	---	---	---	7.0	---	---
PkC---------- Pickton	IIIs	---	---	65	---	6.5	---	---
PkE---------- Pickton	VIe	---	---	---	---	6.0	---	---
Pt**---------- Pits	VIIIs							
Pu---------- Pluck	Vw	---	---	---	---	7.0	---	6.0
RaB---------- Rader	IIe	200	70	60	30	7.0	6.0	6.0
RnA---------- Raino	IIIs	750	70	95	---	8.0	7.0	9.0
RoA---------- Robco	IIe	---	---	65	---	7.0	6.0	6.0
SaE---------- Silawa	VIe	---	---	---	---	5.0	4.5	4.5
SsB, SsD-------- Silstid	IIIe	---	30	---	---	7.0	6.0	---
StB---------- Styx	IIIe	300	65	65	---	7.5	6.0	---
TaB---------- Tabor	IIIe	---	---	---	---	7.0	6.0	6.0
TfA**:								
Tabor----------	IIIs	---	---	---	---	7.0	6.0	6.0
Lufkin---------	IIIw	200	45	---	---	5.0	4.0	4.0
ToC---------- Tonkawa	IVs	---	---	---	---	2	---	---
ToE---------- Tonkawa	VIe	---	---	---	---	---	---	---
Tr---------- Trinity	Vw	---	---	---	---	5.0	4.0	---
Wh, Wk---------- Whitesboro	IIw	500	75	---	35	8.0	7.0	7.0
Wm---------- Whitesboro	Vw	---	---	---	---	8.0	7.0	7.0
WnA---------- Wilson	IIIw	350	50	60	30	6.0	5.0	5.0
WnB---------- Wilson	IIIe	300	45	55	30	6.0	5.0	5.0

See footnote at end of table.

Table 5.--Land Capability and Yields per Acre of Crops and Pasture--Continued

Soil name and map symbol	Land capability	Cotton lint	Grain sorghum	Corn	Wheat	Improved bermuda-grass	Common bermudagrass	Bahiagrass
		Lbs	Bu	Bu	Bu	AUM*	AUM*	AUM*
WoB---Wolfpen	IIIe	---	---	80	---	8	---	6
WoE---Wolfpen	VIe	---	---	---	---	7	---	6

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

** See description of the map unit for composition and behavior characteristics of the map unit.

Table 6.--Prime Farmland

(Only the soils considered prime farmland are listed. Urban or built-up areas of the soils listed are not considered prime farmland. If a soil is prime farmland only under certain conditions, the conditions are specified in parentheses after the soil name)

Map symbol	Soil name
BuA	Burleson clay, 0 to 1 percent slopes
GfB	Gasil fine sandy loam, 1 to 5 percent slopes
Ka	Kaufman clay loam, overwash, occasionally flooded
Kc	Kaufman clay, occasionally flooded
LsC	Leson clay, 3 to 5 percent slopes
OkB	Oakwood fine sandy loam, 1 to 5 percent slopes
RaB	Rader fine sandy loam, 0 to 3 percent slopes
RnA	Raino fine sandy loam, 0 to 2 percent slopes
Wh	Whitesboro fine sandy loam, occasionally flooded
Wk	Whitesboro clay loam, occasionally flooded

Table 7.--Rangeland Productivity

(Only the soils that support rangeland vegetation suitable for grazing are listed)

Soil name and map symbol	Range site	Potential annual production for kind of growing season		
		Favorable	Average	Unfavorable
		Lb/acre	Lb/acre	Lb/acre
ArC Arenosa	Very Deep Sand	3,500	2,500	1,500
AxB, AxD Axtell	Claypan Savannah	5,000	3,500	2,500
BuA Burleson	Blackland	7,000	5,500	4,000
CrA, CrB, CrC, CrD Crockett	Claypan Prairie	6,000	5,000	3,000
CrC3 Crockett	Claypan Prairie	4,500	3,750	2,250
CrD4 Crockett	Claypan Prairie	2,925	2,450	1,500
DrA*:				
Derly	Claypan Savannah	5,000	3,500	2,500
Rader	Sandy Loam	6,000	4,500	3,500
EgB, EgE Edge	Claypan Savannah	5,000	3,500	2,500
ErC*:				
Edge	Claypan Savannah	5,000	3,500	2,500
Gullied land.				
EsE Ellis	Eroded Blackland	4,500	3,500	2,000
FeD Ferris	Eroded Blackland	6,000	4,800	3,500
GfB Gasil	Sandy Loam	5,500	4,000	3,500
Gh Gladewater	Clayey Bottomland	7,000	6,000	4,000
HeE Hearne	Sandy Loam	2,500	1,800	1,250
Ka, Kc, Kd, Kf Kaufman	Clayey Bottomland	7,500	6,000	4,000
LaE Lamar	Clay Loam	6,000	4,500	3,000
LsC Leson	Blackland	8,500	6,000	5,000
MaA Mabank	Claypan Prairie	6,000	5,000	3,000

See footnote at end of table.

Table 7.--Rangeland Productivity--Continued

Soil name and map symbol	Range site	Potential annual production for kind of growing season		
		Favorable	Average	Unfavorable
		Lb/acre	Lb/acre	Lb/acre
Na Nahatche	Loamy Bottomland	5,500	5,000	3,000
NH*: Nahatche	Loamy Bottomland	5,500	5,000	3,000
Hatliff	Loamy Bottomland	4,500	3,500	3,000
PaB Padina	Deep Sand	4,500	3,500	2,250
RaB Rader	Sandy Loam	6,000	4,500	3,500
RoA Robco	Sandy	4,000	3,500	3,000
SaE Silawa	Sandy Loam	5,500	4,500	2,500
SsB, SsD Silstid	Sandy	4,500	4,000	2,000
StB Styx	Sandy	5,500	4,500	3,000
TaB Tabor	Sandy Loam	6,500	5,500	3,500
TfA*: Tabor	Sandy Loam	6,500	5,500	3,500
Lufkin	Claypan Savannah	5,000	4,000	2,500
Tr Trinity	Clayey Bottomland	6,500	4,000	3,000
Wh, Wk, Wm Whitesboro	Loamy Bottomland	8,000	7,000	5,700
WnA, WnB Wilson	Claypan Prairie	6,000	4,500	3,000

* See description of the map unit for composition and behavior characteristics of the map unit.

Table 8.--Woodland Management and Productivity

(Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available)

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Common trees	Site index	Volume*	
BnB--Bienville	10S	Slight	Severe	Moderate	Slight	Loblolly pine	91	340	Loblolly pine,
						Shortleaf pine	80	271	shortleaf pine.
CtE--Cuthbert	8C	Moderate	Moderate	Slight	Slight	Loblolly pine	82	250	Loblolly pine.
						Shortleaf pine	75	222	
CvF--Cuthbert	8R	Severe	Severe	Slight	Slight	Loblolly pine	73	150	Loblolly pine.
						Shortleaf pine	68	155	
CxE**--Cuthbert	5C	Severe	Moderate	Moderate	Slight	Loblolly pine	60	60	Loblolly pine.
						Shortleaf pine	---	--	
CzG--Cuthbert	8R	Severe	Severe	Slight	Slight	Loblolly pine	71	130	Loblolly pine,
						Shortleaf pine	66	139	shortleaf pine.
Gh--Gladewater	6W	Slight	Severe	Severe	Moderate	Water oak	85	162	Water oak,
						Willow oak	85	162	green ash.
Ka, Kc, Kd, Kf--Kaufman	4C	Slight	Moderate	Severe	Moderate	Water oak	70	52	Water oak,
									green ash.
KrB--Kirvin	8A	Slight	Slight	Slight	Slight	Loblolly pine	82	250	Loblolly pine,
						Shortleaf pine	75	222	slash pine.
KyC--Kirvin	8A	Moderate	Slight	Slight	Slight	Loblolly pine	83	260	Loblolly pine.
						Shortleaf pine	72	193	
LgB--Leagueville	8W	Slight	Severe	Severe	Severe	Loblolly pine	80	230	Loblolly pine,
						Sweetgum	80	120	sweetgum.
						Water oak	80	120	
Na--Nahatche	6W	Slight	Moderate	Moderate	Moderate	Water oak	92	227	Water oak.
						Willow oak	91	217	
NH**:									
Nahatche	6W	Slight	Moderate	Moderate	Moderate	Water oak	92	227	Water oak.
						Willow oak	91	217	
Hatliff	10W	Slight	Moderate	Moderate	Moderate	Loblolly pine	95	380	Loblolly pine.
OkB--Oakwood	9A	Slight	Slight	Slight	Moderate	Loblolly pine	91	340	Loblolly pine.
PkC, PkE--Pickton	8S	Slight	Slight	Moderate	Moderate	Loblolly pine	81	240	Loblolly pine,
						Shortleaf pine	73	200	southern red oak.
Pu--Pluck	9W	Slight	Severe	Severe	Severe	Loblolly pine	90	330	Loblolly pine,
						Sweetgum	88	189	water oak,
						Water oak	95	256	sweetgum, cherrybark oak.
RnA--Raino	9W	Slight	Moderate	Slight	Moderate	Loblolly pine	82	250	Loblolly pine,
						Shortleaf pine	75	222	shortleaf pine.

See footnotes at end of table.

Table 8.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Potential productivity: Common trees	Site index	Volume*	Trees to plant
ToC—Tonkawa	6S	Slight	Severe	Severe	Severe	Loblolly pine Shortleaf pine Longleaf pine	63 --- ---	-- -- --	Loblolly pine.
ToE—Tonkawa	6S	Moderate	Severe	Severe	Severe	Loblolly pine	63	80	
Tr—Trinity	5W	Slight	Severe	Moderate	Severe	Water oak	80	120	Water oak.
Wh, Wk, Wm—Whitesboro	5W	Slight	Moderate	Slight	Moderate	Water oak	80	120	Water oak.
WoB, WoE—Wolfpen	9S	Slight	Slight	Moderate	Moderate	Loblolly pine Shortleaf pine	86 79	290 --	Loblolly pine, shortleaf pine.

* Volume is the yield in board feet (Doyle Rule) per acre per year calculated over a 50 year period for fully stocked natural stands.

** See description of the map unit for composition and behavior characteristics of the map unit.

Table 9.--Woodland Understory Vegetation

(Only the soils suitable for production of commercial trees are listed)

Soil name and map symbol	Total production		Characteristic vegetation	Composition
	Kind of year	Dry weight		
		Lb/acre		Pct
BnB	Favorable	3,000	Pinehill bluestem	20
Bienville	Normal	2,500	Purpletop tridens	10
	Unfavorable	2,000	Beaked panicum	5
			Longleaf uniola	10
			Yaupon	10
			Big Bluestem	5
			Indiangrass	5
			Yucca	5
			Sassafras	5
CtE	Favorable	2,300	Pinehill bluestem	50
Cuthbert	Normal	1,800	Purpletop tridens	10
	Unfavorable	1,300	Longleaf uniola	10
			Fineleaf bluestem	5
			Pineywoods dropseed	5
			American beautyberry	5
CvF	Favorable	2,200	Pinehill bluestem	50
Cuthbert	Normal	1,700	Purpletop tridens	10
	Unfavorable	1,200	Longleaf uniola	10
			Fineleaf bluestem	5
			American beautyberry	5
			Pineywoods dropseed	5
CzG	Favorable	2,200	Pinehill bluestem	50
Cuthbert	Normal	1,700	Longleaf uniola	10
	Unfavorable	1,200	Purpletop tridens	10
			Fineleaf bluestem	5
			Pineywoods dropseed	5
			American beautyberry	5
ErC*:				
Edge	Favorable	5,000	Little bluestem	40
	Normal	3,500	Indiangrass	10
	Unfavorable	2,500	Beaked panicum	10
			Purpletop	5
			Florida paspalum	5
			Tall dropseed	5
			Fall witchgrass	5
Gullied land				
Gh	Favorable	4,000	Sedge	20
Gladewater	Normal	3,000	Paspalum	15
	Unfavorable	2,000	Virginia wildrye	10
			Beaked panicum	5
			Purpletop tridens	5
			Pinehill bluestem	5
Ka, Kc, Kd, Kf	Favorable	6,000	Virginia wildrye	20
Kaufman	Normal	3,500	Sedge	20
	Unfavorable	1,500	Longleaf uniola	10
			Beaked panicum	5
			Switchgrass	5
			Eastern gamagrass	5
			Hawthorn	5
			Yaupon	5

See footnote at end of table.

Table 9.--Woodland Understory Vegetation--Continued

Soil name and map symbol	Total production		Characteristic vegetation	Composition
	Kind of year	Dry weight		
		Lb/acre		Pct
Kh	Favorable	2,000	Sedge	20
Keechi	Normal	1,500	Broadleaf uniola	10
	Unfavorable	1,100	Virginia wildrye	10
			Greenbriar	5
			Beaked panicum	5
			Florida paspalum	5
			Yaupon	5
			Southern waymyrtle	5
KrB	Favorable	2,400	Pinehill bluestem	40
Kirvin	Normal	1,900	Longleaf uniola	20
	Unfavorable	1,500	Pineywoods dropseed	5
			American beautyberry	5
			Purpletop tridens	5
			Indiangrass	5
KyC	Favorable	2,200	Pinehill bluestem	50
Kirvin	Normal	1,700	Longleaf uniola	10
	Unfavorable	1,300	American beautyberry	5
			Indiangrass	5
			Purpletop tridens	5
			Pineywoods dropseed	5
LgB	Favorable	2,000	Longleaf uniola	15
Leagueville	Normal	1,500	Pinehill bluestem	10
	Unfavorable	1,000	Beaked panicum	10
			Southern waxmyrtle	10
			Sedge	10
			Common buttonbush	5
			Greenbrier	5
Na	Favorable	3,000	Virginia wildrye	15
Nahatche	Normal	2,000	Beaked panicum	15
	Unfavorable	1,500	Longleaf uniola	15
			Sedge	10
			Eastern gamagrass	5
			Switchgrass	5
			Purpletop	5
			Indiangrass	5
			Knotroot bristlegrass	5
			Florida paspalum	5
NH*:				
Nahatche	Favorable	3,000	Virginia wildrye	15
	Normal	2,000	Beaked panicum	15
	Unfavorable	1,500	Longleaf uniola	15
			Sedge	10
			Eastern gamagrass	5
			Switchgrass	5
			Purpletop	5
			Indiangrass	5
			Knotroot bristlegrass	5
			Florida paspalum	5
Hatliff	Favorable	3,000	Beaked panicum	15
	Normal	2,000	Virginia wildrye	15
	Unfavorable	1,500	Florida paspalum	15
			Longleaf uniola	10
			Pinehill bluestem	10
			American beautyberry	5

See footnote at end of table.

Table 9.--Woodland Understory Vegetation--Continued

Soil name and map symbol	Total production		Characteristic vegetation	Composition
	Kind of year	Dry weight		
		Lb/acre		Pct
OkB	Favorable	4,000	Pinehill bluestem	40
Oakwood	Normal	3,000	Longleaf uniola	10
	Unfavorable	2,000	Beaked panicum	5
			Purpletop tridens	5
			Indiangrass	5
			American beautyberry	5
			Yaupon	5
PkC, PkE	Favorable	3,000	Pinehill bluestem	20
Pickton	Normal	2,500	Purpletop tridens	10
	Unfavorable	2,000	Big bluestem	10
			Yaupon	5
			Indiangrass	5
			Longleaf uniola	5
			Beaked panicum	5
			Yucca	5
			Sassafras	5
Pu	Favorable	2,000	Broadleaf uniola	15
Pluck	Normal	1,500	Sedge	10
	Unfavorable	1,100	Beaked panicum	5
			Virginia wildrye	5
			Florida paspalum	5
			Switchcane	5
			Giant cane	5
			Yaupon	5
			Southern wax myrtle	5
RnA	Favorable	4,000	Pinehill bluestem	25
Raino	Normal	3,000	Beaked panicum	10
	Unfavorable	2,000	Longleaf uniola	10
			Spreading panicum	5
			Florida paspalum	5
			Sedge	5
			Virginia wildrye	5
ToC, ToE	Favorable	2,500	Pinehill bluestem	20
Tonkawa	Normal	2,000	Arrowfeather threeawn	15
	Unfavorable	1,000	Panicum	10
			Indiangrass	10
			Yaupon	5
			Yucca	5
			Bluejack oak	5
Tr	Favorable	6,500	Virginia wildrye	15
Trinity	Normal	4,000	Sedge	15
	Unfavorable	3,000	Eastern gamagrass	10
			Switchgrass	10
			Indiangrass	10
			Big bluestem	10
			Beaked panicum	5
			Panicum	5
Wh, Wk, Wm	Favorable	9,000	Virginia wildrye	15
Whitesboro	Normal	8,000	Beaked panicum	15
	Unfavorable	6,500	Switchgrass	5
			Indiangrass	5
			Little bluestem	5
			White tridens	5
			Panicum	5
			Eastern gamagrass	5

See footnote at end of table.

Table 9.--Woodland Understory Vegetation--Continued

Soil name and map symbol	Total production		Characteristic vegetation	Composition
	Kind of year	Dry weight		
		Lb/acre		Pct
WoB, WoE---------- Wolfpen	Favorable	3,500	Pinehill bluestem----------	20
	Normal	2,500	Purpletop tridens----------	15
	Unfavorable	2,000	Longleaf uniola----------	15
			Beaked panicum----------	10
			Indiangrass----------	5
			Yaupon----------	5
			Sassafras----------	5

* See description of the map unit for composition and behavior characteristics of the map unit.

Table 10.--Recreational Development

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
ArC Arenosa	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: droughty.
AxB Axtell	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Severe: erodes easily.	Moderate: droughty.
AxD Axtell	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: droughty.
BnB Bienville	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.	Moderate: droughty.
BoC Bigbrown	Slight	Slight	Moderate: slope.	Severe: erodes easily.	Slight.
BuA Burleson	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Moderate: too clayey.	Moderate: too clayey.	Severe: too clayey.
CrA Crockett	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: percs slowly.	Severe: erodes easily.	Moderate: droughty.
CrB, CrC, CrC3 Crockett	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Severe: erodes easily.	Moderate: droughty.
CrD Crockett	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: droughty.
CrD4 Crockett	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Severe: erodes easily.	Moderate: droughty.
CtE Cuthbert	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: droughty.
CvF Cuthbert	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.	Moderate: small stones, droughty.
CxE* Cuthbert	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight	Moderate: droughty, slope.
CzG Cuthbert	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Moderate: small stones, droughty.
DrA*: Derly	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.

See footnote at end of table.

Table 10.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
DrA*:					
Rader	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Slight	Slight.
EgB	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Severe: erodes easily.	Slight.
Edge					
EgE	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
Edge					
ErC*:					
Edge	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Severe: erodes easily.	Slight.
Gullied land					
EsE	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Severe: slope.	Moderate: too clayey.	Severe: too clayey.
Ellis					
FeD	Moderate: percs slowly.	Moderate: too clayey.	Moderate: too clayey, percs slowly.	Moderate: too clayey.	Severe: too clayey.
Ferris					
GfB	Slight	Slight	Moderate: slope.	Slight	Slight.
Gasil					
Gh	Severe: flooding, percs slowly, too clayey.	Severe: too clayey, percs slowly.	Severe: too clayey, flooding, percs slowly.	Severe: too clayey.	Severe: flooding, too clayey.
Gladewater					
HeE	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope.
Hearne					
Ka, Kc	Severe: flooding, percs slowly, too clayey.	Severe: too clayey, percs slowly.	Severe: too clayey, percs slowly.	Severe: too clayey.	Severe: too clayey.
Kaufman					
Kd, Kf	Severe: flooding, percs slowly, too clayey.	Severe: too clayey, percs slowly.	Severe: too clayey, flooding, percs slowly.	Severe: too clayey.	Severe: flooding, too clayey.
Kaufman					
Kh	Severe: flooding, ponding.	Severe: ponding.	Severe: ponding, flooding.	Severe: ponding.	Severe: ponding, flooding.
Keechi					
KrB	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Severe: erodes easily.	Slight.
Kirvin					
KyC	Severe: small stones.	Severe: small stones.	Severe: small stones.	Slight	Severe: small stones.
Kirvin					

See footnote at end of table.

Table 10.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
LaE Lamar	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
LgB Leagueville	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
LsC Leson	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Moderate: slope, too clayey, percs slowly.	Moderate: too clayey.	Severe: too clayey.
MaA Mabank	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: percs slowly.	Slight	Moderate: droughty.
Na Nahatche	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.
NH*: Nahatche	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.
Hatliff	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.
OkB Oakwood	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight	Slight.
PaB Padina	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.	Moderate: droughty.
PkC Pickton	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.	Moderate: droughty.
PkE Pickton	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.	Moderate: droughty, slope.
Pt* Pits					
Pu Pluck	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.
RaB Rader	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Slight	Slight.
RnA Raino	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Slight	Slight.
RoA Robco	Moderate: wetness, too sandy.	Moderate: wetness, too sandy.	Moderate: slope, small stones, too sandy.	Moderate: wetness, too sandy.	Moderate: wetness, droughty.

See footnote at end of table.

Table 10.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
SaE Silawa	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
SsB Silstid	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, small stones.	Moderate: too sandy.	Moderate: droughty.
SsD Silstid	Moderate: too sandy.	Moderate: too sandy.	Severe: slope.	Moderate: too sandy.	Moderate: droughty.
StB Styx	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: droughty.
TaB Tabor	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, small stones, percs slowly.	Slight	Moderate: droughty.
TfA*:					
Tabor	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: small stones, percs slowly.	Slight	Moderate: droughty.
Lufkin	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: percs slowly.	Slight	Moderate: droughty.
ToC Tonkawa	Severe: too sandy, too acid.	Severe: too sandy, too acid.	Severe: too sandy, too acid.	Severe: too sandy.	Severe: too acid, droughty.
ToE Tonkawa	Severe: too sandy, too acid.	Severe: too sandy, too acid.	Severe: slope, too sandy, too acid.	Severe: too sandy.	Severe: too acid, droughty.
Tr Trinity	Severe: flooding, percs slowly, too clayey.	Severe: too clayey, percs slowly.	Severe: too clayey, flooding, percs slowly.	Severe: too clayey.	Severe: flooding, too clayey.
Wh, Wk Whitesboro	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: flooding.
Wm Whitesboro	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
WnA, WnB Wilson	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: percs slowly.	Slight	Slight.
WoB Wolfpen	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.	Moderate: droughty.
WoE Wolfpen	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.	Moderate: droughty, slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

Table 11.--Wildlife Habitat

(See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
ArC---Arenosa	Poor	Poor	Fair	---	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
AxB---Axtell	Good	Good	Good	Good	---	Good	Poor	Very poor.	Good	Good	Very poor.	Good.
AxD---Axtell	Fair	Good	Good	Good	---	Good	Poor	Very poor.	Good	Good	Very poor.	Good.
BnB---Bienville	Fair	Fair	Fair	Fair	Fair	---	Very poor.	Very poor.	Fair	Fair	Very poor.	---
BoC---Bigbrown	Fair	Good	Good	---	---	Fair	Very poor.	Very poor.	Good	---	Very poor.	Fair.
BuA---Burleson	Good	Good	Poor	---	---	Poor	Very poor.	Very poor.	Fair	---	Very poor.	Poor.
CrA, CrB, CrC, CrC3---Crockett	Fair	Good	Good	Good	---	Good	Poor	Poor	Good	---	Poor	Good.
CrD, CrD4---Crockett	Poor	Fair	Good	Good	---	Good	Poor	Very poor.	Fair	---	Very poor.	Good.
CtE---Cuthbert	Fair	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.	---
CvF, CxE*---Cuthbert	Poor	Fair	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.	---
CzG---Cuthbert	Very poor.	Fair	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.	---
DrA*:												
Derly	Poor	Fair	Good	Fair	Fair	Fair	Good	Good	Fair	Fair	Good	Fair.
Rader	Good	Good	Good	Good	---	Good	Poor	Poor	Good	Good	Poor	Good.
EgB---Edge	Good	Good	Good	Good	---	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
EgE---Edge	Fair	Good	Good	Good	---	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
ErC*:												
Edge	Fair	Good	Good	Good	---	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
Gullied land												
EsE---Ellis	Fair	Good	Fair	---	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
FeD---Ferris	Poor	Fair	Fair	---	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.

See footnote at end of table.

Table 11.--Wildlife Habitat--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
GfB---- Gasil	Good	Good	Good	Good	---	Good	Very poor.	Very poor.	Good	---	Very poor.	Good.
Gh---- Gladewater	Poor	Fair	Fair	Fair	---	---	Good	Good	Fair	Fair	Good	---
HeE---- Hearne	Fair	Good	Good	---	---	Good	Very poor.	Very poor.	Fair	---	Very poor.	Good.
Ka, Kc---- Kaufman	Fair	Fair	Poor	Good	---	Fair	Poor	Good	Fair	Good	Fair	Poor
Kd, Kf---- Kaufman	Poor	Poor	Fair	Good	---	Fair	Poor	Good	Poor	Good	Fair	---
Kh---- Keechi	Poor	Fair	Fair	Fair	Poor	---	Good	Good	Fair	Fair	Good	---
KrB---- Kirvin	Good	Good	Good	Good	Good	---	Poor	Very poor.	Good	Good	Very poor.	---
KyC---- Kirvin	Fair	Good	Good	Good	Good	---	Poor	Very poor.	Good	Good	Very poor.	---
LaE---- Lamar	Poor	Fair	Fair	---	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
LgB---- Leagueville	Poor	Fair	Fair	Fair	Fair	---	Fair	Poor	Fair	Fair	Fair	---
LsC---- Leson	Good	Good	Poor	---	---	Poor	Very poor.	Very poor.	Fair	---	Very poor.	Poor.
MaA---- Mabank	Fair	Good	Good	---	---	Fair	Fair	Fair	Good	---	Fair	Fair.
Na---- Nahatche	Fair	Fair	Fair	Good	Fair	---	Poor	Fair	Fair	Good	Poor	---
NH*:												
Nahatche----	Fair	Fair	Fair	Good	Fair	---	Poor	Fair	Fair	Good	Poor	---
Hatliff----	Good	Good	Good	Good	Good	---	Poor	Poor	Good	Good	Poor	---
OkB---- Oakwood	Good	Good	Good	Good	Good	---	Poor	Very poor.	Good	Good	Very poor.	---
PaB---- Padina	Poor	Fair	Fair	Good	---	Fair	Poor	Very poor.	Fair	Good	Very poor.	Fair.
PkC, PkE---- Pickton	Poor	Fair	Good	Fair	Fair	---	Poor	Very poor.	Fair	Fair	Very poor.	---
Pt* Pits												
Pu---- Pluck	Poor	Fair	Fair	Fair	Fair	---	Good	Fair	Fair	Fair	Fair	---

See footnote at end of table.

Table 11.--Wildlife Habitat--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
RaB---- Rader	Good	Good	Good	Good	---	Good	Poor	Poor	Good	Good	Poor	Good.
RnA---- Raino	Good	Good	Good	Good	Good	---	Poor	Poor	Good	Good	Poor	---
RoA---- Robco	Fair	Fair	Good	Good	---	Good	Poor	Very poor.	Fair	Good	Very poor.	Good.
SaE---- Silawa	Fair	Good	Good	Good	---	Good	Poor	Very poor.	Good	Good	Very poor.	Good.
SsB, SsD---- Silstid	Poor	Poor	Fair	Poor	Poor	Good	Poor	Very poor.	Poor	Poor	Very poor.	Fair.
StB---- Styx	Poor	Fair	Good	Fair	---	Good	Very poor.	Very poor.	Fair	Fair	Very poor.	Good.
TaB---- Tabor	Fair	Good	Good	Good	---	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
TfA*:												
Tabor----	Fair	Good	Good	Good	---	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
Lufkin----	Fair	Good	Fair	Good	---	---	Fair	Fair	Fair	Good	Fair	---
ToC, ToE---- Tonkawa	Poor	Poor	Fair	Poor	---	---	Very poor.	Very poor.	Poor	Poor	Very poor.	---
Tr---- Trinity	Fair	Fair	Poor	Good	---	Fair	Poor	Good	Fair	Good	Fair	Poor
Wh, Wk---- Whitesboro	Good	Good	Good	---	---	Fair	Poor	Poor	Good	---	Poor	Fair.
Wm---- Whitesboro	Very poor.	Poor	Fair	---	---	Fair	Poor	Poor	Poor	---	Poor	Fair.
WnA, WnB---- Wilson	Fair	Good	Good	---	---	Fair	Fair	Fair	Good	---	Fair	Fair.
WoB, WoE---- Wolfpen	Poor	Fair	Good	Good	Good	---	Poor	Very poor.	Fair	Good	Very poor.	---

* See description of the map unit for composition and behavior characteristics of the map unit.

Table 12.--Building Site Development

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
ArC Arenosa	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Severe: droughty.
AxB, AxD Axtell	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Moderate: droughty.
BnB Bienville	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Slight	Moderate: droughty.
BoC Bigbrown	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
BuA Burleson	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
CrA, CrB, CrC, CrC3, CrD, CrD4-- Crockett	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Moderate: droughty.
CtE Cuthbert	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: droughty.
CvF Cuthbert	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Moderate: small stones, droughty.
CxE* Cuthbert	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: droughty, slope.
CzG Cuthbert	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Moderate: small stones, droughty.
DrA*: Derly	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness.
Rader	Severe: wetness.	Moderate: wetness.	Severe: wetness, shrink-swell.	Moderate: wetness.	Moderate: wetness.	Slight.
EgB Edge	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.

See footnote at end of table.

Table 12.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
EgE---------- Edge	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength.	Moderate: slope.
ErC*: Edge----------	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
Gullied land-----						
EsE---------- Ellis	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
FeD---------- Ferris	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
GfB---------- Gasil	Slight---------	Slight---------	Slight---------	Slight---------	Slight---------	Slight.
Gh---------- Gladewater	Severe: cutbanks cave, wetness.	Severe: flooding, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, shrink-swell.	Severe: shrink-swell, low strength, flooding.	Severe: flooding, too clayey.
HeE---------- Hearne	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: droughty, slope.
Ka, Kc---------- Kaufman	Severe: cutbanks cave.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: shrink-swell, low strength, flooding.	Severe: too clayey.
Kd, Kf---------- Kaufman	Severe: cutbanks cave.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: shrink-swell, low strength, flooding.	Severe: flooding, too clayey.
Kh---------- Keechi	Severe: cutbanks cave, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: ponding, flooding.	Severe: ponding, flooding.
KrB---------- Kirvin	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
KyC---------- Kirvin	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Severe: small stones.
LaE---------- Lamar	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
LgB---------- Leagueville	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.

See footnote at end of table.

Table 12.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
LsC Leson	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
MaA Mabank	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Moderate: droughty.
Na Nahatche	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.	Severe: wetness, flooding.
NH*:						
Nahatche	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.	Severe: wetness, flooding.
Hatliff	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding.	Severe: wetness, flooding.
OkB Oakwood	Moderate: wetness.	Slight	Moderate: wetness.	Slight	Moderate: low strength.	Slight.
PaB Padina	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
PkC Pickton	Severe: cutbanks cave.	Slight	Moderate: wetness.	Moderate: slope.	Slight	Moderate: droughty.
PkE Pickton	Severe: cutbanks cave.	Moderate: slope.	Moderate: wetness, slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
Pt* Pits						
Pu Pluck	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding.	Severe: wetness, flooding.
RaB Rader	Severe: wetness.	Moderate: wetness.	Severe: wetness, shrink-swell.	Moderate: wetness.	Moderate: wetness.	Slight.
RnA Raino	Severe: wetness.	Moderate: wetness.	Severe: wetness, shrink-swell.	Moderate: wetness.	Moderate: wetness.	Slight.
RoA Robco	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness, shrink-swell.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness, droughty.
SaE Silawa	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.
SsB Silstid	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.

See footnote at end of table.

Table 12.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
SsD---------- Silstid	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Slight---------	Moderate: droughty.
StB---------- Styx	Severe: cutbanks cave.	Slight---------	Moderate: wetness.	Slight---------	Slight---------	Moderate: droughty.
TaB---------- Tabor	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Moderate: droughty.
TfA*:						
Tabor----------	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Moderate: droughty.
Lufkin----------	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Moderate: droughty.
ToC---------- Tonkawa	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Slight---------	Severe: too acid, droughty.
ToE---------- Tonkawa	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: too acid, droughty.
Tr---------- Trinity	Severe: cutbanks cave.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: shrink-swell, low strength, flooding.	Severe: flooding, too clayey.
Wh, Wk---------- Whitesboro	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.	Moderate: flooding.
Wm---------- Whitesboro	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.	Severe: flooding.
WnA, WnB---------- Wilson	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Moderate: slight.
WoB---------- Wolfpen	Severe: cutbanks cave.	Slight---------	Moderate: wetness.	Slight---------	Slight---------	Moderate: droughty.
WoE---------- Wolfpen	Severe: cutbanks cave.	Moderate: slope.	Moderate: wetness, slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

Table 13.--Sanitary Facilities

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "good," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
ArC Arenosa	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
AxB, AxD Axtell	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
BnB Bienville	Moderate: wetness.	Severe: seepage.	Severe: seepage, wetness, too sandy.	Severe: seepage.	Poor: too sandy.
BoC Bigbrown	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
BuA Burleson	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
CrA Crockett	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
CrB, CrC, CrC3, CrD, CrD4 Crockett	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
CtE Cuthbert	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey.
CvF Cuthbert	Severe: percs slowly, slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, slope.
CxE* Cuthbert	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey.
CzG Cuthbert	Severe: percs slowly, slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, slope.
DrA*:					
Derly	Severe: wetness, percs slowly.	Slight	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
Rader	Severe: wetness, percs slowly.	Severe: seepage.	Severe: too clayey.	Severe: seepage.	Poor: too clayey, hard to pack.

See footnote at end of table.

Table 13.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
EgB Edge	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
EgE Edge	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
ErC*: Edge	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
Gullied land					
EsE Ellis	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
FeD Ferris	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
GfB Gasil	Moderate: percs slowly.	Severe: seepage.	Slight	Slight	Good.
Gh Gladewater	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding.	Poor: too clayey, hard to pack.
HeE Hearne	Severe: percs slowly.	Severe: slope.	Severe: too clayey, too acid.	Moderate: slope.	Poor: too clayey, too acid.
Ka, Kc, Kd, Kf Kaufman	Severe: flooding, percs slowly.	Slight	Severe: flooding, too clayey.	Severe: flooding.	Poor: too clayey, hard to pack.
Kh Keechi	Severe: flooding, ponding, percs slowly.	Severe: seepage, flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Poor: ponding.
KrB, KyC Kirvin	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
LaE Lamar	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
LgB Leagueville	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too acid.	Severe: seepage, wetness.	Poor: wetness, too acid.
LsC Leson	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.

See footnote at end of table.

Table 13.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
MaA Mabank	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
Na Nahatche	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
NH*: Nahatche	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
Hatliff	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy, wetness.
OkB Oakwood	Severe: wetness, percs slowly.	Moderate: seepage, slope, wetness.	Severe: too acid.	Slight	Poor: thin layer.
PaB Padina	Severe: poor filter.	Severe: seepage.	Severe: too sandy.	Severe: seepage.	Poor: seepage, too sandy.
PkC Pickton	Severe: poor filter.	Severe: seepage.	Severe: too sandy.	Severe: seepage.	Poor: too sandy.
PkE Pickton	Severe: poor filter.	Severe: seepage, slope.	Severe: too sandy.	Severe: seepage.	Poor: too sandy.
Pt* Pits					
Pu Pluck	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, seepage, wetness.	Poor: wetness.
RaB Rader	Severe: wetness, percs slowly.	Severe: seepage.	Severe: too clayey.	Severe: seepage.	Poor: too clayey, hard to pack.
RnA Raino	Severe: wetness, percs slowly.	Severe: wetness.	Severe: too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
RoA Robco	Severe: wetness, percs slowly, poor filter.	Severe: seepage.	Severe: wetness.	Severe: seepage.	Poor: thin layer.
SaE Silawa	Moderate: percs slowly, slope.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Fair: too clayey, slope, thin layer.

See footnote at end of table.

Table 13.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
SsB, SsD---------- Silstid	Severe: poor filter.	Severe: seepage.	Moderate: too sandy.	Severe: seepage.	Poor: seepage.
StB---------- Styx	Severe: wetness.	Severe: seepage.	Moderate: wetness, too clayey.	Severe: seepage.	Fair: too clayey.
TaB---------- Tabor	Severe: percs slowly.	Moderate: seepage, slope.	Severe: too clayey.	Slight----------	Poor: too clayey, hard to pack.
TfA*:					
Tabor----------	Severe: percs slowly.	Moderate: seepage.	Severe: too clayey.	Slight----------	Poor: too clayey, hard to pack.
Lufkin----------	Severe: percs slowly.	Slight----------	Severe: too clayey.	Slight----------	Poor: too clayey, hard to pack.
ToC---------- Tonkawa	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
ToE---------- Tonkawa	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Tr---------- Trinity	Severe: flooding, percs slowly.	Severe: flooding.	Severe: flooding, too clayey.	Severe: flooding.	Poor: too clayey, hard to pack.
Wh, Wk, Wm---------- Whitesboro	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Fair: too clayey.
WnA---------- Wilson	Severe: percs slowly.	Slight----------	Severe: too clayey.	Slight----------	Poor: too clayey, hard to pack.
WnB---------- Wilson	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight----------	Poor: too clayey, hard to pack.
WoB---------- Wolfpen	Severe: poor filter.	Severe: seepage.	Moderate: too clayey.	Severe: seepage.	Fair: too clayey.
WoE---------- Wolfpen	Severe: poor filter.	Severe: seepage, slope.	Moderate: slope, too clayey.	Severe: seepage.	Fair: too clayey, slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

Table 14.--Construction Materials

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
ArC Arenosa	Good	Probable	Improbable: too sandy.	Poor: too sandy.
AxB, AxD Axtell	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
BnB Bienville	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.
BoC Bigbrown	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
BuA Burleson	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
CrA, CrB, CrC, CrC3, CrD, CrD4 Crockett	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
CtE Cuthbert	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
CvF Cuthbert	Fair: shrink-swell, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, slope.
CxE* Cuthbert	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
CzG Cuthbert	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, slope.
DrA*: Derly	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Rader	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
EgB, EgE Edge	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.

See footnote at end of table.

Table 14.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
ErC*:				
Edge	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Gullied land				
EsE	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Ellis				
FeD	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Ferris				
GfB	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Gasil				
Gh	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Gladewater				
HeE	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, too acid.
Hearne				
Ka, Kc, Kd, Kf	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Kaufman				
Kh	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Keechi				
KrB, KyC	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Kirvin				
LaE	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, slope.
Lamar				
LgB	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy, wetness.
Leagueville				
LsC	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Leson				
MaA	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Mabank				
Na	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Nahatche				
NH*:				
Nahatche	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.

See footnote at end of table.

Table 14.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Hatliff	Poor: wetness.	Probable	Improbable: too sandy.	Poor: wetness, too sandy.
OkB Oakwood	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, thin layer.
PaB Padina	Good	Probable	Improbable: too sandy.	Poor: too sandy.
PkC, PkE Pickton	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.
Pt* Pits				
Pu Pluck	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
RaB Rader	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
RnA Raino	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
RoA Robco	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, small stones.
SaE Silawa	Good	Probable	Probable	Fair: too clayey, small stones, area reclaim.
SsB, SsD Silstid	Good	Improbable: thin layer.	Improbable: too sandy.	Fair: too sandy, small stones.
StB Styx	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.
TaB Tabor	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
TfA*: Tabor	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Lufkin	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
ToC, ToE Tonkawa	Good	Probable	Improbable: too sandy.	Poor: too sandy, too acid.

See footnote at end of table.

Table 14.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Tr Trinity	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Wh Whitesboro	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Wk, Wm Whitesboro	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
WnA, WnB Wilson	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
WoB, WoE Wolfpen	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.

* See description of the map unit for composition and behavior characteristics of the map unit.

Table 15.--Water Management

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Terraces and diversions	Grassed waterways
ArC---- Arenosa	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Too sandy, soil blowing.	Droughty.
AxB, AxD---- Axtell	Slight	Severe: hard to pack.	Severe: no water.	Deep to water	Erodes easily, percs slowly.	Erodes easily, droughty.
BnB---- Bienville	Severe: seepage.	Severe: seepage, piping.	Severe: cutbanks cave.	Deep to water	Too sandy, soil blowing.	Droughty.
BoC---- Bigbrown	Moderate: slope.	Moderate: piping.	Severe: no water.	Deep to water	Erodes easily, percs slowly.	Erodes easily, percs slowly.
BuA---- Burleson	Slight	Severe: hard to pack.	Severe: no water.	Deep to water	Percs slowly	Percs slowly.
CrA, CrB, CrC, CrC3, CrD, CrD4-- Crockett	Slight	Severe: hard to pack.	Severe: no water.	Deep to water	Erodes easily, percs slowly.	Erodes easily, droughty.
CtE---- Cuthbert	Moderate: seepage.	Moderate: piping.	Severe: no water.	Deep to water	Slope, erodes easily, percs slowly.	Slope, erodes easily, droughty.
CvF---- Cuthbert	Moderate: seepage.	Moderate: piping.	Severe: no water.	Deep to water	Slope, percs slowly.	Slope, droughty.
CxE*---- Cuthbert	Slight	Moderate: piping.	Severe: no water.	Deep to water	Slope, percs slowly.	Slope, droughty, percs slowly.
CzG---- Cuthbert	Moderate: seepage.	Moderate: piping.	Severe: no water.	Deep to water	Slope, percs slowly.	Slope, droughty.
DrA*:						
Derly----	Slight	Severe: wetness.	Severe: no water.	Percs slowly	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
Rader----	Slight	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly	Erodes easily, wetness.	Erodes easily, percs slowly.
EgB---- Edge	Slight	Severe: hard to pack.	Severe: no water.	Deep to water	Erodes easily.	Erodes easily, percs slowly.
EgE---- Edge	Slight	Severe: hard to pack.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily, percs slowly.
ErC*:						
Edge----	Slight	Severe: hard to pack.	Severe: no water.	Deep to water	Erodes easily,	Erodes easily, percs slowly.

See footnote at end of table.

Table 15.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Terraces and diversions	Grassed waterways
Gullied land						
EsE---------- Ellis	Slight---------	Severe: hard to pack.	Severe: no water.	Deep to water	Percs slowly---	Percs slowly.
FeD---------- Ferris	Slight---------	Severe: hard to pack.	Severe: no water.	Deep to water	Percs slowly---	Percs slowly.
GfB---------- Gasil	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Favorable------	Favorable.
Gh---------- Gladewater	Slight---------	Severe: hard to pack.	Severe: no water.	Percs slowly, flooding.	Wetness, percs slowly.	Percs slowly.
HeE---------- Hearne	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope, percs slowly.	Slope, droughty, percs slowly.
Ka, Kc, Kd, Kf---- Kaufman	Slight---------	Severe: hard to pack.	Severe: no water.	Deep to water	Percs slowly---	Percs slowly.
Kh---------- Keechi	Moderate: seepage.	Severe: seepage, piping, ponding.	Severe: no water.	Ponding, flooding, cutbanks cave.	Ponding, too sandy, soil blowing.	Wetness, droughty.
KrB---------- Kirvin	Slight---------	Severe: hard to pack.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
KyC---------- Kirvin	Slight---------	Severe: hard to pack.	Severe: no water.	Deep to water	Favorable------	Favorable.
LaE---------- Lamar	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Slope----------	Slope.
LgB---------- Leagueville	Severe: seepage.	Severe: piping, wetness.	Severe: cutbanks cave.	Slope, too acid.	Wetness--------	Wetness, droughty.
LsC---------- Leson	Slight---------	Severe: hard to pack.	Severe: no water.	Deep to water	Percs slowly---	Percs slowly.
MaA---------- Mabank	Slight---------	Severe: hard to pack.	Severe: no water.	Percs slowly---	Erodes easily, percs slowly.	Erodes easily.
Na---------- Nahatche	Moderate: seepage.	Severe: wetness.	Moderate: slow refill.	Flooding-------	Wetness--------	Wetness.
NH*:						
Nahatche---------	Moderate: seepage.	Severe: wetness.	Moderate: slow refill.	Flooding-------	Wetness--------	Wetness.
Hatliff----------	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Flooding, cutbanks cave.	Wetness, too sandy, soil blowing.	Wetness, droughty.
OkB---------- Oakwood	Moderate: seepage, slope.	Moderate: piping.	Severe: no water.	Deep to water	Favorable------	Favorable.

See footnote at end of table.

Table 15.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Terraces and diversions	Grassed waterways
PaB---- Padina	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Too sandy, soil blowing.	Droughty.
PkC---- Pickton	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Too sandy, soil blowing.	Droughty.
PkE---- Pickton	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, too sandy, soil blowing.	Slope, droughty.
Pt* Pits						
Pu---- Pluck	Severe: seepage.	Severe: piping, wetness.	Moderate: slow refill.	Flooding-------	Wetness--------	Wetness.
RaB---- Rader	Slight---------	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly---	Erodes easily, wetness.	Erodes easily, percs slowly.
RnA---- Raino	Slight---------	Severe: hard to pack.	Severe: no water.	Percs slowly---	Erodes easily, wetness.	Erodes easily, percs slowly.
RoA---- Robco	Severe: seepage.	Moderate: wetness.	Severe: no water.	Percs slowly---	Erodes easily, wetness, percs slowly.	Erodes easily, droughty, percs slowly.
SaE---- Silawa	Severe: seepage.	Severe: thin layer.	Severe: no water.	Deep to water	Slope.	Slope.
SsB, SsD---- Silstid	Moderate: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Soil blowing---	Droughty.
StB---- Styx	Severe: seepage.	Moderate: piping.	Severe: no water.	Deep to water	Soil blowing---	Droughty.
TaB---- Tabor	Slight---------	Moderate: hard to pack.	Severe: no water.	Deep to water	Erodes easily, percs slowly.	Erodes easily, droughty, percs slowly.
TfA*:						
Tabor----	Slight---------	Moderate: hard to pack.	Severe: no water.	Deep to water	Erodes easily, percs slowly.	Erodes easily, droughty, percs slowly.
Lufkin----	Slight---------	Severe: hard to pack.	Severe: no water.	Percs slowly---	Erodes easily.	Erodes easily, droughty.
ToC---- Tonkawa	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Too sandy, soil blowing.	Droughty.
ToE---- Tonkawa	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, too sandy, soil blowing.	Slope, droughty.
Tr---- Trinity	Slight---------	Severe: hard to pack.	Severe: no water.	Deep to water	Percs slowly---	Droughty, percs slowly.

See footnote at end of table.

Table 15.--Water Management--Continued

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
Wh, Wk, Wm-------- Whitesboro	Moderate: seepage.	Moderate: piping.	Severe: no water.	Deep to water	Favorable------	Favorable.
WnA, WnB---------- Wilson	Slight---------	Severe: hard to pack.	Severe: no water.	Percs slowly---	Erodes easily, percs slowly.	Erodes easily.
WoB--------------- Wolfpen	Severe: seepage.	Severe: thin layer.	Severe: no water.	Deep to water	Soil blowing---	Droughty.
WoE--------------- Wolfpen	Severe: seepage, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, soil blowing.	Slope, droughty.

* See description of the map unit for composition and behavior characteristics of the map unit.

Table 16.--Engineering Index Properties

(The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated)

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	3-10 inches	4	10	40	200		
	In				Pct					Pct	
ArC--Arenosa	0-9	Fine sand	SM, SP-SM, SC-SM	A-2-4, A-3	0	95-100	95-100	63-98	8-20	18-25	NP-6
	9-80	Sand, fine sand	SM, SP-SM, SC-SM	A-2-4, A-3	0	95-100	95-100	63-98	8-20	18-25	NP-6
AxB--Axtell	0-7	Fine sandy loam	SM, ML, SC-SM, CL-ML	A-2-4, A-4	0	90-100	80-100	75-100	28-75	<31	NP-7
	7-24	Clay loam, clay	CL, CH	A-7-6	0-2	95-100	95-100	85-100	70-98	41-65	25-42
	24-49	Clay loam, clay	CL, CH	A-7-6	0-2	95-100	95-100	85-100	70-98	41-65	25-42
	49-80	Sandy clay loam, clay loam, clay.	CL, CH	A-6, A-7-6	0-2	95-100	95-100	75-100	50-95	35-63	20-45
AxD--Axtell	0-6	Fine sandy loam	SM, ML, SC-SM, CL-ML	A-2-4, A-4	0	90-100	80-100	75-100	28-75	<31	NP-7
	6-38	Clay loam, clay	CL, CH	A-7-6	0-2	95-100	95-100	85-100	70-98	41-65	25-42
	38-60	Clay loam, clay	CL, CH	A-7-6	0-2	95-100	95-100	85-100	70-98	41-65	25-42
BnB--Bienville	0-8	Loamy fine sand	SM, SC-SM	A-2-4, A-4	0	100	100	90-100	15-50	<25	NP-5
	8-48	Loamy fine sand, fine sand.	SM	A-2-4, A-4	0	100	100	90-100	15-50	<25	NP-3
	48-80	Loamy fine sand, fine sandy loam, fine sand.	SM, ML	A-2-4, A-4	0	100	100	90-100	20-55	<25	NP-3
BoC--Bigbrown	0-8	Silty clay loam	CL	A-6, A-7	0-1	95-100	95-100	80-100	65-95	30-45	12-25
	8-80	Stratified very fine sandy loam to silty clay loam.	CL, SC	A-4, A-6, A-7-6	0-1	85-100	85-100	60-100	36-95	25-50	7-27
BuA--Burleson	0-37	Clay	CH	A-7-6	0-2	90-100	90-100	90-99	67-97	56-75	33-49
	37-51	Clay, silty clay	CH	A-7-6	0-1	90-100	90-100	90-99	80-99	51-75	34-54
	51-80	Clay, silty clay, clay loam.	CH	A-7-6	0-2	90-100	80-100	75-99	67-98	51-75	34-54
CrA, CrB, CrC, CrD--Crockett	0-7	Fine sandy loam	SM, ML, CL, SC	A-4, A-6	0-2	98-100	94-100	89-100	40-96	15-35	3-15
	7-15	Clay, clay loam, sandy clay.	CH, CL	A-7, A-6	0	89-100	75-100	75-100	60-98	35-59	23-42
	15-39	Clay, clay loam, sandy clay.	CH, CL	A-7, A-6	0	89-100	75-100	75-100	65-98	35-59	23-42
	39-46	Clay loam, sandy clay loam, clay.	CL, CH	A-6, A-7	0-5	90-100	85-100	75-100	50-90	30-60	15-40
	46-60	Stratified loam to clay or shale.	CH, CL	A-7	0-5	90-100	90-100	90-100	70-99	45-71	27-52

See footnote at end of table.

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
CrC3, CrD4------- Crockett	0-4	Fine sandy loam	SM, ML, CL, SC	A-4, A-6	0-2	98-100	94-100	89-100	40-96	15-35	3-15
	4-12	Clay, clay loam, sandy clay.	CH, CL	A-7, A-6	0	89-100	75-100	75-100	60-98	35-59	23-42
	12-30	Clay, clay loam, sandy clay.	CH, CL	A-7, A-6	0	89-100	75-100	75-100	65-98	35-59	23-42
	30-42	Clay loam, sandy clay loam, clay.	CL, CH	A-6, A-7	0-5	90-100	85-100	75-100	50-90	30-60	15-40
	42-60	Stratified loam to clay or shale.	CH, CL	A-7	0-5	90-100	90-100	90-100	70-99	45-71	27-52
CtE-------------- Cuthbert	0-7	Fine sandy loam	SM, ML, SC-SM, CL-ML	A-2-4, A-4	0-1	85-100	78-100	75-98	20-55	<32	NP-7
	7-26	Sandy clay loam, sandy clay, clay.	SC, CL, CH	A-6, A-7-6	0-1	85-100	75-100	65-100	45-98	37-64	19-40
	26-31	Fine sandy loam, sandy clay loam, clay loam.	SC, CL	A-6, A-7, A-2-6	0-1	85-100	80-100	75-100	28-84	29-45	11-26
	31-65	Stratified fine sandy loam to clay or shale.	SC, CL	A-6, A-7, A-2-6	0-3	85-100	80-100	75-100	28-84	21-45	7-26
CvF-------------- Cuthbert	0-5	Gravelly fine sandy loam.	SM, GM, GM-GC, SC-SM	A-1-B, A-2-4, A-4	0-5	60-88	50-80	35-75	20-49	<32	NP-7
	5-34	Sandy clay loam, sandy clay, clay.	SC, CL, CH	A-6, A-7-6	0-1	85-100	75-100	65-100	45-98	37-64	19-40
	34-60	Stratified fine sandy loam to clay or shale.	SC, CL	A-6, A-7, A-2-6	0-3	85-100	80-100	75-100	28-84	21-45	7-26
CxE*------------- Cuthbert	0-3	Clay loam--------	CL, CH	A-6, A-7	0-1	95-100	85-100	75-100	51-98	32-52	16-32
	3-22	Sandy clay loam, sandy clay, clay.	SC, CL, CH	A-6, A-7-6	0-1	85-100	75-100	65-100	45-98	37-64	20-40
	22-28	Clay, sandy clay loam, shaly clay.	SC, CL, CH	A-6, A-7, A-2-6	0-1	85-100	80-100	75-100	28-84	30-57	11-32
	28-60	Stratified fine sandy loam to clay or shale.	SC, CL	A-6, A-7, A-2-6	0-3	85-100	80-100	75-100	28-84	21-45	7-28
CzG-------------- Cuthbert	0-5	Gravelly fine sandy loam.	SM, GM, GM-GC, SC-SM	A-1-B, A-2-4, A-4	0-5	60-88	50-80	35-75	20-49	<32	NP-7
	5-30	Sandy clay loam, sandy clay, clay.	SC, CL, CH	A-6, A-7-6	0-1	85-100	75-100	65-100	45-98	37-64	19-40
	30-35	Fine sandy loam, sandy clay loam, clay loam.	SC, CL	A-6, A-7, A-2-6	0-1	85-100	80-100	75-100	28-84	29-45	11-26
	35-60	Stratified fine sandy loam to clay or shale.	SC, CL	A-6, A-7, A-2-6	0-3	85-100	80-100	75-100	28-84	21-45	7-26

See footnote at end of table.

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
DrA*:											
Derly	0-7	Loam	ML, CL, CL-ML	A-4	0	100	100	85-100	55-90	<30	NP-10
	7-12	Clay loam, silty clay loam, silty clay.	CL, CH	A-7, A-6	0	100	100	90-100	70-95	35-60	20-36
	12-30	Clay loam, silty clay loam, clay.	CH, CL	A-7, A-6	0	100	100	90-100	75-95	38-60	26-36
	30-60	Loam, clay loam, clay.	CH, CL	A-7, A-6	0	100	100	90-100	56-95	34-60	20-36
Rader	0-12	Fine sandy loam	ML, CL-ML, SM, SC	A-4, A-2	0	98-100	98-100	90-100	34-75	18-28	3-10
	12-25	Fine sandy loam, very fine sandy loam, loam.	ML, CL-ML, SM, SC	A-2, A-4	0	98-100	95-100	90-100	34-75	18-28	3-10
	25-38	Loam, sandy clay loam, clay loam.	SC, CL	A-6	0	95-100	95-100	90-100	36-75	26-40	11-22
	38-55	Clay loam, sandy clay, clay.	CL, CH	A-6, A-7	0	95-100	95-100	90-100	51-90	36-60	18-38
	55-80	Sandy clay loam, sandy clay, clay.	SC, CL, CH	A-6, A-7	0	95-100	95-100	90-100	36-75	25-52	11-36
EgB, EgE, ErC---- Edge	0-5	Fine sandy loam	ML, SM	A-4	0	98-100	96-100	80-100	45-75	<30	NP-7
	5-30	Sandy clay, clay	CH, CL	A-7-6	0	98-100	97-100	90-100	70-98	48-65	29-42
	30-40	Fine sandy loam, sandy clay loam, clay loam.	SC, CL, SC-SM, CL-ML	A-4, A-6, A-7-6	0	95-100	90-100	72-100	48-78	18-45	4-25
	40-60	Stratified fine sandy loam to clay or shale.	SC, CL, CH	A-2-6, A-2-7, A-6	0	95-100	90-100	72-100	29-80	25-51	11-34
EsE---- Ellis	0-7	Clay	CH	A-7-6	0-5	95-100	95-100	95-100	75-95	51-75	30-50
	7-37	Clay	CH	A-7-6	0-5	95-100	95-100	95-100	75-95	51-75	30-50
	37-60	Clay or shale	CH	A-7-6	0-5	95-100	95-100	90-100	75-95	51-75	30-50
FeD---- Ferris	0-8	Clay	CH	A-7-6	0	92-100	92-100	75-100	75-100	51-76	35-55
	8-38	Clay, silty clay	CH	A-7-6	0	92-100	92-100	75-100	72-100	51-78	35-56
	38-60	Clay or shale	CH	A-7-6	0	92-100	92-100	85-100	75-100	61-100	42-75
GfB---- Gasil	0-16	Fine sandy loam	CL, ML, SC, SM	A-4	0	95-100	95-100	85-100	36-55	20-28	2-10
	16-62	Sandy clay loam, loam, fine sandy loam.	CL, SC, CL-ML, SC-SM	A-6, A-4	0	95-100	95-100	85-100	36-71	22-40	7-20
Gh---- Gladewater	0-8	Clay	CH, CL	A-7	0	100	100	90-100	80-95	48-75	25-50
	8-63	Clay	CH	A-7	0	100	100	95-100	90-100	51-75	30-50
	63-80	Clay loam, loam	CH, CL	A-7	0	100	100	90-100	70-80	41-56	20-33
HeE---- Hearne	0-8	Fine sandy loam	SM, SC-SM, ML, CL-ML	A-4	0-2	75-100	75-100	65-100	36-55	16-25	NP-7
	8-23	Clay, sandy clay	CH, CL	A-7	0-1	90-100	85-100	85-100	51-95	40-65	20-40
	23-65	Stratified fine sandy loam to clay or shale.	SC, CL	A-6, A-7, A-2	0-3	85-100	85-100	80-100	28-85	29-45	11-26

See footnote at end of table.

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Ka Kaufman	0-14	Clay or clay loam	CL	A-6-6, A-7-5	0	100	96-100	85-100	60-85	30-49	15-30
	14-51	Clay	CH	A-7-6, A-7-5	0	100	100	95-100	90-100	65-102	45-71
	51-80	Clay	CH	A-7-6, A-7-5	0	100	100	95-100	85-100	64-102	45-71
Kc, Kd Kaufman	0-26	Clay	CH	A-7-6, A-7-5	0	100	100	90-100	80-100	56-96	33-62
	26-40	Clay	CH	A-7-6, A-7-5	0	100	100	95-100	90-100	65-102	45-71
	40-60	Clay	CH	A-7-6, A-7-5	0	100	100	95-100	85-100	64-102	45-71
Kf Kaufman	0-9	Clay	CH	A-7-6, A-7-5	0	100	100	90-100	80-100	56-96	33-62
	9-56	Clay	CH	A-7-6, A-7-5	0	100	100	95-100	90-100	65-102	45-71
	56-80	Fine sandy loam, loam, sandy clay loam, clay loam.	SC, CL, SM-SC, CL-ML	A-4, A-6, A24, A26	0	95-100	85-100	90-100	22-70	20-40	4-22
Kh Keechi	0-16	Loamy fine sand	SM	A-2-4	0	95-100	95-100	50-75	15-30	16-20	NP-3
	16-50	Stratified loamy sand to loam.	SM, ML, SC-SM, CL-ML	A-2-4, A-4	0	95-100	95-100	50-95	15-75	16-30	NP-10
	50-80	Clay, clay loam, sandy clay.	CL, CH, SC	A-6, A-7-6	0	95-100	95-100	85-100	45-95	35-60	20-40
KrB Kirvin	0-8	Fine sandy loam	SM, ML, CL, SC	A-4	0-2	95-100	95-98	90-95	36-70	<30	NP-8
	8-35	Clay loam, sandy clay, clay.	CL, CH	A-7	0-1	95-100	90-100	85-100	53-95	42-67	24-43
	35-44	Sandy clay loam, clay loam, clay.	CL, CH	A-6, A-7	0-1	95-100	90-100	75-100	51-90	32-59	16-32
	44-60	Stratified fine sandy loam to clay, or shale.	SC, CL, CH	A-4, A-6, A-7	0-1	95-100	90-100	50-90	36-80	25-52	9-32
KyC Kirvin	0-7	Gravelly fine sandy loam.	SM, GM, SC, GM-GC	A-2-4, A-4	0-5	55-92	47-80	40-75	25-49	<30	NP-8
	7-31	Clay loam, sandy clay, clay.	CL, CH	A-7	0-1	95-100	90-100	85-100	53-95	42-67	24-43
	31-44	Sandy clay loam, clay loam, clay.	CL, CH	A-6, A-7	0-1	95-100	90-100	75-100	51-90	32-59	16-32
	44-60	Stratified fine sandy loam to clay, or shale.	SC, CL, CH	A-4, A-6, A-7	0-1	95-100	90-100	50-90	36-80	25-52	9-32
LaE Lamar	0-21	Clay loam	CL, CL-ML	A-6, A-4, A-7-6	0	95-100	95-100	85-100	70-100	20-49	5-31
	21-38	Clay loam, loam, silty clay loam.	CL, CL-ML	A-6, A-4, A-7-6	0	95-100	95-100	85-100	70-100	20-49	5-31
	38-60	Clay loam, loam, silty clay loam.	CL, CL-ML	A-6, A-4, A-7-6	0	95-100	95-100	85-100	70-100	20-49	5-31

See footnote at end of table.

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
LgB	0-4	Loamy fine sand	SM	A-2	0	100	100	90-100	20-30	16-20	NP-4
Leagueville	4-34	Fine sand, loamy fine sand.	SM	A-2	0	100	100	85-100	15-30	16-20	NP-4
	34-52	Sandy clay loam, fine sandy loam, sandy loam.	SC, CL, SC-SM, CL-ML	A-4, A-6	0	100	95-100	85-100	36-60	20-35	5-15
	52-72	Fine sand, sandy clay loam, fine sandy loam.	SM, SC, SC-SM	A-2, A-4	0	100	95-100	85-100	15-50	16-30	NP-10
LsC	0-20	Clay	CH	A-7-6	0	98-100	98-100	95-100	85-100	60-90	35-60
Leson	20-30	Clay, silty clay	CH	A-7-6	0	98-100	98-100	95-100	90-100	65-96	45-70
	30-58	Clay, silty clay	CH	A-7-6	0	98-100	95-100	90-100	85-100	65-96	45-70
	58-75	Clay or shale	CH	A-7-6	0	98-100	95-100	90-100	80-100	75-96	55-70
MaA	0-9	Fine sandy loam	CL, CL-ML, SC-SM, SC	A-4, A-6	0	95-100	95-100	80-98	40-70	19-32	4-15
Mabank	9-50	Clay, clay loam	CH, CL	A-7, A-6	0	95-100	95-100	95-100	60-85	38-55	22-37
	50-72	Clay, clay loam	CH, CL	A-7, A-6	0	95-100	95-100	95-100	60-85	38-55	22-37
Na	0-10	Clay loam	CL	A-6, A-7, A-4	0	100	100	90-100	54-92	25-47	8-25
Nahatche	10-33	Loam, clay loam, sandy clay loam.	CL	A-6, A-4	0	100	100	85-100	60-90	25-40	8-20
	33-63	Stratified loam to silty clay loam.	CL	A-6, A-7	0	100	100	90-100	60-90	30-45	11-25
NH*:											
Nahatche	0-14	Clay loam	CL	A-6, A-7, A-4	0	100	100	90-100	54-92	25-47	8-25
	14-50	Loam, clay loam, sandy clay loam.	CL	A-6, A-4	0	100	100	85-100	60-90	25-40	8-20
	50-60	Stratified loam to silty clay loam.	CL	A-6, A-7	0	100	100	90-100	60-90	30-45	11-25
Hatliff	0-6	Fine sandy loam	SM, CL, ML, SC	A-4	0	100	95-100	65-95	36-55	<30	NP-10
	6-65	Stratified loam to sand.	SP-SM, SM, SC, SC-SM	A-2-4, A-4, A-3	0	100	95-100	50-90	5-45	<30	NP-9
OkB	0-15	Fine sandy loam	SM, ML, SC-SM, CL-ML	A-4	0	95-100	95-100	85-100	36-55	<25	NP-7
Oakwood	15-46	Fine sandy loam, sandy clay loam, clay loam.	SC, CL	A-4, A-6	0	95-100	95-100	85-100	40-75	20-40	8-22
	46-64	Fine sandy loam, sandy clay loam, clay loam.	SC, CL	A-4, A-6	0	95-100	90-100	80-95	40-75	20-40	8-22
	64-80	Fine sandy loam, sandy clay loam, clay loam.	SC, CL	A-4, A-6	0	95-100	90-100	75-90	35-75	20-40	8-20
PaB	0-4	Loamy fine sand	SM, SC-SM	A-2-4	0	100	95-100	85-100	15-35	16-25	NP-5
Padina	4-58	Fine sand, loamy fine sand.	SM, SP-SM, SC-SM	A-2-4, A-3	0	100	95-100	85-100	8-28	16-25	NP-5
	58-72	Sandy clay loam, fine sandy loam.	SC, CL	A-2, A-4, A-6, A-7	0	90-100	90-100	90-100	25-65	22-42	8-22

See footnote at end of table.

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
PkC---	0-7	Loamy fine sand	SM, SC-SM	A-2-4	0	100	95-100	85-100	15-30	16-28	NP-7
Pickton	7-54	Loamy fine sand, fine sand.	SM, SC-SM	A-2-4	0	100	95-100	85-100	15-30	16-28	NP-7
	54-80	Sandy clay loam, clay loam, fine sandy loam.	SC, CL, CL-ML, SC-SM	A-4, A-6, A-2-6, A-2-4	0	100	95-100	85-100	25-75	23-35	5-14
PkE---	0-12	Loamy fine sand	SM, SC-SM	A-2-4	0	100	95-100	85-100	15-30	16-28	NP-7
Pickton	12-58	Loamy fine sand, fine sand.	SM, SC-SM	A-2-4	0	100	95-100	85-100	15-30	16-28	NP-7
	58-80	Sandy clay loam, clay loam, fine sandy loam.	SC, CL, CL-ML, SC-SM	A-4, A-6, A-2-6, A-2-4	0	100	95-100	85-100	25-75	23-35	5-14
Pt*											
Pits											
Pu---	0-6	Loam---	CL, CL-ML	A-4, A-6	0	98-100	95-100	85-100	60-95	25-40	6-18
Pluck	6-60	Silty clay loam, clay loam.	CL	A-6, A-7-6	0	98-100	95-100	90-100	70-95	32-42	12-20
RaB---	0-16	Fine sandy loam	ML, CL-ML, SM, SC	A-4, A-2	0	98-100	98-100	90-100	34-75	18-28	3-10
Rader	16-26	Fine sandy loam, very fine sandy loam, loam.	ML, CL-ML, SM, SC	A-2, A-4	0	98-100	95-100	90-100	34-75	18-28	3-10
	26-38	Loam, sandy clay loam, clay loam.	SC, CL	A-6	0	95-100	95-100	90-100	36-75	26-40	11-22
	38-60	Clay loam, sandy clay, clay.	CL, CH	A-6, A-7	0	95-100	95-100	90-100	51-90	36-60	18-38
	60-80	Sandy clay loam, sandy clay, clay.	SC, CL, CH	A-6, A-7	0	95-100	95-100	90-100	36-75	25-52	11-36
RnA---	0-14	Fine sandy loam	ML, CL, CL-ML	A-4	0	95-100	95-100	80-100	51-80	<30	NP-10
Raino	14-28	Loam, sandy clay loam, clay loam.	CL, SC, SC-SM, CL-ML	A-6, A-4	0	95-100	95-100	80-100	40-72	20-40	5-20
	28-60	Sandy clay loam, clay loam, clay.	CL, CH	A-7	0	95-100	80-100	80-100	55-90	41-60	18-35
RoA---	0-26	Loamy fine sand	SM, SP-SM	A-2-4, A-3	0	80-100	80-100	65-95	8-35	<25	NP-3
Robco	26-60	Clay loam, sandy clay loam.	CL	A-6, A-7	0	98-100	98-100	80-100	50-80	36-50	16-28
SaE---	0-8	Fine sandy loam	SM, SC-SM, ML, CL-ML	A-4	0	95-100	95-100	70-100	40-60	16-26	NP-7
Silawa	8-29	Sandy clay loam, fine sandy loam, clay loam.	CL, SC	A-4, A-6	0	85-100	85-100	80-100	35-65	25-40	8-18
	29-41	Fine sandy loam, gravelly fine sandy loam, sandy clay loam.	CL, CL-ML, SC, SC-SM	A-4, A-6, A-2-4	0-2	70-100	70-100	38-100	18-60	21-34	4-14
	41-60	Loamy fine sand, gravelly loamy fine sand, fine sandy loam.	SM, SC-SM, SP-SM, GM	A-2-4, A-4, A-1-B	0-2	51-100	51-100	38-100	12-40	16-26	NP-7

See footnote at end of table.

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
SsB--- Silstid	0-10	Loamy fine sand	SM, SP-SM	A-2-4, A-3	0-1	90-100	85-100	80-100	9-25	<25	NP-3
	10-22	Fine sand, loamy fine sand.	SM, SP-SM	A-2, A-3	0-1	90-100	85-100	80-100	9-25	<25	NP-3
	22-52	Sandy clay loam, loam, fine sandy loam.	SC, CL, SC-SM, CL-ML	A-4, A-6, A-2-4, A-2-6	0-1	90-100	85-100	75-100	30-55	20-43	4-26
	52-62	Sandy clay loam, loam, fine sandy loam.	SC, CL, SC-SM, CL-ML	A-4, A-6, A-2-4, A-2-6	0-1	90-100	80-100	70-100	22-55	20-43	4-25
SsD--- Silstid	0-9	Loamy fine sand	SM, SP-SM	A-2-4, A-3	0-1	90-100	85-100	80-100	9-25	<25	NP-3
	9-26	Fine sand, loamy fine sand.	SM, SP-SM	A-2, A-3	0-1	90-100	85-100	80-100	9-25	<25	NP-3
	26-41	Sandy clay loam, loam, fine sandy loam.	SC, CL, SC-SM, CL-ML	A-4, A-6, A-2-4, A-2-6	0-1	90-100	85-100	75-100	30-55	20-43	4-26
	41-63	Sandy clay loam, loam, fine sandy loam.	SC, CL, SC-SM, CL-ML	A-4, A-6, A-2-4, A-2-6	0-1	90-100	80-100	70-100	22-55	20-43	4-25
StB--- Styx	0-6	Loamy fine sand	SM, SC-SM	A-2-4, A-4	0	100	100	70-100	15-40	<25	NP-4
	6-33	Fine sand, loamy fine sand.	SM, SC-SM	A-2-4, A-4	0	100	100	70-100	15-40	<25	NP-4
	33-80	Sandy clay loam, clay loam.	SC, CL	A-6, A-4	0	100	100	80-100	36-70	20-40	8-20
TaB--- Tabor	0-12	Fine sandy loam	ML, SM, CL-ML, SC-SM	A-4, A-2-4	0	85-100	75-100	70-100	30-55	15-25	NP-7
	12-48	Clay---	CH, CL	A-7	0	95-100	90-100	85-100	55-90	45-65	25-40
	48-80	Sandy clay loam, clay loam, clay.	CH, CL, SC	A-7, A-6	0	95-100	90-100	75-100	40-90	35-60	15-35
TfA*:											
Tabor---	0-18	Fine sandy loam	ML, SM, CL-ML, SC-SM	A-4, A-2-4	0	85-100	75-100	70-100	30-55	15-25	NP-7
	18-33	Clay---	CH, CL	A-7	0	95-100	90-100	85-100	55-90	45-65	25-40
	33-60	Sandy clay loam, clay loam, clay.	CH, CL, SC	A-7, A-6	0	95-100	90-100	75-100	40-90	35-60	15-35
Lufkin---	0-9	Fine sandy loam	SM, CL, ML, SC	A-4	0-5	90-100	80-100	80-100	40-85	15-30	NP-10
	9-54	Clay, clay loam, silty clay loam.	CH, CL	A-7-6	0	90-100	90-100	90-100	65-95	45-67	30-45
	54-76	Loam, clay loam, sandy clay loam.	CH, CL, SC	A-7	0	85-100	85-100	80-100	48-90	40-86	25-55
ToC--- Tonkawa	0-6	Fine sand---	SP-SM	A-3, A-2	0	100	97-100	90-100	6-12	16-20	NP-3
	6-80	Fine sand, sand	SP-SM	A-3, A-2	0	100	95-100	90-100	6-12	16-20	NP-3
ToE--- Tonkawa	0-9	Fine sand---	SP-SM	A-3, A-2	0	100	97-100	90-100	6-12	16-20	NP-3
	9-80	Fine sand, sand	SP-SM	A-3, A-2	0	100	95-100	90-100	6-12	16-20	NP-3
Tr--- Trinity	0-7	Clay---	CH	A-7-6	0	100	98-100	85-100	80-100	55-85	35-60
	7-36	Clay---	CH	A-7-6	0	100	95-100	85-100	80-100	55-85	35-60
	36-80	Clay---	CH	A-7-6	0	100	95-100	85-100	80-100	55-85	35-60

See footnote at end of table.

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Wh	0-15	Fine sandy loam	CL, CL-ML	A-4, A-6	0	100	98-100	85-100	60-85	25-36	6-17
Whitesboro	15-60	Loam, clay loam, sandy clay loam.	CL	A-6, A-7-6	0	100	98-100	85-100	65-91	30-47	11-27
Wk	0-26	Clay loam	CL	A-6, A-7-6	0	100	98-100	85-100	70-90	30-47	11-27
Whitesboro	26-60	Loam, clay loam, sandy clay loam.	CL	A-6, A-7-6	0	100	98-100	85-100	65-91	30-47	11-27
Wm	0-32	Clay loam	CL	A-6, A-7-6	0	100	98-100	85-100	70-90	30-47	11-27
Whitesboro	32-60	Loam, clay loam, sandy clay loam.	CL	A-6, A-7-6	0	100	98-100	85-100	65-91	30-47	11-27
WnA	0-4	Silty clay loam	CL	A-6, A-7-6	0	95-100	85-100	80-100	60-96	38-49	20-30
Wilson	4-35	Silty clay, clay, clay loam.	CL, CH	A-7-6	0	90-100	80-100	80-100	65-96	43-56	26-37
	35-65	Silty clay, clay, silty clay loam.	CL, CH	A-7-6, A-6	0	95-100	90-100	85-100	70-96	38-65	24-48
WnB	0-7	Silty clay loam	CL	A-6, A-7-6	0	95-100	85-100	80-100	60-96	38-49	20-30
Wilson	7-45	Silty clay, clay, clay loam.	CL, CH	A-7-6	0	90-100	80-100	80-100	65-96	43-56	26-37
	45-80	Silty clay, clay, silty clay loam.	CL, CH	A-7-6, A-6	0	95-100	90-100	85-100	70-96	38-65	24-48
WoB	0-10	Loamy fine sand	SM, SC-SM	A-2-4	0	95-100	95-100	85-100	15-35	16-22	NP-5
Wolfpen	10-33	Loamy fine sand, fine sand.	SM, SC-SM	A-2-4	0	95-100	95-100	85-100	15-35	16-22	NP-5
	33-56	Fine sandy loam, sandy clay loam, clay loam.	SC, CL	A-6, A-4, A-2	0	95-100	95-100	85-100	26-55	25-40	8-20
	56-80	Fine sandy loam, sandy clay loam, clay loam.	SC, SM, CL, ML	A-4, A-6, A-2, A-7	0	95-100	95-100	85-100	25-55	16-45	2-27
WoE	0-8	Loamy fine sand	SM, SC-SM	A-2-4	0	95-100	95-100	85-100	15-35	16-22	NP-5
Wolfpen	8-31	Loamy fine sand, fine sand.	SM, SC-SM	A-2-4	0	95-100	95-100	85-100	15-35	16-22	NP-5
	31-56	Fine sandy loam, sandy clay loam, clay loam.	SC, CL	A-6, A-4, A-2	0	95-100	95-100	85-100	26-55	25-40	8-20
	56-63	Fine sandy loam, sandy clay loam, clay loam.	SC, SM, CL, ML	A-4, A-6, A-2, A-7	0	95-100	95-100	85-100	25-55	16-45	2-27

* See description of the map unit for composition and behavior characteristics of the map unit.

Table 17.--Physical and Chemical Properties of the Soils

(The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated)

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	G/cc	In/hr	In/in	pH				Pct
ArC	0-9	0-3	1.24-1.50	6.0-20	0.05-0.08	4.5-6.5	Low	0.15	5	.4-1
Arenosa	9-80	0-3	1.45-1.65	6.0-20	0.03-0.07	4.5-6.0	Low	0.15		
AxB	0-7	7-18	1.40-1.60	0.6-2.0	0.11-0.15	5.1-6.5	Low	0.43	5	.5-1
Axtell	7-24	35-55	1.35-1.60	<0.06	0.07-0.16	4.5-5.5	High	0.37		
	24-49	27-50	1.50-1.70	<0.06	0.07-0.16	6.6-8.4	High	0.37		
	49-80	25-50	1.50-1.70	0.2-0.6	0.07-0.12	5.6-8.4	High	0.37		
AxD	0-6	7-18	1.40-1.60	0.6-2.0	0.11-0.15	5.1-6.5	Low	0.43	5	.5-1
Axtell	6-38	35-55	1.35-1.60	<0.06	0.07-0.16	4.5-5.5	High	0.37		
	38-60	27-50	1.50-1.70	<0.06	0.07-0.16	6.6-8.4	High	0.37		
BnB	0-8	4-15	1.35-1.65	6.0-20	0.07-0.11	4.5-6.5	Low	0.20	5	<2
Bienville	8-48	2-15	1.35-1.60	2.0-6.0	0.08-0.11	4.5-6.5	Low	0.20		
	48-80	5-20	1.35-1.70	2.0-6.0	0.08-0.13	5.6-6.0	Low	0.20		
BoC	0-8	27-40	1.20-1.55	0.2-0.6	0.15-0.20	5.6-8.4	Moderate	0.37	5	.3-1
Bigbrown	8-80	18-35	1.25-1.60	0.06-0.2	0.10-0.18	5.6-8.4	Moderate	0.43		
BuA	0-37	40-60	1.35-1.50	0.01-0.06	0.12-0.18	5.6-8.4	Very high	0.32	5	1-3
Burleson	37-51	40-60	1.40-1.55	0.01-0.06	0.12-0.18	5.6-8.4	Very high	0.32		
	51-80	35-60	1.40-1.55	0.01-0.06	0.12-0.18	7.4-8.4	Very high	0.32		
CrA, CrB, CrC, CrD	0-7	5-20	1.50-1.60	0.6-2.0	0.11-0.20	5.6-7.8	Low	0.43	4-3	.5-2
Crockett	7-15	40-55	1.35-1.60	0.01-0.06	0.08-0.14	5.6-7.3	High	0.32		
	15-39	35-55	1.40-1.65	0.01-0.06	0.08-0.14	6.1-8.4	High	0.32		
	39-46	20-50	1.50-1.70	0.01-0.06	0.11-0.15	6.1-8.4	Moderate	0.32		
	46-60	30-60	1.50-1.70	0.01-0.06	0.11-0.15	6.1-8.4	High	0.32		
CrC3, CrD4	0-4	5-20	1.50-1.60	0.6-2.0	0.11-0.20	5.6-7.8	Low	0.43	4-3	.5-2
Crockett	4-12	40-55	1.35-1.60	0.01-0.06	0.08-0.14	5.6-7.3	High	0.32		
	12-30	35-55	1.40-1.65	0.01-0.06	0.08-0.14	6.1-8.4	High	0.32		
	30-42	20-50	1.50-1.70	0.01-0.06	0.11-0.15	6.1-8.4	Moderate	0.32		
	42-60	30-60	1.50-1.70	0.01-0.06	0.11-0.15	6.1-8.4	High	0.32		
CtE	0-7	2-15	1.20-1.40	2.0-6.0	0.09-0.12	4.5-6.5	Low	0.37	3	.5-2
Cuthbert	7-26	35-60	1.24-1.45	0.2-0.6	0.10-0.15	3.6-5.5	Moderate	0.32		
	26-31	20-50	1.35-1.60	0.2-0.6	0.08-0.14	3.6-5.5	Moderate	0.32		
	31-65	20-45	1.40-1.65	0.06-0.6	0.08-0.14	3.6-5.0	Moderate	0.32		
CvF	0-5	2-15	1.20-1.40	2.0-6.0	0.07-0.11	4.5-6.5	Low	0.20	3	.5-2
Cuthbert	5-34	35-60	1.24-1.45	0.2-0.6	0.10-0.15	3.6-5.5	Moderate	0.32		
	34-60	20-45	1.40-1.65	0.06-0.6	0.08-0.14	3.6-5.0	Moderate	0.32		
CxE*	0-3	20-35	1.20-1.40	0.2-0.6	0.10-0.15	3.6-5.5	Moderate	0.32	3	<1
Cuthbert	3-22	35-60	1.20-1.45	0.2-0.6	0.10-0.15	3.6-5.5	Moderate	0.32		
	22-28	20-50	1.35-1.60	0.2-0.6	0.08-0.14	3.6-5.5	Moderate	0.32		
	28-60	20-45	1.40-1.65	0.06-0.6	0.08-0.15	3.6-5.0	Moderate	0.32		
CzG	0-5	2-15	1.20-1.40	2.0-6.0	0.07-0.11	4.5-6.5	Low	0.20	3	.5-2
Cuthbert	5-30	35-60	1.24-1.45	0.2-0.6	0.10-0.15	3.6-5.5	Moderate	0.32		
	30-35	20-50	1.35-1.60	0.2-0.6	0.08-0.14	3.6-5.5	Moderate	0.32		
	35-60	20-45	1.40-1.65	0.06-0.6	0.08-0.14	3.6-5.0	Moderate	0.32		

See footnote at end of table.

Table 17.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	G/cc	In/hr	In/in	pH				Pct
DrA*:										
Derly	0-7	8-20	1.40-1.60	0.6-2.0	0.11-0.16	4.5-6.5	Low	0.37	5	.5-2
	7-12	27-40	1.40-1.55	0.06-0.2	0.13-0.18	4.5-6.0	Moderate	0.37		
	12-30	35-50	1.45-1.60	0.01-0.06	0.10-0.16	4.5-6.0	High	0.32		
	30-60	20-45	1.44-1.65	0.01-0.06	0.10-0.16	5.6-7.3	High	0.32		
Rader	0-12	4-15	1.30-1.50	2.0-6.0	0.10-0.18	4.5-6.5	Low	0.37	5	.5-2
	12-25	4-15	1.35-1.55	2.0-6.0	0.10-0.18	4.5-6.5	Low	0.37		
	25-38	18-30	1.40-1.60	0.2-0.6	0.12-0.18	4.5-5.5	Moderate	0.32		
	38-55	35-50	1.45-1.65	<0.06	0.12-0.18	4.5-5.5	High	0.32		
	55-80	24-45	1.45-1.65	0.06-0.2	0.12-0.18	5.1-6.0	Moderate	0.32		
EgB, EgE, ErC----	0-5	5-12	1.25-1.55	0.6-2.0	0.14-0.18	5.1-6.5	Low	0.43	4	<1
Edge	5-30	40-55	1.36-1.55	<0.06	0.11-0.19	4.5-6.0	High	0.32		
	30-40	10-40	1.40-1.69	0.2-0.6	0.10-0.16	4.5-7.8	Moderate	0.37		
	40-60	10-45	1.50-1.75	0.06-0.2	0.11-0.18	5.1-8.4	Moderate	0.37		
EsE	0-7	40-50	1.35-1.55	<0.06	0.12-0.18	6.1-7.8	High	0.32	3	1-3
Ellis	7-37	40-60	1.35-1.55	<0.06	0.12-0.18	6.6-8.4	High	0.32		
	37-60	40-60	1.40-1.65	<0.06	0.10-0.15	7.9-8.4	High	0.32		
FeD	0-8	40-65	1.40-1.50	0.01-0.06	0.15-0.18	7.9-8.4	Very high	0.32	4	.5-2
Ferris	8-38	40-65	1.40-1.50	0.01-0.06	0.12-0.18	7.9-8.4	Very high	0.32		
	38-60	40-75	1.45-1.65	0.01-0.06	0.11-0.15	7.9-8.4	High	0.32		
GfB	0-16	8-20	1.50-1.60	2.0-6.0	0.11-0.15	6.1-7.8	Low	0.24	5	.5-1
Gasil	16-62	15-35	1.40-1.60	0.6-2.0	0.12-0.19	5.1-6.5	Low	0.32		
Gh	0-8	50-75	1.20-1.40	0.06-0.2	0.15-0.20	5.6-6.5	Very high	0.32	5	1-3
Gladewater	8-63	60-75	1.20-1.40	<0.06	0.15-0.18	5.5-6.5	Very high	0.32		
HeE	0-8	2-15	1.20-1.40	2.0-6.0	0.11-0.17	4.5-6.5	Low	0.32	4	.5-1
Hearne	8-23	35-60	1.30-1.50	0.06-0.2	0.10-0.15	3.5-5.5	Moderate	0.32		
	23-65	20-45	1.40-1.65	0.06-0.6	0.08-0.15	3.5-5.5	Moderate	0.32		
Ka	0-14	30-40	1.20-1.45	0.06-0.2	0.12-0.18	6.1-7.3	Moderate	0.28	5	1-4
Kaufman	14-51	60-86	1.25-1.45	<0.06	0.12-0.18	5.6-8.4	Very high	0.32		
	51-80	60-86	1.25-1.45	<0.06	0.12-0.18	7.4-8.4	Very high	0.32		
Kc, Kd	0-8	50-86	1.20-1.45	<0.06	0.12-0.18	6.6-7.8	Very high	0.32	5	1-4
Kaufman	8-42	60-86	1.25-1.45	<0.06	0.12-0.18	6.6-8.4	Very high	0.32		
	42-70	60-86	1.25-1.45	<0.06	0.12-0.18	7.4-8.4	Very high	0.32		
Kf	0-9	50-86	1.20-1.45	<0.06	0.12-0.18	5.6-8.4	Very high	0.32	5	1-4
Kaufman	9-56	60-86	1.25-1.45	<0.06	0.12-0.18	5.6-8.4	Very high	0.32		
	56-80	15-35	1.25-1.45	0.2-0.6	0.07-0.18	7.9-8.4	Moderate	0.32		
Kh	0-16	2-12	1.50-1.65	6.0-20	0.05-0.10	5.1-6.5	Low	0.17	5	.1-1
Keechi	16-50	5-18	1.40-1.55	0.6-2.0	0.06-0.18	5.1-7.3	Low	0.28		
	50-80	30-50	1.40-1.55	0.06-0.2	0.12-0.18	5.1-7.3	High	0.32		
KrB	0-8	2-15	1.20-1.40	2.0-6.0	0.09-0.12	5.1-6.5	Low	0.37	4	.5-2
Kirvin	8-35	35-60	1.24-1.45	0.2-0.6	0.11-0.15	3.6-5.5	Moderate	0.32		
	35-44	25-50	1.35-1.60	0.2-0.6	0.11-0.15	3.6-5.0	Moderate	0.32		
	44-60	20-45	1.40-1.65	0.2-0.6	0.08-0.14	3.6-5.0	Moderate	0.32		
KyC	0-7	2-15	1.20-1.40	2.0-6.0	0.07-0.11	5.1-7.3	Low	0.20	4	.5-2
Kirvin	7-31	35-60	1.24-1.45	0.2-0.6	0.11-0.15	3.6-5.5	Moderate	0.32		
	31-44	25-50	1.35-1.60	0.2-0.6	0.11-0.15	3.6-5.0	Moderate	0.32		
	44-60	20-45	1.40-1.65	0.2-0.6	0.08-0.14	3.6-5.0	Moderate	0.32		

See footnote at end of table.

Table 17.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	G/cc	In/hr	In/in	pH				Pct
LaE	0-21	20-35	1.25-1.40	0.6-2.0	0.12-0.15	6.6-8.4	Moderate	0.32	5	1-3
Lamar	21-38	20-35	1.30-1.50	0.6-2.0	0.12-0.15	7.9-8.4	Moderate	0.32		
	38-60	20-35	1.35-1.60	0.6-2.0	0.12-0.15	7.9-8.4	Moderate	0.32		
LgB	0-4	2-12	1.20-1.50	6.0-20	0.07-0.11	4.5-6.0	Low	0.20	5	.5-2
Leagueville	4-34	2-10	1.20-1.50	6.0-20	0.07-0.11	4.5-6.5	Low	0.20		
	34-52	10-25	1.30-1.60	0.6-2.0	0.12-0.17	3.5-5.5	Low	0.32		
	52-72	5-25	1.30-1.60	2.0-6.0	0.07-0.15	3.5-5.5	Low	0.28		
LsC	0-20	40-60	1.30-1.45	<0.06	0.12-0.18	6.1-8.4	High	0.32	5	1-4
Leson	20-30	40-60	1.30-1.50	<0.06	0.12-0.18	6.1-8.4	High	0.32		
	30-58	40-60	1.35-1.55	<0.06	0.12-0.18	7.9-8.4	High	0.32		
	58-75	40-65	1.40-1.65	<0.06	0.12-0.16	7.4-8.4	High	0.32		
MaA	0-9	10-25	1.50-1.65	0.6-2.0	0.11-0.15	5.6-6.5	Low	0.43	5	1-2
Mabank	9-50	35-50	1.45-1.65	<0.06	0.10-0.16	6.1-7.3	High	0.32		
	50-72	35-50	1.45-1.65	<0.06	0.10-0.16	7.9-8.4	High	0.32		
Na	0-10	18-35	1.10-1.30	0.6-2.0	0.13-0.20	5.6-7.8	Moderate	0.28	5	1-3
Nahatche	10-33	18-35	1.20-1.50	0.6-2.0	0.12-0.20	5.6-7.8	Moderate	0.28		
	33-63	18-35	1.30-1.60	0.6-2.0	0.12-0.18	5.6-7.8	Moderate	0.28		
NH*:										
Nahatche	0-14	18-35	1.10-1.30	0.6-2.0	0.13-0.20	5.6-7.8	Moderate	0.28	5	1-3
	14-50	18-35	1.20-1.50	0.6-2.0	0.12-0.20	5.6-7.8	Moderate	0.28		
	50-60	18-35	1.30-1.60	0.6-2.0	0.12-0.18	5.6-7.8	Moderate	0.28		
Hatliff	0-6	8-20	1.20-1.50	2.0-6.0	0.11-0.15	5.1-7.3	Low	0.28	5	<1
	6-65	8-18	1.20-1.50	2.0-6.0	0.05-0.11	5.1-7.3	Low	0.24		
OkB	0-15	5-15	1.30-1.50	2.0-6.0	0.10-0.15	5.6-7.3	Low	0.32	5	<1
Oakwood	15-46	18-30	1.38-1.65	0.6-2.0	0.12-0.16	4.5-6.5	Low	0.32		
	46-64	18-30	1.38-1.70	0.2-0.6	0.12-0.16	3.5-6.5	Low	0.28		
	64-80	15-40	1.40-1.70	0.2-0.6	0.10-0.15	3.5-6.5	Low	0.28		
PaB	0-4	2-10	1.20-1.50	6.0-20	0.07-0.11	5.6-7.3	Low	0.17	5	.5-1
Padina	4-58	2-10	1.20-1.50	6.0-20	0.05-0.08	5.6-7.3	Low	0.17		
	58-72	18-30	1.40-1.60	0.6-2.0	0.14-0.18	5.1-6.5	Low	0.24		
PkC	0-7	4-12	1.30-1.60	6.0-20	0.07-0.11	5.6-7.3	Low	0.17	5	.5-2
Pickton	7-54	3-12	1.30-1.60	6.0-20	0.07-0.11	5.1-7.3	Low	0.17		
	54-80	18-30	1.30-1.65	0.6-2.0	0.12-0.17	4.5-6.5	Low	0.24		
PkE	0-12	4-12	1.30-1.60	6.0-20	0.07-0.11	5.6-7.3	Low	0.17	5	.5-2
Pickton	12-58	3-12	1.30-1.60	6.0-20	0.07-0.11	5.1-7.3	Low	0.17		
	58-80	18-30	1.30-1.65	0.6-2.0	0.12-0.17	4.5-6.5	Low	0.24		
Pt*										
Pits										
Pu	0-6	15-35	1.10-1.30	0.6-2.0	0.15-0.22	5.1-6.5	Moderate	0.28	5	1-2
Pluck	6-60	27-40	1.20-1.50	0.6-2.0	0.17-0.22	5.6-7.8	Moderate	0.32		
RaB	0-16	4-15	1.30-1.50	2.0-6.0	0.10-0.18	4.5-6.5	Low	0.37	5	.5-2
Rader	16-26	4-15	1.35-1.55	2.0-6.0	0.10-0.18	4.5-6.5	Low	0.37		
	26-38	18-30	1.40-1.60	0.2-0.6	0.12-0.18	4.5-5.5	Moderate	0.32		
	38-60	35-50	1.45-1.65	<0.06	0.12-0.18	4.5-6.5	High	0.32		
	60-80	24-45	1.45-1.65	0.06-0.2	0.12-0.18	5.6-6.0	Moderate	0.32		

See footnote at end of table.

Table 17.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	G/cc	In/hr	In/in	pH				Pct
RnA	0-14	5-18	1.30-1.40	0.6-2.0	0.11-0.20	5.6-6.0	Low	0.43	5	<2
Raino	14-28	18-30	1.45-1.65	0.6-2.0	0.15-0.20	4.5-5.5	Moderate	0.43		
	28-60	25-50	1.50-1.70	0.06-0.2	0.12-0.18	4.5-5.5	High	0.32		
RoA	0-26	2-10	1.40-1.60	6.0-20	0.04-0.10	5.1-6.5	Low	0.24	5	<1
Robco	26-60	20-35	1.55-1.70	0.06-0.2	0.12-0.18	4.5-6.0	High	0.37		
SaE	0-8	10-20	1.35-1.55	2.0-6.0	0.10-0.15	5.1-6.5	Low	0.24	5-4	.5-2
Silawa	8-29	18-35	1.35-1.60	0.6-2.0	0.12-0.17	4.5-6.0	Low	0.32		
	29-41	12-30	1.40-1.65	2.0-6.0	0.08-0.15	4.5-6.0	Low	0.32		
	41-60	2-15	1.40-1.70	6.0-20	0.05-0.11	4.5-6.5	Low	0.20		
SsB	0-10	3-12	1.40-1.60	6.0-20	0.05-0.10	5.6-7.3	Low	0.17	5	<1
Silstid	10-22	3-12	1.40-1.60	6.0-20	0.05-0.10	5.6-7.3	Low	0.17		
	22-52	18-32	1.50-1.70	0.6-2.0	0.10-0.16	5.1-6.5	Low	0.24		
	52-62	18-32	1.50-1.70	0.6-2.0	0.10-0.16	5.1-6.5	Low	0.24		
SsD	0-9	3-12	1.40-1.60	6.0-20	0.05-0.10	5.6-7.3	Low	0.17	5	<1
Silstid	9-26	3-12	1.40-1.60	6.0-20	0.05-0.10	5.6-7.3	Low	0.17		
	26-41	18-32	1.50-1.70	0.6-2.0	0.10-0.16	5.1-6.5	Low	0.24		
	41-63	18-32	1.50-1.70	0.6-2.0	0.10-0.16	5.1-6.5	Low	0.24		
StB	0-6	3-15	1.40-1.60	2.0-6.0	0.05-0.10	5.1-7.3	Low	0.17	5	.5-2
Styx	6-33	3-15	1.40-1.60	2.0-6.0	0.05-0.10	5.1-7.3	Low	0.17		
	33-80	25-35	1.30-1.65	0.6-2.0	0.12-0.16	4.5-6.5	Low	0.24		
TaB	0-12	8-20	1.50-1.60	0.6-2.0	0.11-0.15	5.1-6.5	Low	0.43	5	.5-1
Tabor	12-48	40-55	1.35-1.55	<0.06	0.09-0.12	4.5-7.3	High	0.32		
	48-80	25-45	1.45-1.65	<0.06	0.14-0.18	5.1-8.4	High	0.32		
TfA*:										
Tabor	0-18	8-20	1.50-1.60	0.6-2.0	0.11-0.15	5.1-6.5	Low	0.43	5	.5-1
	18-33	40-55	1.35-1.55	<0.06	0.09-0.12	4.5-7.3	High	0.32		
	33-60	25-45	1.45-1.65	<0.06	0.14-0.18	5.1-8.4	High	0.32		
Lufkin	0-9	5-18	1.35-1.65	0.6-2.0	0.11-0.18	5.1-6.5	Low	0.43	5	.5-2
	9-54	35-45	1.40-1.60	0.01-0.06	0.09-0.14	4.5-5.5	Very high	0.32		
	54-76	20-40	1.40-1.68	0.01-0.06	0.09-0.14	6.1-8.4	High	0.37		
ToC	0-6	2-8	1.30-1.55	6.0-20	0.04-0.07	3.5-6.0	Low	0.15	5	.1-2
Tonkawa	6-80	2-8	1.30-1.55	6.0-20	0.04-0.07	3.5-5.5	Low	0.15		
ToE	0-9	2-8	1.30-1.55	6.0-20	0.04-0.07	3.5-6.0	Low	0.15	5	.1-2
Tonkawa	9-80	2-8	1.30-1.55	6.0-20	0.04-0.07	3.5-5.5	Low	0.15		
Tr	0-7	60-80	1.25-1.45	<0.06	0.09-0.14	7.4-8.4	Very high	0.32	5	1-4
Trinity	7-36	60-80	1.25-1.45	<0.06	0.09-0.14	7.4-8.4	Very high	0.32		
	36-80	60-80	1.25-1.50	<0.06	0.08-0.13	7.4-8.4	Very high	0.32		
Wh	0-15	12-20	1.25-1.40	0.6-2.0	0.12-0.18	6.1-7.8	Low	0.28	5	1-3
Whitesboro	15-60	22-35	1.30-1.45	0.6-2.0	0.13-0.18	6.1-8.4	Moderate	0.28		
Wk	0-26	20-35	1.25-1.35	0.6-2.0	0.13-0.18	6.1-7.8	Moderate	0.32	5	1-3
Whitesboro	26-60	22-35	1.30-1.45	0.6-2.0	0.13-0.18	6.1-8.4	Moderate	0.28		
Wm	0-32	20-35	1.25-1.35	0.6-2.0	0.13-0.18	6.1-7.8	Moderate	0.32	5	1-3
Whitesboro	32-60	22-35	1.30-1.45	0.6-2.0	0.13-0.18	6.1-8.4	Moderate	0.28		
WnA	0-4	27-35	1.35-1.50	0.2-0.6	0.10-0.17	5.6-7.3	Moderate	0.43	5	.5-2
Wilson	4-35	35-50	1.50-1.60	0.01-0.06	0.10-0.16	6.6-8.4	High	0.37		
	35-65	35-60	1.50-1.60	0.01-0.06	0.10-0.16	7.4-8.4	High	0.37		

See footnote at end of table.

Table 17.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	G/cc	In/hr	In/in	pH				Pct
WnB	0-7	27-35	1.35-1.50	0.2-0.6	0.10-0.17	5.6-7.3	Moderate	0.43	5	.5-2
Wilson	7-45	35-50	1.50-1.60	0.01-0.06	0.10-0.16	6.6-8.4	High	0.37		
	45-80	35-60	1.50-1.60	0.01-0.06	0.10-0.16	7.4-8.4	High	0.37		
WoB	0-10	3-12	1.30-1.60	6.0-20	0.07-0.11	5.6-6.5	Low	0.17	5	.5-2
Wolfpen	10-33	3-12	1.30-1.65	6.0-20	0.07-0.11	5.6-6.5	Low	0.17		
	33-56	18-30	1.30-1.65	0.6-2.0	0.12-0.17	4.5-6.5	Low	0.24		
	56-80	15-35	1.30-1.65	0.6-2.0	0.12-0.17	4.5-6.5	Low	0.24		
WoE	0-8	3-12	1.30-1.60	6.0-20	0.07-0.11	5.6-6.5	Low	0.17	5	.5-2
Wolfpen	8-31	3-12	1.30-1.65	6.0-20	0.07-0.11	5.6-6.5	Low	0.17		
	31-56	18-30	1.30-1.65	0.6-2.0	0.12-0.17	4.5-6.5	Low	0.24		
	56-63	15-35	1.30-1.65	0.6-2.0	0.12-0.17	4.5-6.5	Low	0.24		

* See description of the map unit for composition and behavior characteristics of the map unit.

Table 18.--Soil and Water Features

("Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

Soil name and map symbol	Hydrologic group	Flooding			High water table			Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Uncoated steel	Concrete
					Ft				
ArC--Arenosa	A	None	---	---	>6.0	---	---	Low	Low.
AxB, AxD--Axtell	D	None	---	---	>6.0	---	---	High	Moderate.
BnB--Bienville	A	None	---	---	4.0-6.0	Apparent	Dec-Apr	Low	High.
BoC--Bigbrown	C	None	---	---	>6.0	---	---	Moderate	Low.
BuA--Burleson	D	None	---	---	>6.0	---	---	High	Moderate.
CrA, CrB, CrC, CrC3, CrD, CrD4--Crockett	D	None	---	---	>6.0	---	---	High	Low.
CtE, CvF--Cuthbert	C	None	---	---	>6.0	---	---	High	High.
CxE*--Cuthbert	D	None	---	---	>6.0	---	---	High	High.
CzG--Cuthbert	C	None	---	---	>6.0	---	---	High	High.
DrA*:									
Derly	D	None	---	---	0-1.5	Perched	Dec-Apr	High	High.
Rader	D	None	---	---	2.0-4.0	Perched	Dec-Mar	High	Moderate.
EgB, EgE--Edge	D	None	---	---	>6.0	---	---	Moderate	Moderate.
ErC*:									
Edge	D	None	---	---	>6.0	---	---	Moderate	Moderate.
Gullied land									
EsE--Ellis	D	None	---	---	>6.0	---	---	High	Low.
FeD--Ferris	D	None	---	---	>6.0	---	---	High	Low.
GfB--Gasil	B	None	---	---	>6.0	---	---	Low	Moderate.
Gh--Gladewater	D	Frequent	Long to very long.	Nov-May	1.5-3.5	Perched	Nov-May	High	Moderate.
HeE--Hearne	C	None	---	---	>6.0	---	---	High	High.

See footnote at end of table.

Table 18.--Soil and Water Features--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Uncoated steel	Concrete
					Ft				
Ka, Kc Kaufman	D	Occasional	Brief	Nov-May	>6.0	---	---	High	Low.
Kd, Kf Kaufman	D	Frequent	Long	Nov-May	>6.0	---	---	High	Low.
Kh Keechi	C	Frequent	Long	Dec-May	+1.-1.5	Perched	Jan-Dec	High	Moderate.
KrB, KyC Kirvin	C	None	---	---	>6.0	---	---	High	High.
LaE Lamar	B	None	---	---	>6.0	---	---	Moderate	Low.
LgB Leagueville	B/D	None	---	---	0.5-1.5	Apparent	Nov-May	High	High.
LsC Leson	D	None	---	---	>6.0	---	---	High	Low.
MaA Mabank	D	None	---	---	>6.0	---	---	High	Moderate.
Na Nahatche	C	Frequent	Very brief to brief.	Nov-May	0.5-1.5	Apparent	Nov-May	High	Moderate.
NH*: Nahatche	C	Frequent	Very brief to brief.	Nov-May	0.5-1.5	Apparent	Nov-May	High	Moderate.
Hatliff	C	Frequent	Brief	Nov-May	0-2.0	Apparent	Nov-Mar	Low	Moderate.
OkB Oakwood	B	None	---	---	3.5-5.0	Perched	Jan-Apr	High	Moderate.
PaB Padina	A	None	---	---	>6.0	---	---	High	Moderate.
PkC, PkE Pickton	A	None	---	---	4.0-6.0	Perched	Jan-Apr	Moderate	High.
Pt* Pits									
Pu Pluck	C	Frequent	Brief	Dec-Mar	0-1.5	Apparent	Dec-Apr	High	High.
RaB Rader	D	None	---	---	2.0-4.0	Perched	Dec-Mar	High	Moderate.
RnA Raino	D	None	---	---	2.0-3.5	Perched	Dec-May	High	Moderate.
RoA Robco	C	None	---	---	1.5-3.5	Perched	Jan-Apr	High	High.
SaE Silawa	B	None	---	---	>6.0	---	---	Moderate	Moderate.

See footnote at end of table.

Table 18.--Soil and Water Features--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Uncoated steel	Concrete
					Ft				
SsB, SsD---------- Silstid	A	None--------	---	---	>6.0	---	---	Moderate	Moderate.
StB---------- Styx	B	None--------	---	---	3.5-4.5	Perched	Dec-May	Moderate	Moderate.
TaB---------- Tabor	D	None--------	---	---	>6.0	---	---	High-----	High.
TfA*:									
Tabor----------	D	None--------	---	---	>6.0	---	---	High-----	High.
Lufkin----------	D	None--------	---	---	>6.0	---	---	High-----	Moderate.
ToC, ToE---------- Tonkawa	A	None--------	---	---	>6.0	---	---	Low------	Moderate.
Tr---------- Trinity	D	Frequent----	Long------	Feb-May	>6.0	---	---	High-----	Low.
Wh, Wk---------- Whitesboro	C	Occasional	Brief-----	Sep-May	>6.0	---	---	High-----	Low.
Wm---------- Whitesboro	C	Frequent----	Brief-----	Sep-May	>6.0	---	---	High-----	Low.
WnA, WnB---------- Wilson	D	None--------	---	---	>6.0	---	---	High-----	High.
WoB, WoE---------- Wolfpen	A	None--------	---	---	4.0-6.0	Perched	Dec-May	Moderate	High.

Table 19.--Classification of the Soils

(An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series)

Soil name	Family or higher taxonomic class
Arenosa	Thermic, uncoated Ustic Quartzipsamments
Axtell	Fine, montmorillonitic, thermic Udertic Paleustalfs
Bienville	Sandy, siliceous, thermic Psammentic Paleudalfs
Bigbrown	Fine-silty, mixed, nonacid, thermic Typic Ustorthents
Burleson	Fine, montmorillonitic, thermic Udic Haplusterts
Crockett	Fine, montmorillonitic, thermic Udertic Paleustalfs
Cuthbert	Clayey, mixed, thermic Typic Hapludults
Derly	Fine, montmorillonitic, thermic Typic Glossaqualfs
Edge	Fine, mixed, thermic Udic Paleustalfs
Ellis	Fine, montmorillonitic, thermic Udertic Ustochrepts
Ferris	Fine, montmorillonitic, thermic Chromic Udic Haplusterts
Gasil	Fine-loamy, siliceous, thermic Ultic Paleustalfs
Gladewater	Very-fine, montmorillonitic, thermic Chromic Endoaquerts
*Hatliff	Coarse-loamy, siliceous, nonacid, thermic Aquic Udifluvents
Hearne	Clayey, mixed, thermic Typic Haplustults
Kaufman	Very-fine, montmorillonitic, thermic Typic Hapluderts
Keechi	Coarse-loamy, siliceous, nonacid, thermic Typic Fluvaquents
Kirvin	Clayey, mixed, thermic Typic Hapludults
Lamar	Fine-silty, mixed, thermic Udic Ustochrepts
Leagueville	Loamy, siliceous, thermic Arenic Paleaquults
Leson	Fine, montmorillonitic, thermic Udic Haplusterts
Lufkin	Fine, montmorillonitic, thermic Oxyaquic Vertic Paleustalfs
Mabank	Fine, montmorillonitic, thermic Oxyaquic Vertic Paleustalfs
Nahatche	Fine-loamy, siliceous, nonacid, thermic Aeric Fluvaquents
Oakwood	Fine-loamy, siliceous, thermic Fragic Glossudalfs
Padina	Loamy, siliceous, thermic Grossarenic Paleustalfs
Pickton	Loamy, siliceous, thermic Grossarenic Paleudalfs
Pluck	Fine-loamy, siliceous, nonacid, thermic Typic Fluvaquents
Rader	Fine-loamy, mixed, thermic Aquic Paleustalfs
Raino	Fine-loamy over clayey, siliceous, thermic Aquic Glossudalfs
Robco	Loamy, siliceous, thermic Aquic Arenic Paleustalfs
Silawa	Fine-loamy, siliceous, thermic Ultic Haplustalfs
Silstid	Loamy, siliceous, thermic Arenic Paleustalfs
Styx	Loamy, siliceous, thermic Arenic Paleustalfs
Tabor	Fine, montmorillonitic, thermic Udertic Paleustalfs
Tonkawa	Thermic, coated Typic Quartzipsamments
Trinity	Very-fine, montmorillonitic, thermic Typic Hapluderts
Whitesboro	Fine-loamy, mixed, thermic Cumulic Haplustolls
Wilson	Fine, montmorillonitic, thermic Oxyaquic Vertic Haplustalfs
Wolfpen	Loamy, siliceous, thermic Arenic Paleudalfs

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