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 Brazos 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.

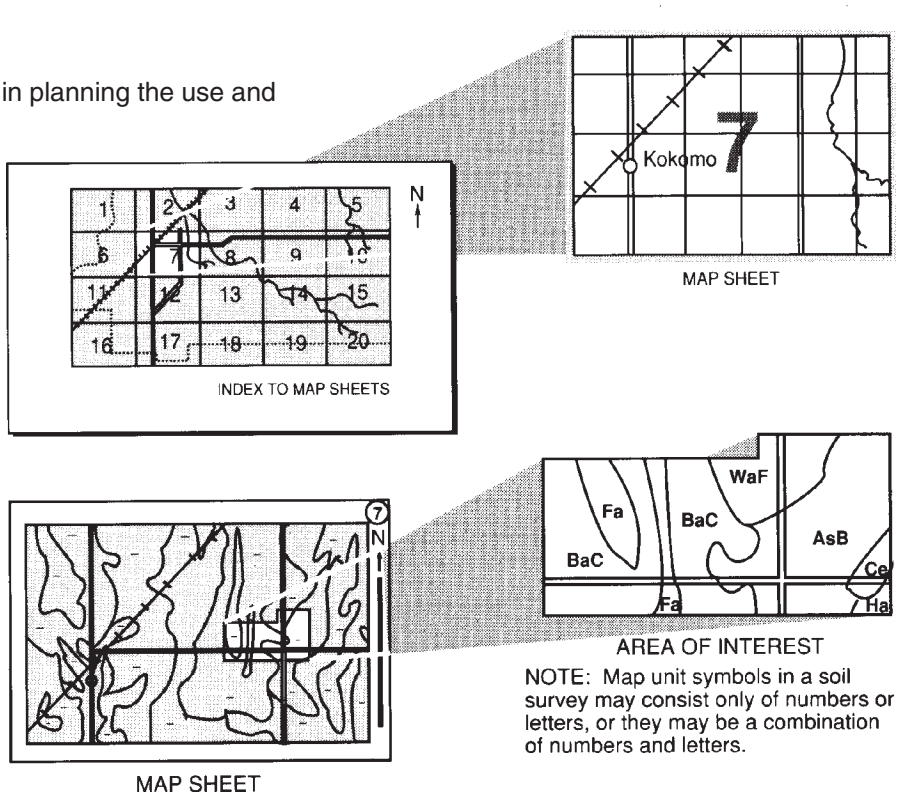
Detailed Soil Maps

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.



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 1990. Soil names and descriptions were approved in 1993. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1993. This survey was made cooperatively by the Natural Resources Conservation Service, 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 Brazos County 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.

Cover: Texas A&M University in College Station, Texas, is headquarters for the Texas Agricultural Experiment Station, a major cooperator in the National Cooperative Soil Survey (photo courtesy of Texas A&M University, 2002).

Additional information about the Nation's natural resources is available on the Natural Resources Conservation Service homepage on the World Wide Web. The address is http://www.nrcs.usda.gov.

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Issued 2002

Preface

This soil survey contains information that affects land use planning in this survey area. 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 on 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 shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

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

Soil Survey of
Brazos County, Texas

By Glen Chervenka, Natural Resources Conservation Service

Fieldwork by Joseph Castille, Glen Chervenka, James Greenwade, Lee Nordt, and Randy Oakley, 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

Brazos County is in southeast-central Texas, about 125 miles from the Gulf of Mexico (fig. 1). The county has an area of 590.8 square miles, or 378,106 acres. The Navasota River borders the county on the east, and the Brazos River forms the western boundary. The northern boundary is the Old San Antonio Road (OSR), which was established in 1691. The elevation in the county ranges from 200 to 400 feet above sea level. The topography is nearly level to gently sloping.

Brazos County is in the Western Gulf Coastal Plain of the Coastal Plain. It is in the Southern Claypan and the Southern Blackland Prairie Major Land Resource Areas (USDA, 1981). The soils formed under post oak savannah and prairie vegetation. The soils that formed under post oak savannah are mostly light colored and sandy, and many have a dense clay subsoil that is less than 12 inches below the surface. The soils that formed under prairie vegetation are mostly dark loams and clays.

The county is drained by numerous streams that flow into the Navasota River or the Brazos River.

This soil survey updates the survey of Brazos County published in 1958 (Mowery and Oakes, 1958). It provides additional information and has larger maps, which show the soils in greater detail. In addition, the mapping in this survey has been statistically tested and documented.

General Nature of the Survey Area

This section provides general information about Brazos County. It describes settlement and population, urbanization and economic status, agriculture, natural resources, and climate.

Settlement and Population

Indians hunted in the survey area, but apparently neither they nor the Spanish or Mexicans established any permanent settlements. American colonists arrived in 1821, when Robert Millican settled his family near the present town of Millican. Although the area that is now Brazos County was included in Stephen F. Austin's colony, the area remained sparsely populated for many years. The earliest residents were primarily from southern states, especially Alabama, Georgia, Mississippi, and Tennessee. After the end of the Civil War in 1865, immigrants from Italy and Germany began to settle in rural parts of the county. Smaller numbers of immigrants from other countries, such as Czechoslovakia, Poland, and even Canada, also settled here. Although scattered references to Hispanics appear before 1900, Brazos County did not have significant numbers of Hispanics until after 1900.

Figure 1.—Location of Brazos County in Texas.

In 1841, the Republic of Texas created Navasota County from Washington and Robertson Counties and Boonville was named the county seat. In 1842, legislators changed the name of Navasota County to Brazos County. The county experienced little growth until 1860, when the Houston and Texas Central Railroad was extended to Millican.

The beginning of the Civil War halted work on the railroad, leaving the end of the road at Millican. Since most freight and passengers to or from the interior of the state had to pass through Millican, it quickly became a boomtown. In 1866, in anticipation of the further extension of the railroad, the county seat was moved from Boonville to the recently established town of Bryan. In August 1867, the railroad arrived in Bryan. Bryan, like Millican before it, experienced rapid growth; business property there sold for more money than similar lots in the port city of Galveston.

Early agriculture in Brazos County consisted primarily of raising livestock. The first known crime in the county was the theft of hogs in 1822. When Robert Millican died in 1836, he owned an estimated 4,000 head of cattle. Cattle raising continued to be the primary source of agricultural income until the late 1870s.

The first harvests probably consisted of little more than settlers gathering plants that grew naturally. In 1822, W.B. Dewees wrote: “Rye grows here spontaneously, about four feet high. It would, were it not for the timber standing in the midst, present the same appearance which a cultured rye field in the northern states presents, for miles and miles. In fact, it

far surpasses the common rye fields in beauty, being much larger and thicker" (Letters From an Early Settler of Texas, 1968).

Some cotton was evidently being raised in the area quite early, according to an 1826 census in which it was noted that Robert Millican was building a gin. Cotton remained a rather minor crop for many years; in 1850, for example, local farms produced only 152 bales of cotton. The advent of the railroad simplified marketing the cotton, and 6,927 bales were raised in 1870. Millican was a major shipping point of cotton for the Confederacy. Cotton was raised both in the uplands and in areas of bottom land along the Brazos River. Brazos County experienced a period of rapid agricultural growth beginning in the late 1860s. The development of cotton plantations on the bottom land along the Brazos River was an important factor in this growth. Cotton production peaked in the 1920s and then fell sharply. The collapse of the European cotton market and the spread of the boll weevil contributed to the decline. The boll weevil first became a problem in 1899 (Veatch and Waldrop, 1916). Also, few farmers used modern agricultural techniques during this period, and soil productivity substantially declined because of such factors as erosion and the failure to rotate crops. The 1910 census showed 137,886 acres in cropland; 52 percent of this acreage was in cotton, and 25 percent was in corn.

Over time, the settlers slowly changed the natural environment. In 1807, for example, Zebulon Pike observed mesquite trees growing along the Old San Antonio Road; Spanish cattle had probably brought the seeds for the trees into the area. Other factors placed further stress on native trees. By 1872, the railroad required 5,000 cords of wood per month, prompting one writer to reflect, "The past and present generations have been destroying the timber; the next generation will have to plant, and plant very extensively, or fuel in certain localities will be very scarce" (Letters From an Early Settler of Texas, 1968). Certainly the demands of the railroad, coupled with the desire for increased croplands, contributed to the widespread clearing of much of the timber in Brazos County. Also, it seems reasonable to believe that the widespread grazing of sheep in the northern part of the county in the late 1840s and in the 1850s may have had a significant impact on the prairies.

The early settlers obtained much of their food by hunting. At first, nature supplied an apparently limitless supply of wild game and other resources. In 1822, W.B. Dewees wrote:

> We have no reason to fear suffering for food, as the country is literally alive with all kinds of game. We have only to go out for a few miles . . . to find as many wild cattle as one could wish. If we desire buffalo meat, we are able to go out, load our horses, and return the same day. Boars are very plentiful, but we are obliged to use great care when hunting for them, lest the javelina kill our dogs. . . . The prairies are teeming with wild horses and cattle. There are a vast quantity of bee trees about here, so that we have no want of honey. . . . You would scarcely believe me, were I to tell you of the vast herds of buffalo which abound here. I have frequently seen a thousand in a day between this place and the mouth of Little River. (Letters From an Early Settler of Texas, 1968)

The wildlife was not inexhaustible, of course; since then, at least six species of mammals have been exterminated, including bears, bison, otters, wolves, panthers, and javelina. And, of course, wild horses no longer run free.

Urbanization and Economic Status

Historically, Brazos County's most important economic contributors have been Texas A&M University, established in 1876, and agriculture. Agriculture has, however, steadily declined in importance since World War II. Retail sales, manufacturing, and the service industries play an increasingly important role in the county's economic well-being. Texas A&M University remains the county's largest employer.

In 1990, Brazos County had a population of 121,862. The major cities in the county are Bryan (population 55,002) and College Station (population 52,456). Unincorporated communities in the county include Edge, Tabor, Kurten, Millican, Steep Hollow, Harvey, Wellborn, and Smetana. Texas A&M University has a student population of more than 40,000.

Rural areas have an increasing number of subdivisions of 2 to 25 acres provided with water and electric utilities but no sewer facilities. In 1990, there were more than 136 platted rural subdivisions, or about 25,000 acres, in Brazos County with a population of about 14,000. The people in these areas generally work at a job other than farming or ranching. Some of the larger tracts may have a few livestock. Problems related to rural subdivisions and soils are discussed in specific sections elsewhere in this survey.

The growth of Bryan and College Station continues and is evidenced by the ongoing annexation of land by these cities. In 1990, about 36,000 acres in the county

was considered urban land. Bryan-College Station is the center of what is known as the "Brazos Valley" with major businesses, industry, hospitals, schools, and other facilities.

Agriculture

Livestock, hay, and crops of cotton, corn, grain sorghum, and wheat are the main agricultural enterprises in Brazos County. Crop production is mainly in areas of bottom land along the Brazos River (the "Brazos Bottom"), and some small grain is grown in the uplands. Crop production accounts for about 26 percent of the agricultural income. The main livestock operations are cow-calf operations, but the number of stocker operations is increasing. Chicken and hog operations also are significant in number. Livestock sales accounted for about 74 percent of the agricultural income in 1993. Cattle are mainly pastured on permanent grasses during the warm season and on temporary pastures of small grain or rye grass and some native grasses in the winter. Locally grown hay is a major source of feed. The interest in raising horses is increasing in the county. Other enterprises that are becoming increasingly important are exotic-animal ranches, vineyards, and Christmas tree farms.

Natural Resources

Soil is one of the most important natural resources in Brazos County. In the 1980s, oil and gas production became important in the area. Lignite occurs in the southern part of the county, but mining is currently active only in adjacent counties. Sand and gravel are mined on the flood plain along the Brazos River. Gravel, sand, and rock are mined in some upland areas. Water is another important natural resource. The Brazos River is a source of irrigation water for areas adjacent to the river that have riparian rights. Well water is available in the Brazos River alluvium at a depth of 50 to 70 feet and is used extensively for crop irrigation. Also, the cities of Bryan and College Station, as well as some privately owned water systems, obtain ground water for human and industrial consumption from wells that access the Carrizo aquifer.

Climate

Table 1 gives data on temperature and precipitation for the survey area as recorded at College Station, Texas, 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 51 degrees F and the average daily minimum temperature is 41 degrees. The lowest temperature on record, which occurred on December 23, 1989, is 2 degrees. In summer, the average temperature is 83 degrees and the average daily maximum temperature is 93 degrees. The highest recorded temperature, which occurred on July 12, 1954, is 109 degrees.

Growing degree days are shown in table 1. 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 inches. Of this total, about 21 inches, or 54 percent, usually falls in April through September. The growing season for most crops falls within this period. The heaviest 1-day rainfall during the period of record was 6.2 inches on May 20, 1983. Thunderstorms occur on about 61 days each year.

Snowfall is rare. The average seasonal snowfall is about 0.4 inch. The greatest snow depth at any one time during the period of record was 4 inches.

The average relative humidity in midafternoon is about 59 percent. Humidity is higher at night, and the average at dawn is about 90 percent. The sun shines 65 percent of the time possible in summer and 47 percent in winter. The prevailing wind is from the south. Average windspeed is highest, 9 miles per hour, in March.

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 soil 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 rivers, all of which help in locating boundaries accurately.

Statistical Analysis of Map Unit Composition

Dr. C.T. Hallmark, Texas A&M University, provided guidance for and the analysis of this statistical sampling.

Near the end of the soil survey, the soil survey party selected 30 map units representing 60 percent of the county acreage from which to obtain detailed transect observations of the soils. The purpose of the detailed transect work was to scientifically and statistically establish the soil composition of the map unit and the percent of each map unit with moderate or severe limitations for selected uses. The map units that were transected are listed at the end of this section.

At least four delineations per map unit were selected randomly in a manner that ensured selections from throughout the county. At least 40 observations were made for each map unit. Within each delineation, observations were made at intervals of a minimum of 200 feet along a randomly selected transect. This distance interval was chosen to ensure sample independence (Brubaker, 1989). Soil properties at each observation were described from soil cores and included horizonation depth, color, texture, structure, estimated depth to the water table, the depth of the soil over bedrock, the likelihood of flooding, and slope. Where possible, soils were classified to the series level. Generally, soils that have

similar interpretations are considered similar soils. The mean percentage composition for the named soil(s) and similar soils of each map unit was calculated and is presented in the map unit descriptions. Sufficient observations were made so that the 80 percent confidence interval of each mean is within 10 percent of the mean presented in the composition portion of the map unit. In other words, there is an 80 percent probability that the true average extent of the named soil in the map unit lies between the mean percentage minus 10 and the mean percentage plus 10. Map units that were not transected have an estimated map unit composition based on the judgment of the soil scientist rather than on statistical procedure.

The map units selected for obtaining transect data were:

AxB Axtell fine sandy loam, 1 to 3 percent slopes
BoB Boonville fine sandy loam, 1 to 3 percent slopes
BuA Burleson clay, 0 to 1 percent slopes
BwC Burlewash fine sandy loam, 1 to 5 percent slopes
BwD Burlewash fine sandy loam, 5 to 8 percent slopes
ChC Chazos loamy fine sand, 1 to 5 percent slopes
CrB Crockett loam, 1 to 3 percent slopes
DeA Derly-Rader complex, 0 to 1 percent slopes
Gd Gladewater clay, frequently flooded
GrC Gredge fine sandy loam, 1 to 5 percent slopes
GrD Gredge fine sandy loam, 5 to 8 percent slopes
Ka Kaufman clay, frequently flooded
LuB Luling clay, 1 to 3 percent slopes
LuD Luling clay, 5 to 8 percent slopes
PaC Padina loamy fine sand, 1 to 5 percent slopes
RaB Rader fine sandy loam, 0 to 2 percent slopes
RbA Rader-Tabor complex, 1 to 3 percent slopes
RoB Robco loamy fine sand, 1 to 3 percent slopes
Sa Sandow loam, frequently flooded
ShA Ships clay, 0 to 1 percent slopes, rarely flooded
SmC Silawa fine sandy loam, 2 to 5 percent slopes
SmD Silawa fine sandy loam, 5 to 8 percent slopes
SnB Singleton fine sandy loam, 1 to 3 percent slopes
SpB Spiller loamy fine sand, 1 to 3 percent slopes
TaA Tabor fine sandy loam, 0 to 2 percent slopes
Uh Uhland loam, frequently flooded
WeA Weswood silt loam, 0 to 1 percent slopes, rarely flooded
WzA Wilson loam, 0 to 1 percent slopes
ZaB Zack very fine sandy loam, 1 to 5 percent slopes
ZuB Zulch fine sandy loam, 1 to 3 percent slopes

General Soil Map Units

The general soil map in 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 or miscellaneous areas and some minor soils or miscellaneous areas. It is named for the major soils or miscellaneous areas. 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.

Dominantly Undulating, Loamy Soils on Uplands

This group of general soil map units makes up about 40 percent of Brazos County. Benchley, Boonville, Burlewash, Crockett, Kurten, Singleton, Spiller, Zack, and Zulch soils are dominant in this group. These soils formed mostly in clayey and loamy sediments and shales. The landscape is nearly level to undulating. Vegetative cover ranges from oak savannah to bluestem prairies. Native grasses are mainly bluestems, indiangrass, paspalums, and panicums. Trees are predominantly oak and elm.

Most soils in this group are claypan soils that have low fertility, have a low or moderate water-holding capacity, and are highly erodible. These soils are not generally suited to crops, although they were farmed in the past. Introduced grasses, mainly improved bermudagrass and bahiagrass, and native species are used for forage production.

Some of the soils are used for urban development. The hazard of erosion during construction, a high shrink-swell potential, and restricted permeability present problems for urban uses.

1. Zack-Boonville-Zulch

Nearly level to moderately sloping, moderately deep and very deep, loamy soils that are somewhat poorly drained or moderately well drained; on prairies

The landscape in areas of this unit consists of gently rolling dissected erosional uplands and some nearly level footslopes. Small areas of steeper soils are adjacent to streams. The underlying material is alkaline, loamy sediment and shales of the Easterwood Shale Member of the Yegua Formation. Most of the soils in this unit are moderately deep over this slowly weathering parent material.

This unit makes up about 19 percent of the county. It is 33 percent Zack soils, 29 percent Boonville soils, 14 percent Zulch soils, and 24 percent soils of minor extent (fig. 2).

Zack soils are mostly on summits and the upper backslopes and on breaks to streams. Typically, the surface layer is thin. It is dark brown, strongly acid fine sandy loam. The subsoil is mostly slightly acid to moderately alkaline clay that has colors in shades of brown. It is underlain by moderately alkaline, loamy sediments.

Boonville soils are on nearly level or very gently sloping footslopes. Typically, the surface layer is brown, slightly acid fine sandy loam. The thickness of the surface layer is highly variable. The subsoil is light brownish gray, neutral clay that has red and brown mottles. The underlying material is a mixture of alkaline gray clay that is part colluvium and part shale.

Zulch soils are on the lower backslopes. Typically, the surface layer is thin. It is grayish brown, moderately acid fine sandy loam. The subsoil is dark grayish brown, slightly acid clay. The underlying material is brown and gray, alkaline shale with interbedded loamy materials.

Of minor extent in this unit are Chazos, Derly, Gredge, Rader, Sandow, and Tabor soils. Chazos and Gredge soils are on summits and backslopes. Derly

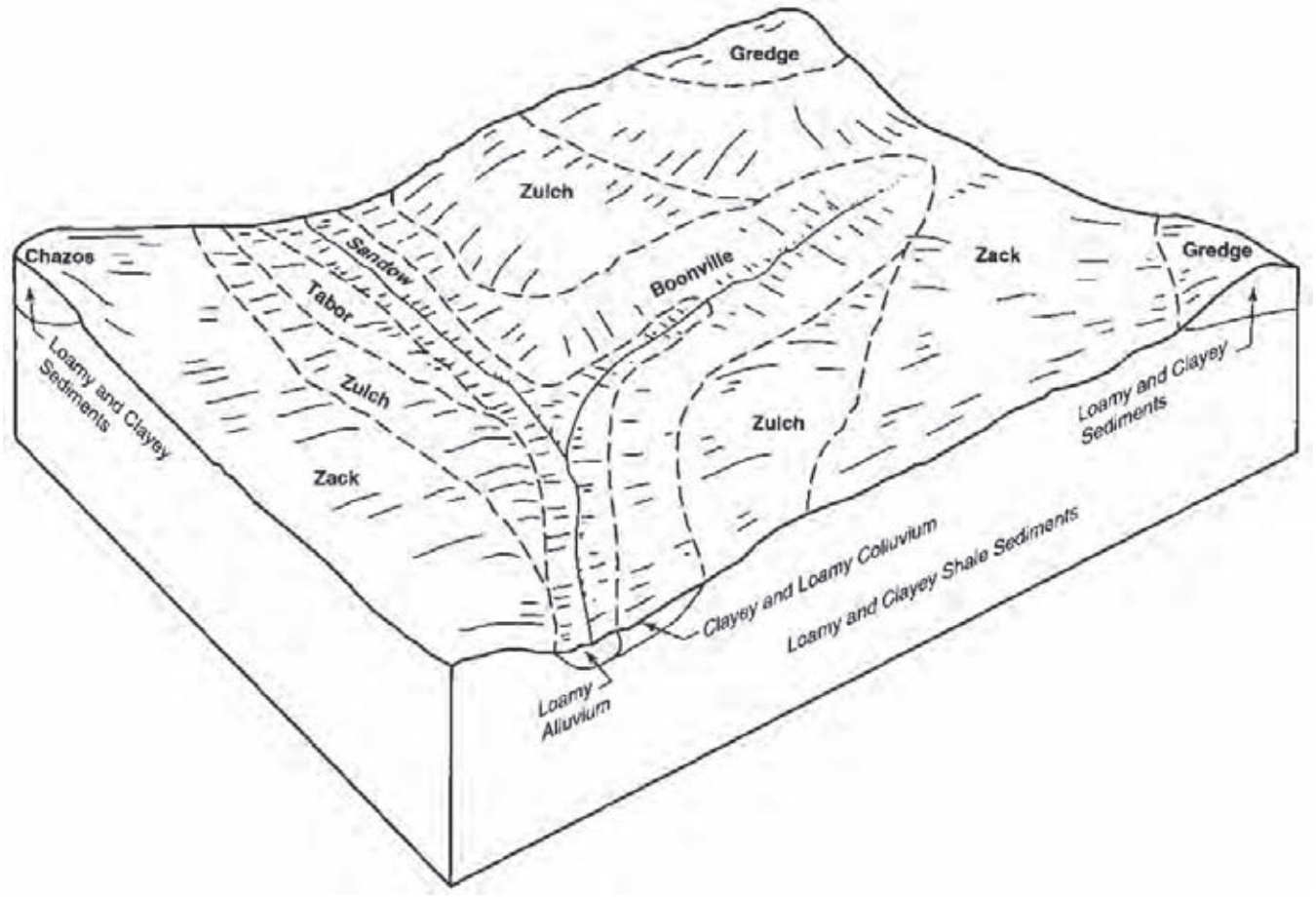

Figure 2.—Pattern of soils and underlying material in the Zack-Boonville-Zulch general soil map unit.

and Rader soils are on nearly level, mounded landscapes. Tabor soils are on summits and toeslopes. Sandow soils are on the flood plains along local streams.

The soils in this unit are used mainly for pasture, hayland, or range. They are used for pasture or hayland in the less sloping areas and for range in the more sloping areas. Many of these areas have been used as cropland in the past.

Most of the pasture and hayland is improved bermudagrass and bahiagrass. The main limitations affecting pasture and hayland are low fertility, droughtiness, and a severe hazard of erosion. If proper amounts of fertilizer are applied, low or medium production of forage or hay can be expected. Overseeding legumes, such as vetch and clovers, into the grass can lengthen the grazing season and improve the soils.

Restricted permeability and a high shrink-swell potential are problems affecting urban development. Cracks in foundations and the failure of septic systems are common in areas of this unit.

2. Burlewash-Singleton

Gently sloping to moderately sloping, moderately deep, loamy soils that are well drained or moderately well drained; in areas of oak savannah

The landscape in areas of this unit typically consists of undulating dissected erosional uplands. The underlying material is acid, tuffaceous, slightly cemented sandstone and siltstone of the Jackson and Catahoula Formations. The soils in this unit are mainly moderately deep, but some of the soils are shallow. Soil depth is limited by the parent material, which is resistant to weathering.

This unit makes up about 9 percent of the county. It is 38 percent Burlewash soils, 19 percent Singleton soils, and 43 percent soils of minor extent (fig. 3).

Burlewash soils are on summits and backslopes. Typically, the surface layer is thin. It is gray, moderately acid fine sandy loam. The subsoil is light reddish brown, very strongly acid clay. The underlying material is gray, very strongly acid, slightly cemented, tuffaceous sandstone or siltstone.

Singleton soils are on backslopes. Typically, the surface layer is thin. It is gray, slightly acid fine sandy loam. The subsoil is brown or pale brown, very strongly acid clay. The underlying material is stratified, white and brown tuffaceous siltstone.

Of minor extent in this unit are Chazos, Falba, Gredge, Koether, Sandow, and Shiro soils. Chazos and Gredge soils are on the convex upper backslopes and ridgetops. Falba soils are on footslopes. Koether soils are on strongly sloping north-facing scarps. Shiro soils are on rounded hilltops and ridges. Sandow soils are on the flood plains along local streams.

The soils in this unit are used mainly for pasture, range, or wildlife habitat. The less sloping areas are used for pasture and some hayland, and the more sloping areas are used for range or as wildlife habitat. The main limitations affecting pasture are low fertility, droughtiness, low pH, and a severe hazard of erosion. The yield potential for forage and hay is low, even if fertilizer and lime are applied. Overseeding legumes, such as vetch and clovers, into the grass can lengthen the grazing season and improve the soils.

Restricted permeability and a high shrink-swell potential are problems affecting urban development. Cracks in foundations and the failure of septic systems are common in areas of this unit.

3. Crockett-Benchley

Nearly level to gently sloping, deep and very deep, loamy soils that are moderately well drained; on prairies

The landscape in areas of this unit typically consists of gently sloping, broad ridges and interstream divides and nearly level footslopes. The underlying material is slightly acid shale of the Wheelock Member of the Cook Mountain Formation. The soils in this unit are very deep or deep to weathered shale.

This unit makes up about 6 percent of the county. It is 46 percent Crockett soils, 17 percent Benchley soils, and 37 percent soils of minor extent (fig. 4).

Crockett soils are on gently sloping, broad ridges

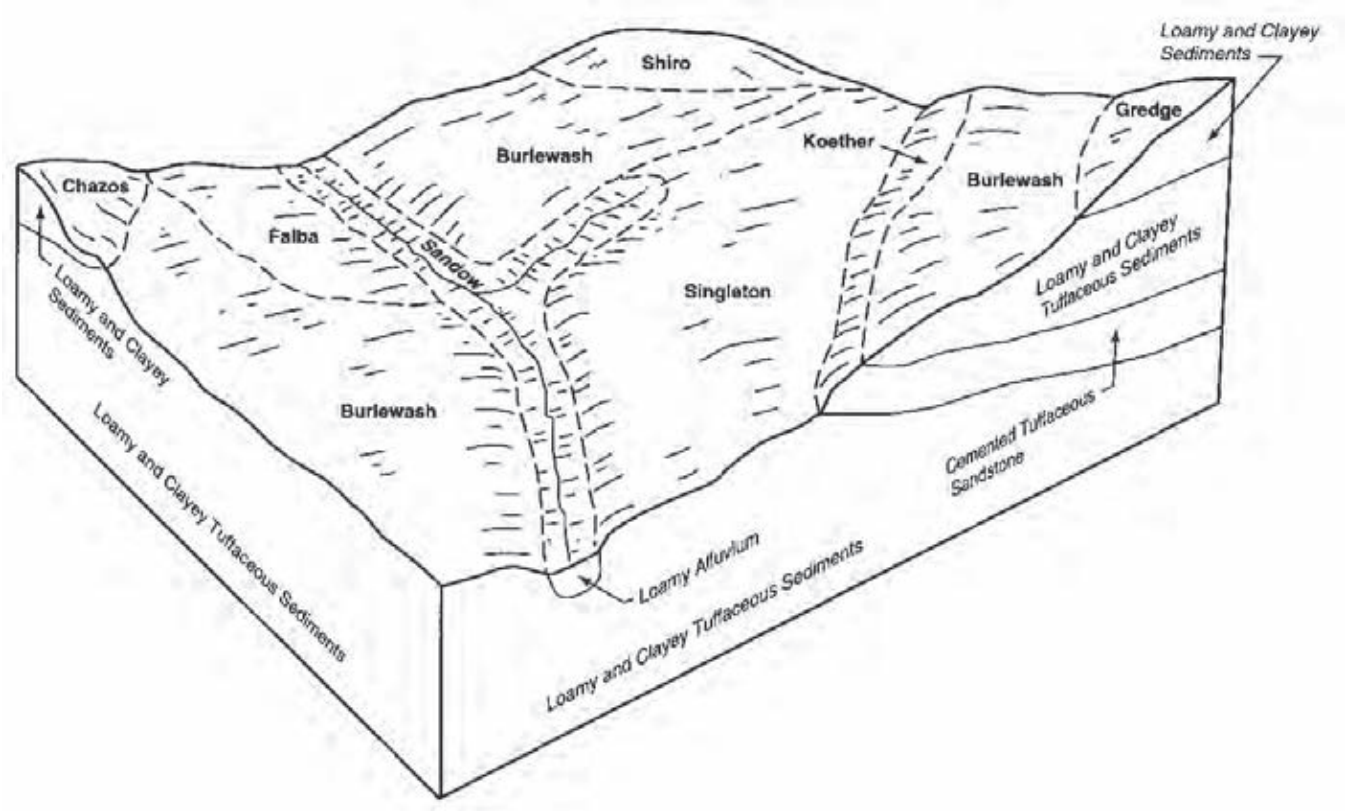

Figure 3.—Pattern of soils and underlying material in the Burlewash-Singleton general soil map unit.

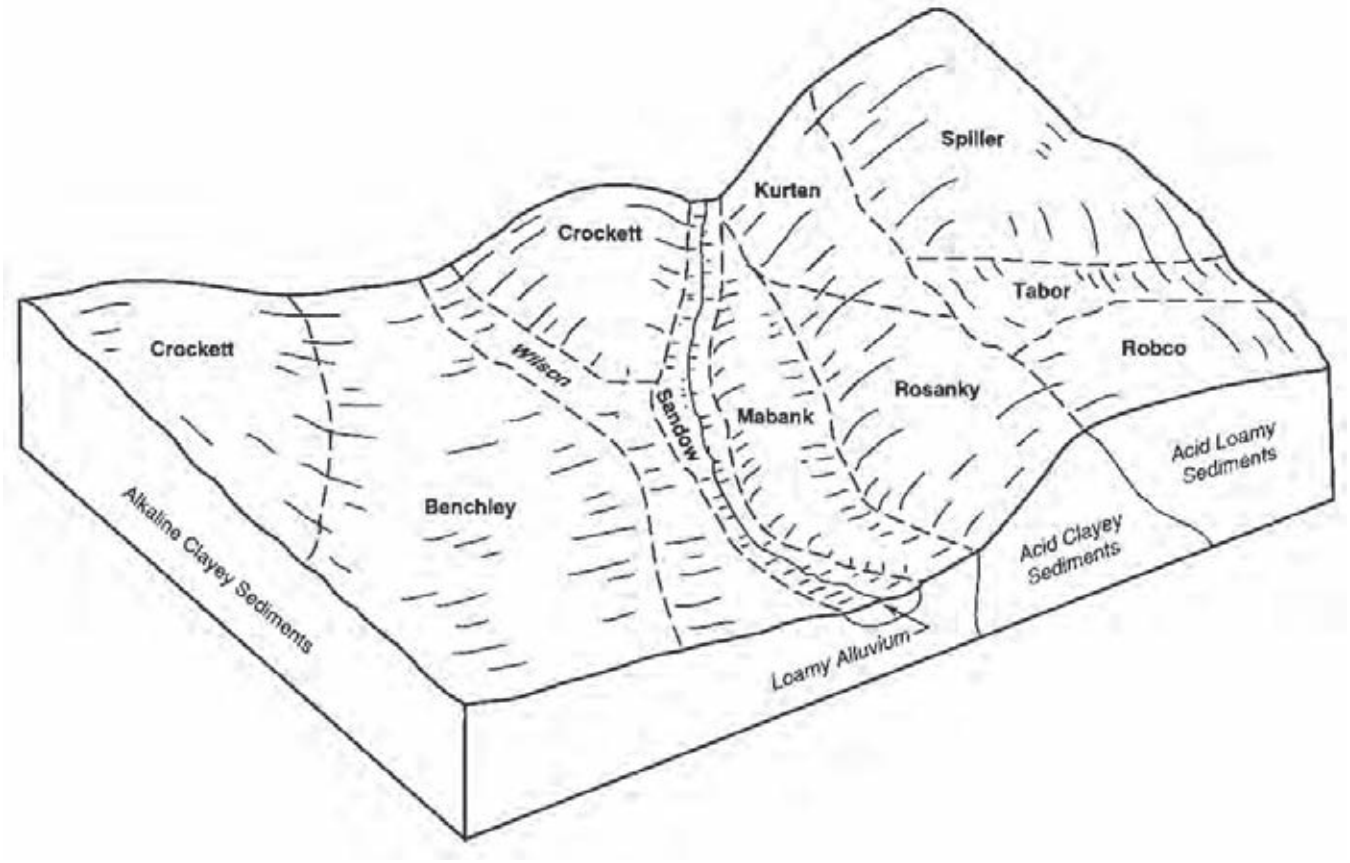

Figure 4.—Pattern of soils and underlying material in the Crockett-Benchley and Spiller-Rosanky-Kurten general soil map units.

and interstream divides. Typically, the surface layer is thin. It is brown, neutral loam. The subsoil is slightly acid or neutral clay that has colors in shades of brown. The underlying material is dark brown, slightly acid shale.

Benchley soils are on nearly level or very gently sloping footslopes. Typically, the surface layer is thin. It is very dark grayish brown, slightly acid loam. The upper part of the subsoil is slightly acid clay that has colors in shades of brown. The lower part of the subsoil is light yellowish brown, neutral clay loam. The underlying material is light yellowish brown, slightly alkaline shale.

Of minor extent in this unit are Luling, Mabank, Tabor, Wilson, and Sandow soils. Luling soils are on broad, nearly level ridgetops. Mabank and Wilson soils are on nearly level stream terraces or remnants of terraces in the uplands. Tabor soils are on nearly level footslopes near streams. Sandow soils are on the flood plains along local streams.

The soils in this unit are used mainly for pasture or range. Some areas are cropped to temporary winter pasture of small grain. Most areas of this unit have been cultivated in the past.

Most of the pasture is improved bermudagrass and some kleingrass. The main limitations affecting pasture are low fertility and droughtiness. If proper amounts of fertilizer are applied, high production of forage can be expected. Winter pasture of oats or wheat is used for stocker and cow-calf operations.

Restricted permeability and a high shrink-swell potential are problems affecting urban development. Cracks in foundations and the failure of septic systems are common in areas of this unit.

4. Spiller-Rosanky-Kurten

Gently sloping to moderately sloping, deep and very deep, loamy soils that are well drained or moderately well drained; in areas of oak savannah

The landscape in areas of this unit typically consists of undulating, dissected erosional uplands. The steeper slopes are adjacent to breaks to

drainageways. The material underlying the Spiller soils is interbedded acid sands and shales of the Spiller Member of the Cook Mountain Formation. The material underlying the Kurten and Rosanky soils is acid shale of the Landrum Member of the Cook Mountain Formation.

This unit makes up about 6 percent of the county. It is 23 percent Spiller soils, 19 percent Rosanky soils, 16 percent Kurten soils, and 42 percent soils of minor extent (fig. 4).

Spiller soils are on slightly convex summits and backslopes. Typically, the surface layer is brown, slightly acid loamy fine sand. The subsoil is slightly acid or moderately acid sandy clay or sandy clay loam that has colors in shades of brown and yellow. The underlying material is stratified, moderately alkaline loamy material and shale.

Rosanky soils are on the upper backslopes and shoulders. Typically, the surface layer is brown, moderately acid fine sandy loam. The subsoil is red, very strongly acid to moderately acid clay in the upper part and red, very strongly acid sandy clay loam in the lower part. The underlying material is dark reddish brown, very strongly acid clay loam over interbedded, weakly cemented sandstone and clay.

Kurten soils are on backslopes. Typically, the surface layer is thin. It is pale brown, slightly acid fine sandy loam. The subsoil is very strongly acid clay. It is red in the upper part and grayish brown in the lower part. The underlying material is grayish brown, very strongly acid shale stratified with loamy materials.

Of minor extent in this unit are Crockett, Rader, Robco, Sandow, and Tabor soils. Crockett soils are on gently sloping interstream divides. Rader, Robco, and Tabor soils are on nearly level or very gently sloping toeslopes and low ridges of local stream terraces. Sandow soils are on flood plains.

The soils in this unit are used mainly for pasture or range. They are used for pasture in the less sloping areas and for range in the more sloping areas. Most areas that do not support trees have been cultivated in the past.

Most of the pasture is improved bermudagrass. The main limitations affecting pasture are low fertility and droughtiness. If proper amounts of fertilizer and lime are applied, high production of forage can be expected. Overseeding legumes, such as vetch and clovers, into the grass can lengthen the grazing season and improve the soils.

Restricted permeability and a high shrink-swell potential are problems affecting urban development. Cracks in foundations and the failure of septic systems are common in areas of this unit.

Dominantly Nearly Level to Gently Undulating, Sandy and Loamy Soils on Stream Terraces

This group of general soil map units makes up about 34 percent of Brazos County. Burleson, Chazos, Gredge, Rader, Robco, Tabor, and Wilson soils are dominant in this group. These soils formed in clayey and sandy alluvial sediments of the Pleistocene. The landscape is nearly level to gently undulating. Native grasses are bluestems, indiangrass, paspalums, and panicums. Trees are predominantly oak and elm.

The clay soils are suited to cropland, and the sandy soils are suited to truck crops. All of the soils are suited to pasture. Pastures can produce medium or high yields if fertilizer is applied. Many of the soils in this group were farmed in the past.

The sandy soils are suited to urban development. Other soils in this group, however, are limited for this use because of restricted permeability and a high shrink-swell potential.

5. Tabor-Gredge-Rader

Nearly level to moderately sloping, very deep, loamy soils that are well drained or moderately well drained; in areas of oak savannahs

The landscape in areas of this unit typically consists of undulating, dissected stream terraces and some nearly level, broad flats and toeslopes. The nearly level areas are characterized by circular mounds. The underlying material is clayey and loamy alluvial sediments.

This unit makes up about 23 percent of the county. It is 20 percent Tabor soils, 18 percent Gredge soils, 12 percent Rader soils, 15 percent soils that are similar to the major soils, and 35 percent soils of minor extent (fig. 5).

Tabor soils are on summits and toeslopes. Typically, the surface layer is pale brown, strongly acid fine sandy loam. The thickness of the surface layer is highly variable. The upper part of the subsoil is brown, grayish brown, or yellowish brown, strongly acid to neutral clay or clay loam. The lower part of the subsoil is light gray or light brownish gray, neutral sandy clay loam.

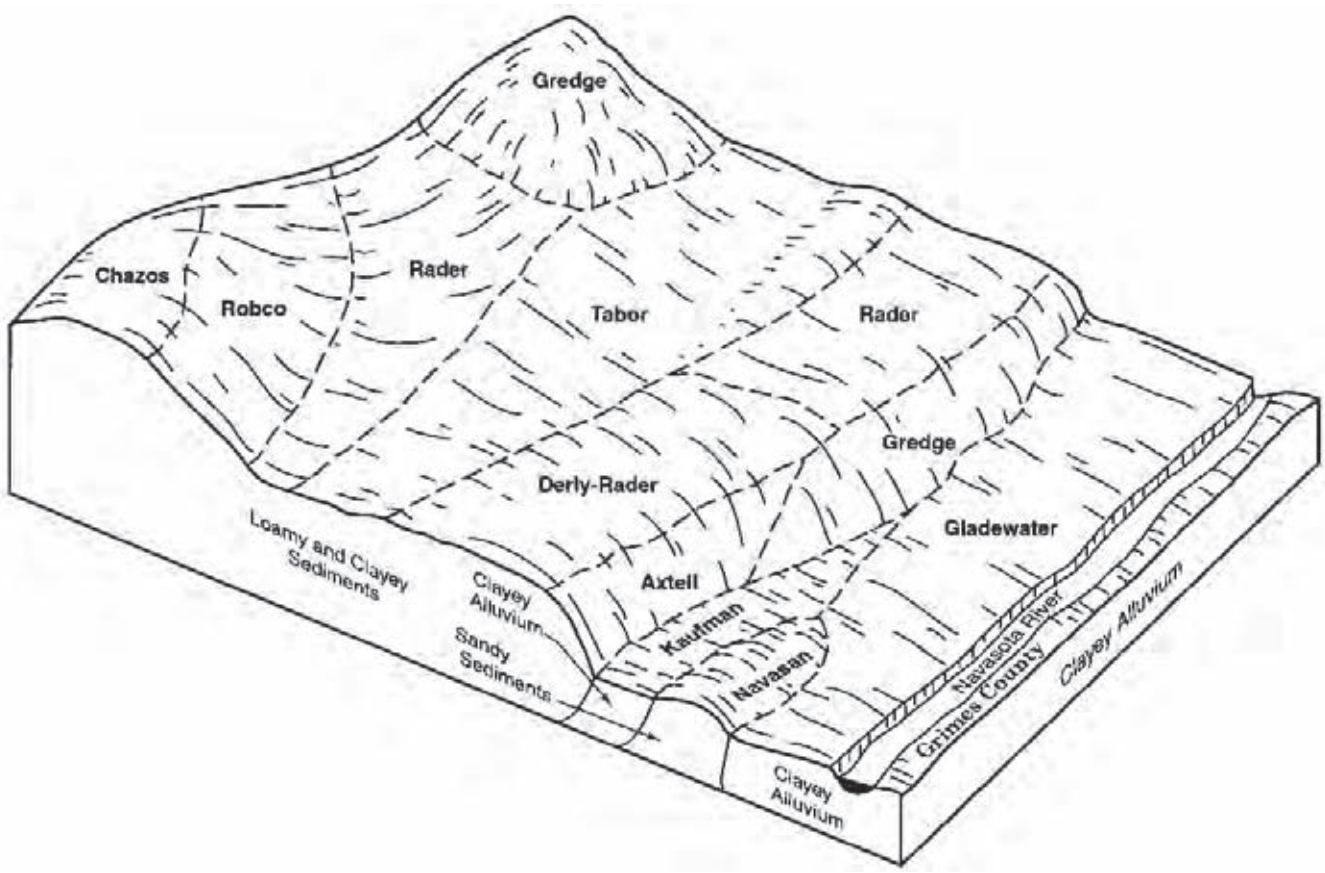

Figure 5.—Pattern of soils and underlying material in the Tabor-Gredge-Rader and Gladewater-Kaufman general soil map units.

Gredge soils are on narrow summits and the upper backslopes. Typically, the surface layer is thin. It is very pale brown, very strongly acid fine sandy loam. The upper part of the subsoil is dark red or reddish brown, very strongly acid clay. The next part is light brownish gray, strongly acid clay loam. The lower part of the subsoil is slightly acid to moderately alkaline clay or clay loam that is mottled in shades of yellow, brown, and gray.

Rader soils are on broad flats and toeslopes. Typically, the surface layer is brown, slightly acid fine sandy loam. The thickness of the surface layer is highly variable. The upper part of the subsoil is yellowish brown, slightly to strongly acid sandy clay loam, clay, or clay loam. The lower part of the subsoil is gray, slightly alkaline clay loam.

Of minor extent in this unit are Axtell, Chazos, Derly, Mabank, Robco, and Sandow soils. Axtell soils are on broad summits and side slopes. Derly soils are on nearly level, mounded landscapes. Mabank soils are on broad flats and toeslopes. Chazos and Robco soils are on rounded ridges and hilltops and on side slopes. Sandow soils are on the flood plains along local streams.

The soils in this unit are used mainly for pasture, hayland, or range. They are used for pasture and hayland in the less sloping areas and for range in the more sloping areas. The areas that do not have a tree cover have been cultivated in the past.

Most of the pasture and hayland is improved bermudagrass and bahiagrass. The main limitations affecting pasture and hayland are low fertility, droughtiness, and the hazard of erosion in the sloping areas. If proper amounts of fertilizer are applied, high production of forage or hay can be expected. Overseeding legumes, such as vetch and clovers, into the grass can lengthen the grazing season and improve the soils.

Restricted permeability and a high shrink-swell potential are problems affecting urban development. Cracks in foundations and the failure of septic systems are common in areas of this unit.

6. Robco-Chazos

Gently sloping and moderately sloping, very deep, sandy soils that are moderately well drained; in areas of oak savannah

The landscape in areas of this unit typically consists of undulating, dissected stream terraces. Steeper areas are adjacent to breaks to the major streams. The underlying material is sandy and loamy alluvial sediments.

This unit makes up about 6 percent of the county. It is 45 percent Robco and similar soils, 22 percent Chazos soils, and 33 percent soils of minor extent.

Robco and similar soils are on summits and shoulders. Typically, the surface layer is thick, brown, slightly acid loamy fine sand. The upper part of the subsoil is mostly light gray, strongly acid sandy clay loam or clay loam. The lower part of the subsoil is red, strongly acid sandy clay loam. In some areas on summits and backslopes, the thick surface layer consists of sandy or very sandy material and the subsoil is loamy. These areas are typically adjacent to breaks to the major streams and on low terraces. These similar soils include Desan, Dutek, Eufaula, Navasan, Padina, and Styx soils.

Chazos soils are on summits and the upper back slopes. Typically, the surface layer is brownish gray, slightly acid loamy fine sand. The subsoil is reddish brown or brownish yellow, moderately acid clay or sandy clay in the upper part and yellowish brown or reddish brown, slightly alkaline clay loam or sandy clay loam in the lower part.

Of minor extent in this unit are Axtell, Derly, Gredge, Rader, Sandow, and Tabor soils. Axtell soils are on broad summits. Derly, Rader, and Tabor soils are on broad flats and toeslopes. Gredge soils are on narrow summits and the upper backslopes. Sandow soils are on the flood plains along local streams.

The soils in this unit are mainly used for pasture, hayland, range, or wildlife habitat. They are used for pasture and hayland in the less sloping areas. The steeper areas are used for range. These areas have potential for wildlife habitat because of their proximity to the more remote flood plains.

Most of the pasture and hayland is improved bermudagrass. Lovegrass and switchgrass grow in areas of the deeper sands. The main limitations affecting pasture and hayland are low fertility, the need for lime, and droughtiness. If proper amounts of fertilizer are applied, high production of forage or hay can be expected. Overseeding legumes, such as vetch and clovers, into the grass can lengthen the grazing season and improve the soils.

Rapid permeability in some of the soils can be a problem affecting urban development if onsite sewage disposal systems are used.

7. Burleson-Wilson

Nearly level to gently sloping, very deep, loamy and clayey soils that are moderately well drained; on prairies

The landscape in areas of this unit typically consists of nearly level to undulating, smooth stream terraces. The underlying material is alkaline, clayey and loamy alluvial sediments.

This unit makes up about 5 percent of the county. It is 43 percent Burleson soils, 21 percent Wilson soils, and 36 percent soils of minor extent (fig. 6).

Burleson soils are on flat interstream divides. Typically, the surface layer is very dark gray, neutral clay. The subsoil is dark gray or very dark gray clay. It is slightly alkaline or moderately alkaline. The underlying material is reddish yellow, moderately alkaline silty clay.

Wilson soils are on the slightly higher summits. Typically, the surface layer is grayish brown, moderately acid loam. The subsoil is clay. The upper part is dark gray or gray and is slightly acid or moderately acid. The lower part is gray and is slightly alkaline.

Of minor extent in this unit are Axtell, Chazos, Desan, and Silawa soils. Axtell soils are on summits. Chazos and Desan soils are on rounded ridges and hilltops. Silawa soils are on the convex upper backslopes.

The soils in this unit are mainly used for pasture and hayland. Most of the pasture and hayland is improved bermudagrass and bahiagrass. The main limitation affecting pasture and hayland is low fertility. If proper amounts of fertilizer are applied, medium or high production of forage or hay can be expected. Many areas of this unit were cultivated in the past.

A high shrink-swell potential and restricted permeability can be a problem affecting urban development. Cracks in foundations and the failure of septic systems are common in areas of this unit.

Dominantly Nearly Level, Loamy and Clayey Soils on Flood Plains

This group of general soil map units makes up about 26 percent of Brazos County. Gladewater, Kaufman, Sandow, Ships, and Weswood soils are dominant in this group. These soils formed in clayey, loamy, and sandy alluvium. The landscape is nearly level. Native grasses are mainly bluestems,

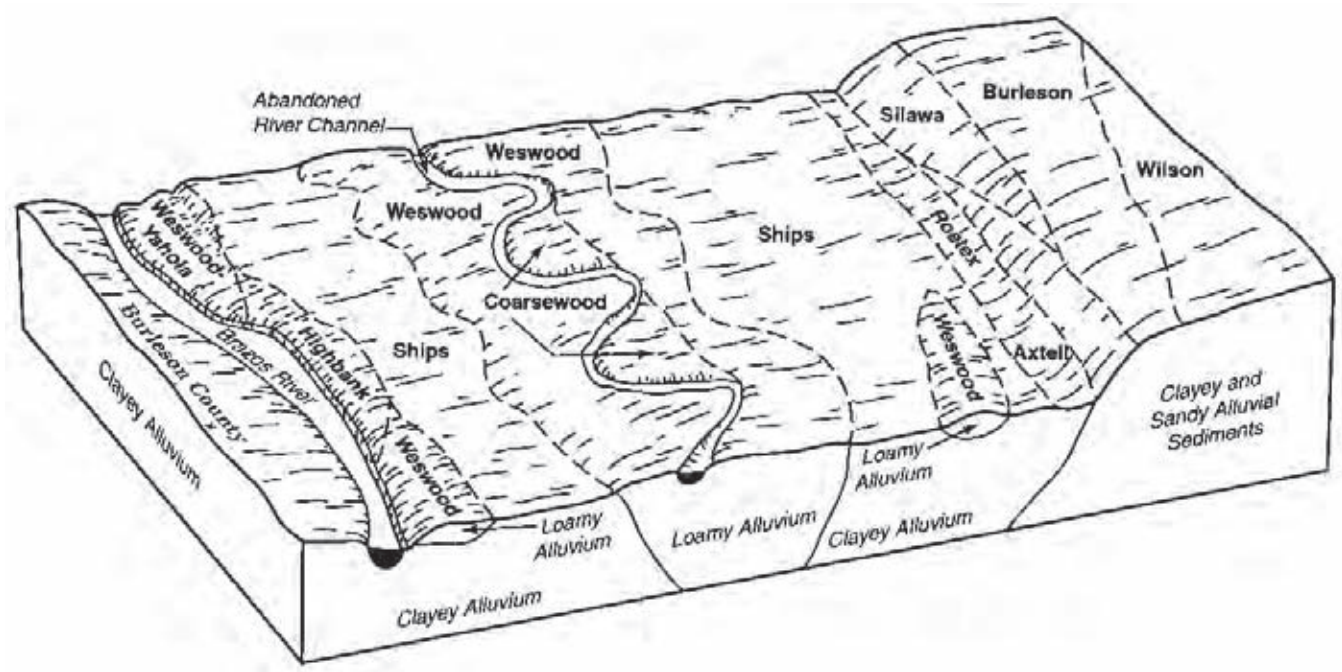

Figure 6.—Pattern of soils and underlying material on the flood plain along the Brazos River and on adjacent terraces. Included are the Burleson-Wilson, Ships, and Weswood general soil map units.

indiangrass, and switchgrass and an overstory of elm, pecan, oak, and ash.

These soils range from clay to sandy loam. They are used for growing irrigated crops on the flood plain along the Brazos River. Soils in areas of the Navasota River flood plain are used for range or as wildlife habitat. Along the smaller streams are mostly loamy soils that are used for pasture or as wildlife habitat.

The flooding potential, a high shrink-swell potential, and restricted permeability are problems affecting urban development.

8. Ships

Nearly level to gently sloping, very deep, clayey soils that are moderately well drained; in areas on bottom land that are subject to rare flooding

The landscape in areas of this unit typically consists of nearly level, smooth flood plains along the Brazos River. The underlying material is alkaline, clayey recent alluvial sediments.

This unit makes up about 7 percent of the county. It is about 75 percent Ships soils and 25 percent soils of minor extent (fig. 6).

Ships soils are on broad flats. Typically, the surface layer is brown, moderately alkaline clay. The subsoil is brown, dark brown, and dark reddish brown, moderately alkaline clay.

Of minor extent in this unit are Highbank, Roetex, Weswood, and Yahola soils. Highbank soils are on transitional natural levees. Roetex soils are in slight depressions. Weswood and Yahola soils occur as natural levees adjacent to active and abandoned channels.

The soils in this unit are mainly used as irrigated cropland. Some areas are used for dryland crops and pasture. The irrigated crops are dominantly cotton and corn. The dryland crops are grain sorghum, small grain, and annual forage crops. The main limitation affecting crop production is the difficulty in managing the high content of clay in the soils. Medium or high pasture yields can be expected in areas of these soils.

A high shrink-swell potential, restricted permeability, and the hazard of flooding are problems affecting urban development. There is limited housing in the higher elevations or on manmade mounds.

9. Sandow

Nearly level, very deep, loamy soils that are moderately well drained; in frequently flooded areas on bottom land

The landscape in areas of this unit typically consists of nearly level flood plains along the smaller local streams and natural levees along the larger streams.

The underlying material is slightly acid, loamy alluvium.

This unit makes up about 7 percent of the county. It is 60 percent Sandow soils and 40 percent soils of minor extent.

Sandow soils are on narrow flood plains along small streams and on natural levees along the larger streams. Typically, the surface layer is grayish brown, slightly acid loam. The subsoil is stratified with loamy textures in shades of gray and brown. It is slightly acid or moderately acid.

Of minor extent in this unit are Derly, Gredge, Rader, Robco, Silawa, Tabor, and Uhland soils. Derly, Rader, and Tabor soils are on broad flats and toeslopes of terraces adjacent to the flood plain. Gredge and Silawa soils are on the upper backslopes of stream terraces. Robco soils are on rounded ridges and hilltops. Uhland soils are along narrow local streams and adjacent to channels on natural levees along other streams.

The soils in this unit are used for pasture or as wildlife habitat. Pastures of bahiagrass and common bermudagrass are the most common. Areas of these soils that are wooded or adjacent to woodlands are used as wildlife habitat. Because of the natural fertility of the soils, good pasture production is possible with little or no application of fertilizer.

Because of the frequent flooding, areas of this unit are not suited to urban development.

10. Gladewater-Kaufman

Nearly level, very deep, clayey soils that are somewhat poorly drained to moderately well drained; in frequently or occasionally flooded areas on bottom land

The landscape in areas of this unit typically consists of nearly level, large, broad major flood plains, especially along the Navasota River. The underlying material is slightly acid, clayey alluvium.

This unit makes up about 6 percent of the county. It is 65 percent Gladewater soils, 16 percent Kaufman soils, and 19 percent soils of minor extent (fig. 5).

Gladewater soils are on broad, level flood plains, mainly along the Navasota River. Typically, the surface layer is dark gray, strongly acid clay. The subsoil is dark grayish brown, moderately acid or strongly acid clay.

Kaufman soils are on broad, level flood plains, mainly along major tributaries of the Navasota River and on its outer flood plain. Typically, the surface layer is very dark gray, strongly acid clay. The subsoil is very dark gray, moderately acid clay in the upper part and dark grayish brown, moderately alkaline clay in the lower part.

Of minor extent in this unit are Desan, Dutek, Eufaula, Navasan, Padina, Robco, Sandow, and Uhland soils. Desan, Dutek, Padina, and Robco soils are on slightly rounded ridges and hills on breaks to the major flood plain. Sandow and Uhland soils are on natural levees or flood plains along the smaller streams. Eufaula and Navasan soils are on low stream terraces.

The soils in this unit are used for range or as wildlife habitat. Because of the flooding, the soils are not used for crops or improved pasture.

Areas of this unit are not suitable for urban development because of the flooding, the shrink-swell potential, and restricted permeability.

11. Weswood

Nearly level to gently sloping, very deep, loamy soils that are well drained; in areas on bottom land that are subject to rare flooding

The landscape in areas of this unit typically consists of nearly level to gently sloping flood plains along the Brazos River. The underlying material is alkaline, stratified, loamy alluvial sediments.

This unit makes up about 6 percent of the county. It is about 58 percent Weswood soils and 42 percent soils of minor extent (fig. 6).

Weswood soils are on natural levees and alluvial fans. Typically, the surface layer is brown, moderately alkaline silt loam. The subsoil is light brown, moderately alkaline silt loam. The underlying material is stratified, moderately alkaline silt loam in various shades of brown.

Of minor extent in this unit are Coarsewood, Highbank, Roetex, Ships, and Yahola soils. Coarsewood soils are on natural levees. Highbank and Ships soils are on flats away from channels. Roetex soils are in depressions. Yahola soils are adjacent to channels.

The soils in this unit are mainly used as irrigated cropland. Some small areas are used for dryland crops. The irrigated crops are dominantly cotton and some corn. The dryland crops are grain sorghum, small grain, and annual forage crops. High yields can be expected if proper irrigation management, proper amounts of herbicide and pesticide, and timely tillage are applied. These soils are well suited to pasture.

The rare flooding is a slight problem affecting urban development.

Detailed Soil Map Units

The map units delineated on the detailed soil maps in 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.

A map unit delineation on a soil 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. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils 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. If intensive use of small areas is planned, however, 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, Weswood silty clay loam, 0 to 1 percent slopes, rarely flooded, is a phase of the Weswood series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are called complexes. 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. Rader-Tabor complex, 1 to 3 percent slopes, is an example.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Urban land 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.

AxB—Axtell fine sandy loam, 1 to 3 percent slopes

Setting

Landform: Stream terraces
Landscape position: Summits and the upper side slopes
Slope: Very gently sloping; slightly convex or plane surfaces
Shape of areas: Elongated or irregular
Size of areas: 8 to 150 acres
Native vegetation: Post oak savannah

Typical Profile

Surface layer:
0 to 4 inches—grayish brown, strongly acid fine sandy loam

Subsurface layer:
4 to 8 inches—pale brown, moderately acid fine sandy loam

Subsoil:
8 to 29 inches—strong brown, very strongly acid clay that has mottles in shades of gray, brown, and red
29 to 40 inches—red, strongly acid clay that has strong brown and weak red mottles
40 to 50 inches—light olive brown, moderately acid clay that has yellowish brown and grayish brown mottles
50 to 80 inches—light olive brown, slightly alkaline clay that has yellowish brown and grayish brown mottles

Soil Properties

Depth class: Very deep
Drainage class: Moderately well drained
Depth to the water table: More than 6 feet
Flooding: None
Runoff: Medium
Permeability: Very slow
Available water capacity: Moderate
Root zone: Very deep; restricted by the clayey subsoil
Natural soil fertility: Low
Shrink-swell potential: High in the subsoil
Hazard of water erosion: Moderate or severe

Composition

• Based on transects, this map unit contains 67 percent soils of the Axtell series. There is an 80 percent probability that Axtell and similar soils make up 80 to 100 percent of the unit. Contrasting soils are Lufkin, Rader, and Silawa soils, but neither of these soils makes up as much as 10 percent of the unit.

Contrasting Soils

• Rader soils, which have a thicker surface layer than that of the Axtell soil
• Lufkin soils, which have a gray subsoil; in the less sloping areas
• Silawa soils, which have a loamy subsoil; on the convex upper slopes adjacent to streams

Land Uses

Major land use: Pasture
Other land use: Rangeland

Management Concerns

Pasture

Major limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.
• The available water capacity limits the potential forage production during dry seasons.
• The low natural fertility also limits the potential forage production.

Cropland

Major limitations:
• Because of the hazard of erosion, conservation measures are needed.
• The available water capacity limits the potential production during dry seasons.
• The low natural fertility limits the potential yields of most crops.

Rangeland

Major limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.
• The available water capacity limits the potential production during dry seasons.
• The low natural fertility also limits the potential production.

Urban development

Major limitations:
- Structures and roads are affected by the high shrink-swell potential in the subsoil.
- Erosion-control measures are needed at construction sites.
- Disposal of septic tank effluent is a concern because of the restricted permeability.

Interpretive Groups

Land capability classification: 3e
Ecological site: Claypan Savannah
Pasture management group: 7

BeA—Benchley loam, 0 to 1 percent slopes

Setting

Landform: Uplands
Landscape position: Footslopes
Slope: Nearly level; plane or slightly concave
Shape of areas: Irregular
Size of areas: 8 to 50 acres
Native vegetation: Tall grass prairie

Typical Profile

Surface layer:
0 to 5 inches—grayish brown, slightly acid loam

Subsurface layer:
5 to 15 inches—black, slightly acid loam

Subsoil:
15 to 21 inches—brown, slightly acid clay that has yellow mottles
21 to 50 inches—mottled gray and brown, slightly acid clay
50 to 80 inches—mottled gray and brown, neutral clay

Soil Properties

Depth class: Very deep
Drainage class: Moderately well drained
Depth to the water table: More than 6 feet
Flooding: None
Runoff: Slow
Permeability: Slow
Available water capacity: High
Root zone: Very deep; restricted by the clayey subsoil
Natural soil fertility: High
Shrink-swell potential: High in the subsoil
Hazard of water erosion: Slight

Composition

- This map unit consists of about 85 percent Benchley soil and similar soils. Contrasting soils make up about 15 percent of the unit.

Contrasting Soils

- Dimebox and Luling soils, which are clayey throughout; in landscape positions similar to those of the Benchley soil

Land Uses

Major land use: Pasture
Other land use: Rangeland

Management Concerns

Pasture

Major limitations:
- No major limitations affect the use of this soil for pasture. If good management is applied, high yields of adapted forage grasses can be produced.

Cropland

Major limitations:
- No major limitations affect the use of this soil for crops. If good management is applied, high yields of adapted crops can be produced.

Rangeland

Major limitations:
- No major limitations affect the use of this soil as rangeland. If good management is applied, high yields of native plants can be produced.

Urban development

Major limitations:
- Structures and roads are affected by the high shrink-swell potential in the subsoil.
- Erosion-control measures are needed at construction sites.
- Disposal of septic tank effluent is a concern because of the restricted permeability.

Interpretive Groups

Land capability classification: 2w
Ecological site: Clay Loam
Pasture management group: 1

BeB—Benchley loam, 1 to 3 percent slopes

Setting

Landform: Uplands
Landscape position: Lower footslopes
Slope: Very gently sloping; plane or slightly concave
Shape of areas: Irregular

Size of areas: 8 to 50 acres
Native vegetation: Tall grass prairie

Typical Profile

Surface layer:
0 to 10 inches—very dark grayish brown, slightly acid loam

Subsoil:
10 to 16 inches—very dark grayish brown, slightly acid clay loam that has yellowish brown mottles
16 to 30 inches—reddish brown, slightly acid clay that has light olive brown and pale yellow mottles
30 to 54 inches—light yellowish brown, slightly acid clay that has red mottles
54 to 70 inches—light yellowish brown, neutral clay loam that has pale yellow mottles

Underlying material:
70 to 80 inches—light yellowish brown, slightly alkaline shale that has clayey texture and pale brown mottles

Soil Properties

Depth class: Very deep
Drainage class: Moderately well drained
Depth to the water table: More than 6 feet
Flooding: None
Runoff: Slow
Permeability: Slow
Available water capacity: High
Root zone: Very deep; restricted by the clayey subsoil
Natural soil fertility: High
Shrink-swell potential: High in the subsoil
Hazard of water erosion: Moderate

Composition

• This map unit consists of about 85 percent Benchley soil and similar soils. Contrasting soils make up about 15 percent of the unit.

Contrasting Soils

• Dimebox and Luling soils, which are clayey throughout; in landscape positions similar to those of the Benchley soil

Land Uses

Major land use: Pasture
Other land use: Rangeland

Management Concerns

Pasture

Major limitations:
• No major limitations affect the use of this soil for pasture. If good management is applied, high yields of adapted forage grasses can be produced.
Minor limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.

Cropland

Major limitations:
• Because of the hazard of erosion, conservation measures are needed.

Rangeland

Major limitations:
• No major limitations affect the use of this soil as rangeland. If good management is applied, high yields of adapted forage grasses can be produced.
Minor limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.

Urban development

Major limitations:
• Structures and roads are affected by the high shrink-swell potential in the subsoil.
• Erosion-control measures are needed at construction sites.
• Disposal of septic tank effluent is a concern because of the restricted permeability.

Interpretive Groups

Land capability classification: 2e
Ecological site: Clay Loam
Pasture management group: 1

BoA—Boonville fine sandy loam, 0 to 1 percent slopes

Setting

Landform: Uplands
Landscape position: Footslopes
Slope: Nearly level; slightly concave or plane
Shape of areas: Elongated or oval
Size of areas: 50 to 150 acres
Native vegetation: Open savannah with mid and tall grasses

Typical Profile

Surface layer:
0 to 17 inches—dark grayish brown, slightly acid fine sandy loam

Subsoil:
17 to 41 inches—light grayish brown, neutral clay that has red and brown mottles

41 to 56 inches—light gray, moderately alkaline clay loam
56 to 73 inches—pale yellow, moderately alkaline clay loam

Underlying material:
73 to 80 inches—light brownish gray, slightly alkaline shale that has clay texture

Soil Properties

Depth class: Very deep
Drainage class: Somewhat poorly drained
Depth to the water table: 0.5 to 1.0 foot (perched)
Flooding: None
Runoff: Slow
Permeability: Very slow
Available water capacity: Moderate
Root zone: Very deep; restricted by the clay subsoil
Natural soil fertility: Medium
Shrink-swell potential: High in the subsoil
Hazard of water erosion: Slight

Composition

• This map unit consists of about 85 percent Boonville soil and similar soils. Contrasting soils make up about 15 percent of the unit.

Contrasting Soils

• Tabor soils, which have a yellower subsoil than that of the Boonville soil; in landscape positions similar to those of the Boonville soil
• Zack and Zulch soils, which have a thinner surface layer than that of the Boonville soil; on convex slopes

Land Uses

Major land use: Pasture
Other land use: Urban development

Management Concerns

Pasture

Major limitations:
• The moderate available water capacity and medium natural fertility limit the potential forage production.

Cropland

Major limitations:
• The moderate available water capacity and medium natural fertility limit yields of most crops.
Minor limitations:
• Seasonal wetness is a concern in most years.

Rangeland

Major limitations:
• The moderate available water capacity and medium natural fertility limit the potential forage production.

Urban development

Major limitations:
• Structures and roads are affected by the high shrink-swell potential in the subsoil.
• Disposal of septic tank effluent is a concern because of the restricted permeability and short periods of soil saturation.

Interpretive Groups

Land capability classification: 3w
Ecological site: Claypan Prairie
Pasture management group: 7

BoB—Boonville fine sandy loam, 1 to 3 percent slopes

Setting

Landform: Uplands
Landscape position: Footslopes
Slope: Very gently sloping; slightly concave or plane
Shape of areas: Elongated or oval
Size of areas: 25 to 200 acres
Native vegetation: Open savannah with mid and tall grasses

Typical Profile

Surface layer:
0 to 4 inches—pale brown, neutral or slightly acid fine sandy loam
4 to 10 inches—brown, moderately acid fine sandy loam
10 to 17 inches—very pale brown, moderately acid fine sandy loam

Subsoil:
17 to 36 inches—light brownish gray, slightly acid clay that has red, yellowish brown, and olive brown mottles
36 to 56 inches—light brownish gray and light gray, moderately alkaline clay loam that has olive mottles
56 to 73 inches—pale yellow, moderately alkaline clay loam

Underlying material:
73 to 80 inches—light brownish gray, slightly alkaline shale that has clay loam texture

Soil Properties

Depth class: Very deep
Drainage class: Somewhat poorly drained

Depth to the water table: 0.5 to 1.0 foot (perched)
Flooding: None
Runoff: Slow
Permeability: Very slow
Available water capacity: Moderate
Root zone: Very deep; restricted by the clay subsoil
Natural soil fertility: Medium
Shrink-swell potential: High in the subsoil
Hazard of water erosion: Severe

Composition

• Based on transects, this map unit contains 85 percent soils of the Boonville series. There is an 80 percent probability that Boonville and similar soils make up 82 to 100 percent of the unit. Contrasting soils are Tabor, Zack, and Zulch soils, but neither of these soils makes up as much as 10 percent of the unit.

Contrasting Soils

• Tabor soils, which have a yellower subsoil than that of the Boonville soil; in landscape positions similar to those of the Boonville soil
• Zack and Zulch soils, which have a thinner surface layer than that of the Boonville soil; on convex slopes

Land Uses

Major land use: Pasture (fig. 7)
Other land use: Urban development

Management Concerns

Pasture

Major limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.
• The moderate available water capacity and medium natural fertility limit the potential forage production.

Cropland

Major limitations:
• Because of the hazard of erosion, conservation measures are needed.
• The moderate available water capacity and medium natural fertility limit the potential production of most crops.
Minor limitations:
• Seasonal wetness is a concern in most years.

Rangeland

Major limitations:
• The moderate available water capacity and medium natural fertility limit the potential forage production.
• Water erosion is a concern unless an adequate cover of vegetation is maintained.

Urban development

Major limitations:
• Structures and roads are affected by the high shrink-swell potential in the subsoil.
• Erosion-control measures are needed at construction sites.
• Disposal of septic tank effluent is a concern because of the restricted permeability and short periods of soil saturation.

Interpretive Groups

Land capability classification: 3e
Ecological site: Claypan Prairie
Pasture management group: 7

BrB—Boonville-Urban land complex, 0 to 3 percent slopes

Setting

Landform: Uplands
Landscape position: Footslopes
Slope: Nearly level and very gently sloping; slightly concave or plane
Shape of areas: Elongated or oval
Size of areas: 25 to 1,200 acres
Native vegetation: Open savannah with mid and tall grasses

Typical Profile

Boonville

Surface layer:
0 to 12 inches—brown, slightly acid fine sandy loam

Subsoil:
12 to 30 inches—grayish brown, neutral clay that has red and yellowish brown mottles
30 to 55 inches—light gray, moderately alkaline clay loam that has brown mottles
55 to 65 inches—pale olive, moderately alkaline clay loam

Underlying material:
65 to 80 inches—mottled brownish gray, slightly alkaline clay loam

Soil Properties

Boonville

Depth class: Very deep
Drainage class: Somewhat poorly drained
Depth to the water table: 0.5 to 1.0 foot (perched)
Flooding: None
Runoff: Slow

Figure 7.—Improved bermudagrass hay in an area of Boonville fine sandy loam, 1 to 3 percent slopes.

Permeability: Very slow
Available water capacity: Moderate
Root zone: Very deep; restricted by the clay subsoil
Natural soil fertility: Medium
Shrink-swell potential: High in the subsoil
Hazard of water erosion: Moderate

Composition

• This map unit consists of about 40 to 60 percent Boonville and similar soils and 35 to 45 percent Urban land.

Contrasting Soils

• Zack and Zulch soils, which have a thinner surface layer than that of the Boonville soil; on convex slopes

Land Uses

Major land use: Urban development
Other land use: Idle land

Management Concerns

Pasture

Major limitations:
• This map unit is generally not suitable for use as pasture because of the areas of urban development.

Cropland

Major limitations:
• This map unit is generally not suitable for use as cropland because of the areas of urban development.

Rangeland

Major limitations:
• This map unit is generally not suitable for use as rangeland because of the areas of urban development.

Urban development

Major limitations:
• Structures and roads are affected by the high shrink-swell potential in the subsoil.
• Disposal of septic tank effluent is a concern because of the restricted permeability and short periods of soil saturation.
• Erosion-control measures are needed at construction sites.

Interpretive Groups

Land capability classification: None assigned
Ecological site: None assigned
Pasture management group: None assigned

BuA—Burleson clay, 0 to 1 percent slopes

Setting

Landform: Stream terraces
Landscape position: Flat interstream divides
Slope: Nearly level; plane to convex surfaces
Shape of areas: Irregular or elongated
Size of areas: 10 to 300 acres
Native vegetation: Tall grass prairie

Typical Profile

Surface layer:
0 to 8 inches—very dark gray, neutral clay

Subsoil:
8 to 40 inches—very dark gray, slightly alkaline clay
40 to 65 inches—moderately alkaline clay that is dark gray in the upper part and light brownish gray in the lower part

Underlying material:
65 to 80 inches—reddish yellow, moderately alkaline silty clay

Soil Properties

Depth class: Very deep
Drainage class: Moderately well drained
Depth to the water table: More than 6 feet
Flooding: None
Runoff: Slow
Permeability: Very slow
Available water capacity: High
Root zone: Very deep
Natural soil fertility: High
Shrink-swell potential: Very high
Hazard of water erosion: Slight

Composition

• Based on transects, this map unit contains 97 percent soils of the Burleson series. There is an 80 percent probability that Burleson and similar soils make up 95 to 100 percent of the unit. Contrasting soils are Crockett, Mabank, and Wilson soils, but neither of these soils makes up as much as 10 percent of the unit.

Contrasting Soils

• Crockett, Mabank, and Wilson soils, which have a loamy surface layer; in landscape positions similar to those of the Burleson soil

Land Uses

Major land uses: Cropland and pasture
Other land use: Rangeland

Management Concerns

Pasture

Major limitations:
• No major limitations affect the use of this soil for pasture. If good management is applied, high yields of adapted forage grasses can be produced.
Minor limitations:
• The high content of clay limits the uptake of water.

Cropland

Major limitations:
• No major limitations affect the use of this soil for crops. If good management is applied, high yields of adapted crops can be produced.
Minor limitations:
• The high content of clay limits the uptake of water.
• Surface crusting affects seedling emergence.
• Because of the high content of clay, high-powered equipment is needed.
• Wetness resulting from the restricted runoff rate can cause delays in cultivation. It can also promote seedling problems because it keeps the soil temperature lower than in other areas.

Rangeland

Major limitations:
• No major limitations affect the use of this soil as rangeland. High yields of adapted native plants can be produced.
Minor limitations:
• The high content of clay limits the uptake of water.

Urban development

Major limitations:
• Structures and roads are affected by the very high shrink-swell potential in the subsoil.
• Disposal of septic tank effluent is a concern because of the restricted permeability.

• Erosion-control measures are needed at construction sites.
Minor limitations:
• The high content of clay can affect the maintenance of landscape plants.

Interpretive Groups

Land capability classification: 2w
Ecological site: Blackland
Pasture management group: 6

BuB—Burleson clay, 1 to 3 percent slopes

Setting

Landform: Stream terraces
Landscape position: Interstream divides
Slope: Very gently sloping; plane or slightly convex
Shape of areas: Irregular or elongated
Size of areas: 10 to 50 acres
Native vegetation: Tall grass prairie

Typical Profile

Surface layer:
0 to 3 inches—very dark gray, slightly alkaline clay

Subsoil:
3 to 25 inches—black, moderately alkaline clay
25 to 48 inches—very dark gray, moderately alkaline clay
48 to 80 inches—yellowish red, moderately alkaline clay

Soil Properties

Depth class: Very deep
Drainage class: Moderately well drained
Depth to the water table: More than 6 feet
Flooding: None
Runoff: Medium
Permeability: Very slow
Available water capacity: High
Root zone: Very deep
Natural soil fertility: High
Shrink-swell potential: Very high
Hazard of water erosion: Moderate

Composition

• This map unit consists of about 85 percent Burleson soil and similar soils. Contrasting soils make up about 15 percent of the unit.

Contrasting Soils

• Crockett, Mabank, and Wilson soils, which have a loamy surface layer; in landscape positions similar to those of the Burleson soil

Land Uses

Major land uses: Cropland and pasture
Other land use: Rangeland

Management Concerns

Pasture

Major limitations:
• No major limitations affect the use of this soil for pasture. High yields of adapted forage grasses can be produced.
Minor limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.
• The high content of clay limits the uptake of water.

Cropland

Major limitations:
• Because of the hazard of erosion, conservation measures are needed.
Minor limitations:
• Surface crusting affects seedling emergence.
• Because of the high content of clay, high-powered equipment is needed.

Rangeland

Major limitations:
• No major limitations affect the use of this soil as rangeland. High yields of native plants can be produced.
Minor limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.
• The high content of clay limits the uptake of water.

Urban development

Major limitations:
• Structures and roads are affected by the very high shrink-swell potential.
• Disposal of septic tank effluent is a concern because of the restricted permeability.
• Erosion-control measures are needed at construction sites.
Minor limitations:
• The high content of clay can affect the maintenance of landscaping plants.

Interpretive Groups

Land capability classification: 2e
Ecological site: Blackland
Pasture management group: 6

BuC—Burleson clay, 3 to 5 percent slopes

Setting

Landform: Stream terraces
Landscape position: Interstream divides
Slope: Gently sloping; plane or slightly convex
Shape of areas: Elongated
Size of areas: 10 to 100 acres
Native vegetation: Tall grass prairie

Typical Profile

Surface layer:
0 to 6 inches—very dark gray, slightly alkaline clay

Subsoil:
6 to 25 inches—black, moderately alkaline clay
25 to 45 inches—very dark gray, moderately alkaline clay
45 to 80 inches—yellowish red, moderately alkaline clay

Soil Properties

Depth class: Very deep
Drainage class: Moderately well drained
Depth to the water table: More than 6 feet
Flooding: None
Runoff: Medium
Permeability: Very slow
Available water capacity: High
Root zone: Very deep
Natural soil fertility: High
Shrink-swell potential: Very high
Hazard of water erosion: Severe

Composition

• This map unit consists of about 85 percent Burleson soil and similar soils. Contrasting soils make up about 15 percent of the unit.

Contrasting Soils

• Crockett soils, which have a loamy surface layer; in landscape positions similar to those of the Burleson soil

Land Uses

Major land uses: Cropland and pasture
Other land use: Rangeland

Management Concerns

Pasture

Major limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.
Minor limitations:
• The high content of clay limits the uptake of water.

Cropland

Major limitations:
• Because of the hazard of erosion, conservation measures are needed.
Minor limitations:
• Surface crusting affects seedling emergence.
• Because of the high content of clay, high-powered equipment is needed.

Rangeland

Major limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.
Minor limitations:
• The high content of clay limits the uptake of water.

Urban development

Major limitations:
• Structures and roads are affected by the very high shrink-swell potential in the subsoil.
• Disposal of septic tank effluent is a concern because of the restricted permeability.
• Erosion-control measures are needed at construction sites.
Minor limitations:
• The high content of clay can affect the maintenance of landscape plants.

Interpretive Groups

Land capability classification: 3e
Ecological site: Blackland
Pasture management group: 6

BwC—Burlewash fine sandy loam, 1 to 5 percent slopes

Setting

Landform: Uplands
Landscape position: Summits and the upper side slopes
Slope: Gently sloping; convex to plane
Shape of areas: Elongated
Size of areas: 10 to 100 areas
Native vegetation: Post oak savannah

Typical Profile

Surface layer:
0 to 8 inches—light brownish gray, moderately acid fine sandy loam

Subsoil:
8 to 35 inches—light reddish brown, very strongly acid clay

Underlying material:
35 to 40 inches—light brownish gray, very strongly acid, slightly cemented tuffaceous siltstone

Soil Properties

Depth class: Moderately deep
Drainage class: Well drained
Depth to the water table: More than 6 feet
Flooding: None
Runoff: Medium
Permeability: Very slow
Available water capacity: Low
Root zone: Moderately deep; restricted by the clayey subsoil
Natural soil fertility: Low
Shrink-swell potential: High in the subsoil
Hazard of water erosion: Severe

Composition

• Based on transects, this map unit contains 76 percent soils of the Burlewash series. There is an 80 percent probability that Burleson and similar soils make up 78 to 98 percent of the unit. Contrasting soils are Rehburg, Shalba, Shiro, and Silawa soils and soils that have sandstone or slightly cemented materials at a depth of less than 20 inches. None of these contrasting soils makes up as much as 10 percent of the unit.

Contrasting Soils

• Rehburg and Shiro soils, which have a sandier surface layer than that of the Burlewash soil; in slightly convex positions
• Shalba soils and soils that have sandstone or cemented materials within a depth of 20 inches; in landscape positions similar to those of the Burlewash soil
• Silawa soils, which do not have a clayey subsoil; on stream terraces

Land Uses

Major land use: Rangeland
Other land use: Pasture

Management Concerns

Pasture

Major limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.
• The low available water capacity and low natural fertility limit the potential forage production.

Cropland

Major limitations:
• Because of the hazard of erosion, conservation measures are needed.
• The low available water capacity and low natural fertility limit the potential production of most crops.

Rangeland

Major limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.
• The low available water capacity and low natural fertility limit the potential forage production.

Urban development

Major limitations:
• Structures and roads are affected by the high shrink-swell potential in the subsoil.
• Erosion-control measures are needed at construction sites.
• Disposal of septic tank effluent is a concern because of the restricted permeability.

Interpretive Groups

Land capability classification: 4e
Ecological site: Claypan Savannah
Pasture management group: 13

BwD—Burlewash fine sandy loam, 5 to 8 percent slopes

Setting

Landform: Uplands
Landscape position: Narrow summits and backslopes
Slope: Strongly sloping; convex to plane
Shape of areas: Elongated
Size of areas: 10 to 300 acres
Native vegetation: Post oak savannah

Typical Profile

Surface layer:
0 to 4 inches—light brownish gray, very strongly acid fine sandy loam

Subsoil:
4 to 30 inches—reddish brown, very strongly acid clay

Underlying material:
30 to 40 inches—light brownish gray, very strongly acid, slightly cemented tuffaceous sandstone and siltstone

Soil Properties

Depth class: Moderately deep
Drainage class: Well drained
Depth to the water table: More than 6 feet
Flooding: None
Runoff: Rapid
Permeability: Very slow
Available water capacity: Low
Root zone: Moderately deep; restricted by the clayey subsoil
Natural soil fertility: Low
Shrink-swell potential: High in the subsoil
Hazard of water erosion: Severe

Composition

• Based on transects, this map unit contains 72 percent soils of the Burlewash series. There is an 80 percent probability that Burlewash and similar soils make up 78 to 98 percent of the unit. Contrasting soils are Shalba soils, soils that have sandstone at a depth of less than 20 inches, and Burlewash soils that are severely eroded. None of these contrasting soils makes up as much as 10 percent of the unit.

Contrasting Soils

• Burlewash soils that are severely eroded; on the upper slope breaks
• Shalba soils and soils that have sandstone at a depth of less than 20 inches; in landscape positions similar to those of the Burlewash soil

Land Uses

Major land uses: Rangeland and pasture
Other land uses: Urban development and recreation

Management Concerns

Pasture

Major limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.
• The low available water capacity and low natural fertility limit the potential forage production.

Cropland

Major limitations:
• This soil is not suited to use as cropland because of the slope.

Rangeland

Major limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.
• The low available water capacity and low natural fertility limit the potential forage production.

Urban development

Major limitations:
• Structures and roads are affected by the high shrink-swell potential in the subsoil.
• Erosion-control measures are needed at construction sites.
• Disposal of septic tank effluent is a concern because of the restricted permeability.

Interpretive Groups

Land capability classification: 6e
Ecological site: Claypan Savannah
Pasture management group: 14

ChC—Chazos loamy fine sand, 1 to 5 percent slopes

Setting

Landform: Stream terraces
Landscape position: Summits and the upper backslopes
Slope: Gently sloping; convex
Shape of areas: Elongated
Size of areas: 10 to 30 acres
Native vegetation: Post oak savannah

Typical Profile

Surface layer:
0 to 4 inches—light brownish gray, slightly acid loamy fine sand

Subsurface layer:
4 to 14 inches—very pale brown, slightly acid loamy fine sand

Subsoil:
14 to 26 inches—reddish brown, moderately acid clay that has light brownish gray mottles
26 to 38 inches—brownish yellow, moderately acid sandy clay that has light brownish gray mottles
38 to 52 inches—yellowish brown, slightly alkaline clay loam that has grayish brown mottles
52 to 80 inches—reddish brown and light reddish brown, slightly alkaline sandy clay loam that has strata of sandy loam and loamy sand in the lower part

Soil Properties

Depth class: Very deep
Drainage class: Moderately well drained

Depth to the water table: More than 6 feet
Flooding: None
Runoff: Slow
Permeability: Slow
Available water capacity: Moderate
Root zone: Very deep
Natural soil fertility: Medium
Shrink-swell potential: Moderate in the subsoil
Hazard of water erosion: Moderate

Composition

• Based on transects, this map unit contains 60 percent soils of the Chazos series. There is an 80 percent probability that Chazos and similar soils make up 76 to 96 percent of the unit. Contrasting soils are Gredge and Shiro soils, but neither of these soils makes up as much as 10 percent of the unit.

Contrasting Soils

• Gredge soils, which have a more clayey subsoil than that of the Chazos soil and have a less sandy surface layer; in landscape positions similar to those of the Chazos soil
• Shiro soils, which have slightly cemented materials within a depth of 40 inches; in landscape positions similar to those of the Chazos soil

Land Uses

Major land uses: Rangeland and pasture
Other land use: Cropland

Management Concerns

Pasture

Major limitations:
• No major limitations affect the use of this soil for pasture. High yields of adapted forage grasses can be produced.
Minor limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.
• The moderate available water capacity and medium natural fertility limit the potential forage production.

Cropland

Major limitations:
• Because of the hazard of erosion, conservation measures are needed.
Minor limitations:
• The moderate available water capacity and medium natural fertility limit the potential production of most crops.

Rangeland

Major limitations:
• No major limitations affect the use of this soil as rangeland. High yields of adapted forage grasses can be produced.
Minor limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.
• The moderate available water capacity and medium natural fertility limit the potential forage production.

Urban development

Major limitations:
• Erosion-control measures are needed at construction sites.
• Disposal of septic tank effluent is a concern because of the restricted permeability.
Minor limitations:
• Structures and roads are affected by the moderate shrink-swell potential in the subsoil.

Interpretive Groups

Land capability classification: 3e
Ecological site: Sandy Loam
Pasture management group: 5

ChD—Chazos loamy fine sand, 5 to 8 percent slopes

Setting

Landform: Stream terraces
Landscape position: Summits and the upper backslopes
Slope: Strongly sloping; convex
Shape of areas: Elongated
Size of areas: 10 to 100 acres
Native vegetation: Post oak savannah

Typical Profile

Surface layer:
0 to 11 inches—brown, moderately acid loamy fine sand

Subsoil:
11 to 23 inches—light yellowish brown, moderately acid clay that has yellowish red and gray mottles
23 to 41 inches—brownish yellow, moderately acid sandy clay that has grayish brown and yellowish red mottles
41 to 65 inches—brownish yellow, slightly alkaline sandy clay loam that has grayish brown and yellowish red mottles

Underlying material:
65 to 80 inches—light reddish brown, slightly alkaline clay loam stratified with fine sandy loam and loamy fine sand

Soil Properties

Depth class: Very deep
Drainage class: Moderately well drained
Depth to the water table: More than 6 feet
Flooding: None
Runoff: Medium
Permeability: Slow
Available water capacity: Moderate
Root zone: Very deep
Natural soil fertility: Medium
Shrink-swell potential: Moderate in the subsoil
Hazard of water erosion: Severe

Composition

• This map unit consists of about 85 percent Chazos soil and similar soils. Contrasting soils are Gredge and Shiro soils, but neither of these soils makes up as much as 10 percent of the unit.

Contrasting Soils

• Gredge soils, which have a more clayey subsoil than that of the Chazos soil and a less sandy surface layer; in landscape positions similar to those of the Chazos soil
• Shiro soils, which have slightly cemented materials within a depth of 40 inches; in landscape positions similar to those of the Chazos soil

Land Uses

Major land use: Rangeland
Other land use: Pasture

Management Concerns

Pasture

Major limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.
Minor limitations:
• The moderate available water capacity and medium natural fertility limit the potential forage production.

Cropland

Major limitations:
• Because of the hazard of erosion, conservation measures are needed.
Minor limitations:
• The moderate available water capacity and medium natural fertility limit the potential production of most crops.

Rangeland

Major limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.
Minor limitations:
• The moderate available water capacity and medium natural fertility limit the potential forage production.

Urban development

Major limitations:
• Erosion-control measures are needed at construction sites.
• Disposal of septic tank effluent is a concern because of the restricted permeability.
Minor limitations:
• Structures and roads are affected by the moderate shrink-swell potential in the subsoil.

Interpretive Groups

Land capability classification: 4e
Ecological site: Sandy Loam
Pasture management group: 5

CoA—Coarsewood silt loam, 0 to 1 percent slopes, rarely flooded

Setting

Landform: Flood plains
Landscape position: Natural levees adjacent to stream channels
Slope: Nearly level; slightly convex
Shape of areas: Elongated
Size of areas: 10 to 100 acres
Native vegetation: Hardwood forest of pecan, elm, hackberry, and cottonwood and an understory of briars, vines, and mid grasses

Typical Profile

Surface layer:
0 to 7 inches—light brown, moderately alkaline silt loam

Subsurface layer:
7 to 25 inches—pink, moderately alkaline silt loam

Subsoil:
25 to 48 inches—light brown, moderately alkaline silt loam
48 to 80 inches—pink, moderately alkaline silt loam or loam

Soil Properties

Depth class: Very deep
Drainage class: Well drained

Depth to the water table: More than 6 feet
Flooding: Rare
Runoff: Slow
Permeability: Moderately rapid
Available water capacity: Moderate
Root zone: Very deep
Natural soil fertility: High
Shrink-swell potential: Low
Hazard of water erosion: None

Composition

• This map unit consists of about 85 percent Coarsewood soil and similar soils. Contrasting soils make up about 15 percent of the unit.

Contrasting Soils

• Highbank, Ships, and Weswood soils, which are more clayey than the Coarsewood soil and generally have a smoother surface; in the lower landscape positions

Land Uses

Major land use: Cropland
Other land use: Pasture

Management Concerns

Pasture

Major limitations:
• No major limitations affect the use of this soil for pasture. High yields of adapted forage grasses can be produced.
Minor limitations:
• A plowpan can develop rapidly and can restrict the movement of water and roots.

Cropland

Major limitations:
• No major limitations affect the use of this soil as cropland. High yields of adapted crops can be produced.
Minor limitations:
• A plowpan can develop rapidly and can restrict the movement of water and roots.

Rangeland

Major limitations:
• No major limitations affect the use of this soil as rangeland; however, very few areas support native vegetation.

Urban development

Major limitations:
• This soil is not suitable for urban development unless it is protected from flooding.

Interpretive Groups

Land capability classification: 1
Ecological site: Loamy Bottomland
Pasture management group: 3

CrB—Crockett loam, 1 to 3 percent slopes

Setting

Landform: Uplands
Landscape position: Broad ridges and interstream divides
Slope: Very gently sloping; plane or slightly concave
Shape of areas: Irregular
Size of areas: 10 to 100 acres
Native vegetation: Mid and tall grass prairie

Typical Profile

Surface layer:
0 to 8 inches—brown, neutral loam

Subsoil:
8 to 21 inches—yellowish brown, slightly acid clay that has red and dark grayish brown mottles
21 to 34 inches—dark reddish brown, slightly acid clay that has dark gray mottles
34 to 45 inches—brown, neutral clay that has red mottles

Underlying material:
45 to 80 inches—dark brown, slightly acid shale that has clay texture

Soil Properties

Depth class: Deep to shale
Drainage class: Moderately well drained
Depth to the water table: More than 6 feet
Flooding: None
Runoff: Medium
Permeability: Very slow
Available water capacity: Moderate
Root zone: Very deep; restricted by the clayey subsoil
Natural soil fertility: Medium
Shrink-swell potential: High in the subsoil
Hazard of water erosion: Severe

Composition

• Based on transects, this map unit contains 68 percent soils of the Crockett series. There is an 80 percent probability that Crockett and similar soils make up 78 to 98 percent of the unit. Contrasting soils are Benchley, Rader, Spiller, and Wilson soils, but neither of these soils makes up as much as 10 percent of the unit.

Contrasting Soils

• Benchley, Rader, and Spiller soils, which have a thicker surface layer than that of the Crockett soil; in landscape positions similar to those of the Crockett soil
• Wilson soils, which have a black subsoil; in the flatter positions

Land Uses

Major land uses: Pasture and rangeland
Other land use: Cropland

Management Concerns

Pasture

Major limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.
• The moderate available water capacity and medium natural fertility limit the potential forage production.

Cropland

Major limitations:
• Because of the hazard of erosion, conservation measures are needed.
• The moderate available water capacity and medium natural fertility limit the potential production of most crops.

Rangeland

Major limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.
• The moderate available water capacity and medium natural fertility limit the potential forage production.

Urban development

Major limitations:
• Structures and roads are affected by the high shrink-swell potential in the subsoil.
• Erosion-control measures are needed at construction sites.
• Disposal of septic tank effluent is a concern because of the restricted permeability.

Interpretive Groups

Land capability classification: 3e
Ecological site: Claypan Prairie
Pasture management group: 7

CrB2—Crockett loam, 2 to 5 percent slopes, eroded

Setting

Landform: Uplands
Landscape position: Narrow summits and the upper backslopes
Slope: Gently sloping; slightly convex or plane surfaces
Shape of areas: Irregular or elongated
Size of areas: 8 to 25 acres
Native vegetation: Mid and tall grass prairie

Typical Profile

Surface layer:
0 to 5 inches—dark brown, slightly acid loam

Subsoil:
5 to 32 inches—yellowish brown, slightly acid clay that has red and gray mottles
32 to 45 inches—brownish yellow, neutral clay that has gray mottles

Underlying material:
45 to 65 inches—brown, yellow, and light gray, moderately alkaline shale that has clay texture

Soil Properties

Depth class: Deep to shale
Drainage class: Moderately well drained
Depth to the water table: More than 6 feet
Flooding: None
Runoff: Rapid
Permeability: Very slow
Available water capacity: Moderate
Root zone: Very deep; restricted by the clayey subsoil
Natural soil fertility: Low
Shrink-swell potential: High in the subsoil
Hazard of water erosion: Severe

Composition

• This map unit consists of about 90 percent Crockett soil and similar soils. Contrasting soils make up about 10 percent of the unit.

Contrasting Soils

• Luling soils, which are clayey throughout; in landscape positions similar to those of the Crockett soil

Land Uses

Major land uses: Rangeland and pasture

Management Concerns

Pasture

Major limitations:
- Water erosion has reduced the overall productivity of this soil. Further water erosion is a concern unless an adequate cover of vegetation is maintained.
- The limited available water capacity hinders the establishment of a vegetative cover and thus increases the hazard of erosion.

Cropland

Major limitations:
- Because of the hazard of erosion, conservation measures are needed.
- The available water capacity and the loss of surface soil limit the potential production of most crops.
- The low natural fertility also limits the potential production of most crops.

Rangeland

Major limitations:
- Additional water erosion is a concern unless an adequate cover of vegetation is maintained.
- The moderate available water capacity and low natural fertility limit the potential forage production. They also hinder revegetation and thus increase the hazard of erosion.

Urban development

Major limitations:
- Structures and roads are affected by the high shrink-swell potential in the subsoil.
- Erosion-control measures are needed at construction sites.
- Disposal of septic tank effluent is a concern because of the restricted permeability in the subsoil.
- Additions of topsoil are necessary for most landscaping projects.

Interpretive Groups

Land capability classification: 4e
Ecological site: Claypan Prairie
Pasture management group: 9

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

Setting

Landform: Stream terraces (fig. 8)
Landscape position: Derly—intermound flats; Rader—mounds
Slope: Nearly level
Shape of areas: Elongated
Size of areas: 10 to 200 acres
Native vegetation: Post oak savannah

Typical Profile

Derly

Surface layer:
0 to 6 inches—light brownish gray, moderately acid loam

Subsoil:
6 to 16 inches—grayish brown, moderately acid clay loam and light yellowish brown, moderately acid fine sandy loam
16 to 44 inches—grayish brown, moderately acid clay loam
44 to 80 inches—light brownish gray, slightly alkaline clay loam

Rader

Surface layer:
0 to 9 inches—light yellowish brown, slightly acid fine sandy loam

Subsurface layer:
9 to 19 inches—very pale brown, slightly acid fine sandy loam

Subsoil:
19 to 24 inches—light yellowish brown, moderately acid sandy clay loam that has brownish gray mottles
24 to 65 inches—light gray, strongly acid sandy clay that has red and yellow mottles

Soil Properties

Depth class: Very deep
Drainage class: Derly—poorly drained; Rader—moderately well drained
Seasonal high water table: Derly—at the surface to 1.5 feet below the surface; Rader—at a depth of 2 to 5 feet
Flooding: None
Runoff: Derly—ponded for 7 to 10 days during the growing season in most years; Rader—slow
Permeability: Very slow
Available water capacity: High
Root zone: Very deep, but root growth is restricted by the clayey subsoil
Natural soil fertility: Medium
Shrink-swell potential: Moderate in the subsoil
Hazard of water erosion: Slight

Figure 8.—An area of Derly-Rader complex, 0 to 1 percent slopes, on stream terraces. Some of the mounds that characterize this map unit are visible.

Composition

• Based on transects, soils of the Derly and Rader series make up 86 percent of this map unit. There is an 80 percent probability that Derly and similar soils make up 59 to 79 percent of the unit and Rader and similar soils make up 21 to 41 percent. Contrasting soils include Robco soils.

Contrasting Soils

• Robco soils, which have a thick, sandy surface layer; on the larger mounds

Land Uses

Major land uses: Pasture and rangeland
Other land use: Recreation

Management Concerns

Pasture

Major limitations:
• Production is low in areas of the Derly soil because of wetness and low natural fertility. The Rader soil produces high yields of grasses.
Minor limitations:
• Plant adaptation on the wetter Derly soil should be considered.

Cropland

Major limitations:
• Crop production is low or moderate in areas of this map unit because of wetness and the undulating topography.

Rangeland

Major limitations:
• Production of native plants is limited on the Derly soil because of wetness but is high in areas of the Rader soil.

Urban development

Major limitations:
• Wetness, the restricted permeability, and the undulating topography are concerns affecting many urban uses.
Minor limitations:
• Structures and roads are affected by the moderate shrink-swell potential in the subsoil.

Interpretive Groups

Land capability classification: Derly—4w; Rader—2w
Ecological site: Derly—Claypan Savannah; Rader—Sandy Loam
Pasture management group: 12

DfC—Desan loamy fine sand, 3 to 8 percent slopes

Setting

Landform: Stream terraces
Landscape position: Shoulders on breaks to flood plains
Slope: Gently sloping or moderately sloping; convex surfaces
Shape of areas: Elongated
Size of areas: 10 to 300 acres
Native vegetation: Post oak savannah

Typical Profile

Surface layer:
0 to 8 inches—light brown, neutral loamy fine sand

Subsurface layer:
8 to 52 inches—very pale brown, moderately acid loamy fine sand

Subsoil:
52 to 80 inches—red, moderately acid sandy clay loam

Soil Properties

Depth class: Very deep
Drainage class: Somewhat excessively drained
Depth to the water table: More than 6 feet
Flooding: None
Runoff: Slow
Permeability: Rapid in the upper part and moderate in the subsoil
Available water capacity: Low
Root zone: Very deep
Natural soil fertility: Low
Shrink-swell potential: Low
Hazard of water erosion: Moderate

Composition

• This map unit consists of about 90 percent Desan soil and similar soils. Contrasting soils make up about 10 percent of the unit.

Contrasting Soils

• Dutek and Silawa soils, which have a thinner surface layer than that of the Desan soil; in landscape positions similar to those of the Desan soil

Land Uses

Major land uses: Rangeland and pasture

Management Concerns

Pasture

Major limitations:
• The low available water capacity and low natural fertility limit the potential forage production.
Minor limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.

Cropland

Major limitations:
• The low available water capacity and low natural fertility limit the potential forage production.

Minor limitations:
• Because of the hazard of erosion, conservation measures are needed.

Rangeland

Major limitations:
• The low available water capacity and natural fertility limit the potential forage production.
Minor limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.

Urban development

Major limitations:
• Disposal of septic tank effluent is a concern because of poor filtration in the upper part of the soil.
Minor limitations:
• Because of the low available water capacity, supplemental water is needed for the maintenance of landscape vegetation.
• The sidewalls of excavations are unstable because of the sandy texture of the soil.

Interpretive Groups

Land capability classification: 3e
Ecological site: Deep Sand
Pasture management group: 10

DmA—Dimebox clay, 0 to 1 percent slopes

Setting

Landform: Uplands
Landscape position: Lower slopes next to streams
Slope: Nearly level; plane or slightly concave
Shape of areas: Round or elongated
Size of areas: 10 to 100 acres
Native vegetation: Tall grass prairie

Typical Profile

Surface layer:
0 to 11 inches—very dark gray, moderately acid clay

Subsoil:
11 to 37 inches—dark gray, slightly alkaline clay
37 to 61 inches—mottled light olive brown, yellowish brown, and gray, moderately alkaline clay

Underlying material:
61 to 80 inches—mottled olive brown, yellowish brown, and gray, moderately alkaline shale that has clay texture

Soil Properties

Depth class: Very deep
Drainage class: Moderately well drained
Depth to the water table: More than 6 feet
Flooding: None
Runoff: Medium
Permeability: Very slow
Available water capacity: High
Root zone: Very deep
Natural soil fertility: High
Shrink-swell potential: Very high
Hazard of water erosion: Slight

Composition

• This map unit consists of about 90 percent Dimebox soil and similar soils. Contrasting soils make up about 10 percent of the unit.

Contrasting Soils

• Crockett and Wilson soils, which have a thin loamy surface layer; in landscape positions similar to those of the Dimebox soil

Land Uses

Major land uses: Pasture and rangeland
Other land use: Cropland

Management Concerns

Pasture

Major limitations:
• No major limitations affect the use of this soil for pasture. High yields of adapted forage grasses can be produced.
Minor limitations:
• The high content of clay limits the uptake of water.

Cropland

Major limitations:
• No major limitations affect the use of this soil as cropland. High yields of adapted crops can be produced.
Minor limitations:
• Surface crusting affects seedling emergence.
• Because of the high content of clay, high-powered equipment is needed.
• Wetness resulting from the restricted runoff rate can cause delays in cultivation. It can also promote seedling problems because it keeps the soil temperature lower than in other areas.

Rangeland

Major limitations:
• No major limitations affect the use of this soil as

rangeland. High yields of native plants can be produced.
Minor limitations:
• The high content of clay limits the uptake of water.

Urban development

Major limitations:
• Structures and roads are affected by the very high shrink-swell potential.
• Disposal of septic tank effluent is a concern because of the restricted permeability.
• Erosion-control measures are needed at construction sites.
Minor limitations:
• The high content of clay is a concern affecting landscaping.

Interpretive Groups

Land capability classification: 2w
Ecological site: Blackland
Pasture management group: 6

DuC—Dutek loamy fine sand, 3 to 8 percent slopes

Setting

Landform: Stream terraces
Landscape position: Shoulders and the upper backslopes
Slope: Gently sloping or moderately sloping; convex
Shape of areas: Elongated or irregular
Size of areas: 10 to 50 acres
Native vegetation: Post oak savannah

Typical Profile

Surface layer:
0 to 6 inches—light brown, neutral loamy fine sand

Subsurface layer:
6 to 35 inches—pink, slightly acid loamy fine sand

Subsoil:
35 to 55 inches—red, slightly acid sandy clay loam
55 to 75 inches—light red, neutral fine sandy loam
75 to 85 inches—reddish yellow, neutral fine sandy loam

Soil Properties

Depth class: Very deep
Drainage class: Well drained
Depth to the water table: More than 6 feet
Flooding: None
Runoff: Slow
Permeability: Rapid in the upper part; moderate in the subsoil
Available water capacity: Moderate
Root zone: Very deep
Natural soil fertility: Medium
Shrink-swell potential: Low
Hazard of water erosion: Moderate or severe

Composition

• This map unit consists of about 90 percent Dutek soil and similar soils. Contrasting soils make up about 10 percent of the unit.

Contrasting Soils

• Desan and Padina soils, which have a sandy surface layer more than 40 inches thick; in landscape positions similar to those of the Dutek soil
• Gredge soils, which have a loamy surface layer less than 10 inches thick; in the less sloping areas

Land Uses

Major land use: Pasture
Other land use: Rangeland

Management Concerns

Pasture

Major limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.
Minor limitations:
• The moderate available water capacity and medium natural fertility limit the potential forage production.

Cropland

Major limitations:
• Because of the hazard of erosion, conservation measures are needed.
Minor limitations:
• The moderate available water capacity and medium natural fertility limit the potential production of most crops.

Rangeland

Major limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.
Minor limitations:
• The moderate available water capacity and medium natural fertility limit the potential forage production.

Urban development

Major limitations:
• Disposal of septic tank effluent is a concern because of poor filtration in the upper part of the soil.

Minor limitations:
• The sidewalls of excavations are unstable because of the sandy texture of the soil.

Interpretive Groups

Land capability classification: 3e
Ecological site: Sandy
Pasture management group: 2

EuB—Eufaula loamy fine sand, 1 to 3 percent slopes

Setting

Landform: Stream terraces
Landscape position: The lower slopes next to flood plains
Slope: Very gently sloping; convex to plane
Shape of areas: Irregular
Size of areas: 10 to 50 acres
Native vegetation: Post oak savannah

Typical Profile

Surface layer:
0 to 15 inches—pale brown, moderately acid loamy fine sand

Subsurface layer:
15 to 42 inches—very pale brown, moderately acid loamy fine sand
42 to 62 inches—very pale brown, moderately acid loamy fine sand that has a few lamellae of red sandy clay loam

Subsoil:
62 to 82 inches—very pale brown, strongly acid loamy fine sand that has very thin layers of strong brown fine sandy loam

Soil Properties

Depth class: Very deep
Drainage class: Somewhat excessively drained
Depth to the water table: More than 6 feet
Flooding: None
Runoff: Very slow
Permeability: Rapid
Available water capacity: Low
Root zone: Very deep
Natural soil fertility: Low
Shrink-swell potential: Low
Hazard of water erosion: Slight

Composition

• This map unit consists of about 90 percent Eufaula soil and similar soils. Contrasting soils make up about 10 percent of the unit.

Contrasting Soils

• Dutek and Robco soils, which have a thinner sandy surface layer than that of the Eufaula soil; in landscape positions similar to those of the Eufaula soil

Land Uses

Major land use: Pasture
Other land use: Rangeland

Management Concerns

Pasture

Major limitations:
• The low available water capacity and low natural fertility limit the potential forage production.

Cropland

Major limitations:
• The low available water capacity and low natural fertility limit the potential production of most crops.

Rangeland

Major limitations:
• The low available water capacity and low natural fertility limit the potential forage production.

Urban development

Major limitations:
• Disposal of septic tank effluent is a concern because of poor filtration.
Minor limitations:
• The sidewalls of excavations are unstable because of the sandy texture of the soil.

Interpretive Groups

Land capability classification: 4s
Ecological site: Deep Sand
Pasture management group: 10

FaB—Falba fine sandy loam, 1 to 3 percent slopes

Setting

Landform: Uplands
Landscape position: Footslopes
Slope: Very gently sloping; plane
Shape of areas: Irregular or elongated
Size of areas: 10 to 100 acres
Native vegetation: Post oak savannah

Typical Profile

Surface layer:
0 to 7 inches—light brownish gray, moderately acid fine sandy loam

Subsoil:
7 to 13 inches—grayish brown, strongly acid clay
13 to 36 inches—gray, slightly acid clay

Underlying material:
36 to 50 inches—very pale brown, tuffaceous sandstone

Soil Properties

Depth class: Moderately deep
Drainage class: Moderately well drained
Depth to the water table: 0.5 foot to 1.5 feet (perched)
Flooding: None
Runoff: Slow
Permeability: Very slow
Available water capacity: Low
Root zone: Moderately deep; restricted by the clayey subsoil
Natural soil fertility: Low
Shrink-swell potential: High in the subsoil
Hazard of water erosion: Severe

Composition

• This map unit consists of about 90 percent Falba soil and similar soils. Contrasting soils make up about 10 percent of the unit.

Contrasting Soils

• Rehburg and Shiro soils, which have a sandy surface layer; in the higher, more convex positions

Land Uses

Major land use: Pasture
Other land use: Rangeland

Management Concerns

Pasture

Major limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.
• The low available water capacity and low natural fertility limit the potential forage production.

Cropland

Major limitations:
• Because of the hazard of erosion, conservation measures are needed.
• The low available water capacity and low natural fertility limit the potential production of most crops.

Rangeland

Major limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.
• The low available water capacity and low natural fertility limit the potential forage production.

Urban development

Major limitations:
• Structures and roads are affected by the high shrink-swell potential in the subsoil.
• Erosion-control measures are needed at construction sites.
• Depth to rock is a limitation affecting road construction.
• Disposal of septic tank effluent is a concern because of the depth to rock, the restricted permeability, and short periods of soil saturation.

Interpretive Groups

Land capability classification: 4e
Ecological site: Claypan Savannah
Pasture management group: 11

Gd—Gladewater clay, frequently flooded

Setting

Landform: Flood plains
Landscape position: Broad backwater areas
Slope: Nearly level; plane or slightly concave
Shape of areas: Elongated
Size of areas: 25 to 1,000 acres
Native vegetation: Hardwood forest of mostly oak and elm and an understory of shortgrass and shrubs

Typical Profile

Surface layer:
0 to 8 inches—dark gray, strongly acid clay

Subsoil:
8 to 53 inches—dark grayish brown, strongly acid clay
53 to 80 inches—dark grayish brown, moderately acid clay

Soil Properties

Depth class: Very deep
Drainage class: Somewhat poorly drained
Depth to the water table: 1.5 to 3.5 feet
Flooding: Frequent; long or very long duration (fig. 9)
Runoff: Very slow
Permeability: Very slow
Available water capacity: High
Root zone: Very deep

Figure 9.—An area of Gladewater clay, frequently flooded, along the Navasota River.

Natural soil fertility: High
Shrink-swell potential: Very high
Hazard of water erosion: None or slight

Composition

• Based on transects, this map unit contains 84 percent soils of the Gladewater series. There is an 80 percent probability that Gladewater and similar soils make up 74 to 94 percent of the unit. Contrasting soils are Sandow and Uhland soils, but neither of these soils makes up as much as 15 percent of the unit.

Contrasting Soils

• The frequently flooded, loamy Sandow and Uhland soils on natural levees and along stream channels

Land Uses

Major land uses: Rangeland and wildlife habitat
Other land use: Pasture

Management Concerns

Pasture

Major limitations:
• Because of poor drainage and the flooding, only well adapted species of grasses should be established.
Minor limitations:
• The high content of clay limits water uptake and can result in droughtiness during the summer.

Cropland

Major limitations:
• This soil is not used for crops because of the frequent flooding and the poor drainage.

Rangeland

Major limitations:
• No major limitations affect the use of this soil as rangeland or for wildlife habitat.

Minor limitations:
• Forage production is limited by the flooding and by poor drainage.

Urban development

Major limitations:
• This soil is not suited to urban development because of the flooding, the poor drainage, and the shrink-swell potential.

Interpretive Groups

Land capability classification: 5w
Ecological site: Clayey Bottomland
Pasture management group: 14

GrC—Gredge fine sandy loam, 1 to 5 percent slopes

Setting

Landform: Stream terraces
Landscape position: Narrow summits and the upper backslopes
Slope: Gently sloping; convex to plane surfaces
Shape of areas: Elongated or irregular
Size of areas: 10 to 100 acres
Native vegetation: Post oak savannah

Typical Profile

Surface layer:
0 to 7 inches—very pale brown, very strongly acid fine sandy loam

Subsoil:
7 to 13 inches—dark red, very strongly acid clay
13 to 21 inches—reddish brown, very strongly acid clay that has light brownish gray mottles
21 to 40 inches—light brownish gray, strongly acid clay loam that has strong brown and red mottles
40 to 57 inches—slightly acid clay loam mottled with colors in shades of yellow and gray
57 to 68 inches—moderately alkaline sandy clay loam mottled with colors in shades of brown and gray

Soil Properties

Depth class: Very deep
Drainage class: Well drained
Depth to the water table: More than 6 feet
Flooding: None
Runoff: Medium
Permeability: Very slow
Available water capacity: Moderate
Root zone: Very deep; restricted by the clay subsoil
Natural soil fertility: Low
Shrink-swell potential: High in the subsoil
Hazard of water erosion: Severe

Composition

• Based on transects, this map unit contains 77 percent soils of the Gredge series. There is a 90 to 100 percent probability that Gredge and similar soils make up 90 to 100 percent of the unit. Contrasting soils are Rader, Silawa, and Zack soils, but neither of these soils makes up as much as 10 percent of the unit.

Contrasting Soils

• Rader soils, which are clayey to a depth of 60 inches or more; in the less sloping areas
• Silawa soils, which have a loamy subsoil; on the convex upper slopes along drainageways
• Zack soils, which are underlain by shale within a depth of 40 inches

Land Uses

Major land use: Pasture
Other land use: Rangeland

Management Concerns

Pasture

Major limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.
• The moderate available water capacity and low natural fertility limit the potential forage production.

Cropland

Major limitations:
• Because of the hazard of erosion, conservation measures are needed.
• The moderate available water capacity and low natural fertility limit the potential production of most crops.

Rangeland

Major limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.
• The moderate available water capacity and low natural fertility limit the potential forage production.

Urban development

Major limitations:
• Structures and roads are affected by the high shrink-swell potential in the subsoil.
• Erosion-control measures are needed at construction sites.
• Disposal of septic tank effluent is a concern because of the restricted permeability.

Interpretive Groups

Land capability classification: 4e
Ecological site: Claypan Savannah
Pasture management group: 7

GrC2—Gredge fine sandy loam, 2 to 5 percent slopes, eroded

Setting

Landform: Stream terraces
Landscape position: Summits and the upper backslopes
Slope: Very gently sloping; slightly convex or plane surfaces
Shape of areas: Irregular or elongated
Size of areas: 8 to 25 acres
Native vegetation: Post oak savannah

Typical Profile

Surface layer:
0 to 3 inches—grayish brown, strongly acid fine sandy loam

Subsoil:
3 to 25 inches—dark red, strongly acid clay that has light brownish gray mottles
25 to 62 inches—mottled brown, gray, and yellow, moderately acid clay loam

Underlying material:
62 to 80 inches—brown, moderately alkaline, stratified loamy sediments

Soil Properties

Depth class: Very deep
Drainage class: Well drained
Depth to the water table: More than 6 feet
Flooding: None
Runoff: Rapid
Permeability: Very slow
Available water capacity: Moderate
Root zone: Very deep; restricted by the clayey subsoil
Natural soil fertility: Low
Shrink-swell potential: High in the subsoil
Hazard of water erosion: Severe

Composition

• This map unit consists of about 90 percent Gredge soil and similar soils. Contrasting soils make up about 10 percent of the unit.

Contrasting Soils

• Zack soils, which are underlain by shale within a depth of 40 inches; in landscape positions similar to those of the Gredge soil

Land Uses

Major land uses: Rangeland and improved pasture
Other land use: Wildlife habitat

Management Concerns

Pasture

Major limitations:
• Water erosion has reduced the overall productivity of this soil. Further erosion is a concern unless an adequate cover of vegetation is maintained.
• The moderate available water capacity and low natural fertility limit the potential forage production.

Cropland

Major limitations:
• Because of the hazard of erosion, conservation measures are needed.
• The moderate available water capacity and low natural fertility limit the potential production of most crops.

Rangeland

Major limitations:
• Additional water erosion is a concern unless an adequate cover of vegetation is maintained.
• The moderate available water capacity and low natural fertility limit the potential forage production and hinder revegetation.

Urban development

Major limitations:
• Structures and roads are affected by the high shrink-swell potential in the subsoil.
• Erosion-control measures are needed at construction sites.
• Disposal of septic tank effluent is a concern because of the restricted permeability.
• The addition of topsoil is necessary if lawn grasses and other landscaping plants are established.

Interpretive Groups

Land capability classification: 4e
Ecological site: Claypan Savannah
Pasture management group: 9

GrD—Gredge fine sandy loam, 5 to 8 percent slopes

Setting

Landform: Stream terraces

Landscape position: Backslopes
Slope: Moderately sloping; convex
Shape of areas: Elongated
Size of areas: 8 to 30 acres
Native vegetation: Post oak savannah

Typical Profile

Surface layer:
0 to 7 inches—brown, very strongly acid fine sandy loam

Subsoil:
7 to 28 inches—dark red, very strongly acid clay that has light brownish gray mottles
28 to 65 inches—mottled brownish gray, yellowish brown, and brownish yellow, slightly acid clay loam

Underlying material:
65 to 75 inches—brown, moderately alkaline, stratified loamy sediments

Soil Properties

Depth class: Very deep
Drainage class: Well drained
Depth to the water table: More than 6 feet
Flooding: None
Runoff: Rapid
Permeability: Very slow
Available water capacity: Moderate
Root zone: Very deep; restricted by the clay subsoil
Natural soil fertility: Low
Shrink-swell potential: High in the subsoil
Hazard of water erosion: Severe

Composition

• Based on transects, this map unit contains 67 percent soils of the Gredge series. There is an 80 percent probability that Gredge and similar soils make up 79 to 99 percent of the unit. Contrasting soils are Silawa and Zack soils, but neither of these soils makes up as much as 10 percent of the unit.

Contrasting Soils

• Silawa soils, which have a loamy subsoil; on the convex upper slopes along drainageways
• Zack soils, which have shale within a depth of 40 inches; in landscape positions similar to those of the Gredge soil

Land Uses

Major land use: Rangeland
Other land use: Pasture

Management Concerns

Pasture

Major limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.
• The moderate available water capacity and low natural fertility limit the potential forage production.

Cropland

Major limitations:
• Because of the hazard of erosion, conservation measures are needed.
• The moderate available water capacity and low natural fertility limit the potential production of most crops.

Rangeland

Major limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.
• The moderate available water capacity and low natural fertility limit the potential forage production.

Urban development

Major limitations:
• Structures and roads are affected by the high shrink-swell potential in the subsoil.
• Erosion-control measures are needed at construction sites.
• Disposal of septic tank effluent is a concern because of the restricted permeability.

Interpretive Groups

Land capability classification: 6e
Ecological site: Claypan Savannah
Pasture management group: 9

GvC—Gredge very gravelly fine sandy loam, 3 to 8 percent slopes

Setting

Landform: Stream terraces
Landscape position: Summits and the upper backslopes
Slope: Gently sloping or moderately sloping; plane surfaces
Shape of areas: Elongated
Size of areas: 10 to 50 acres
Native vegetation: Post oak savannah

Typical Profile

Surface layer:
0 to 8 inches—dark yellowish brown, moderately acid very gravelly fine sandy loam

Subsoil:
8 to 26 inches—red, strongly acid clay that has light brownish gray mottles
26 to 61 inches—red and gray, mottled, moderately acid sandy clay loam

Underlying material:
61 to 70 inches—stratified brown and red, moderately acid sandy clay loam

Soil Properties

Depth class: Very deep
Drainage class: Well drained
Depth to the water table: More than 6 feet
Flooding: None
Runoff: Rapid
Permeability: Very slow
Available water capacity: Moderate
Root zone: Very deep; restricted by the clayey subsoil
Natural soil fertility: Low
Shrink-swell potential: High in the subsoil
Hazard of water erosion: Slight

Composition

• This map unit consists of about 85 percent Gredge soil and similar soils. Contrasting components make up about 15 percent of the unit.

Contrasting Components

• Gredge soils that have a surface layer of fine sandy loam; in landscape positions similar to those of the major Gredge soil
• Eroded areas of Gredge soils; in landscape positions similar to those of the major Gredge soil
• Gravel pits; in landscape positions similar to those of the major Gredge soil

Land Uses

Major land uses: Rangeland and pasture

Management Concerns

Pasture

Major limitations:
• The content of gravel makes it very difficult to establish vegetation on this soil.
Minor limitations:
• The moderate available water capacity and low natural fertility limit the potential forage production.

Cropland

Major limitations:
• This soil is not suited to crops because of the slope and the content of gravel.

Rangeland

Major limitations:
• The moderate available water capacity and low natural fertility limit the potential forage production.

Urban development

Major limitations:
• The content of gravel in the surface layer is a problem affecting urban development.
• Structures and roads are affected by the high shrink-swell potential in the subsoil.
• Erosion-control measures are needed at construction sites.
• Disposal of septic tank effluent is a concern because of the restricted permeability.

Interpretive Groups

Land capability classification: 6s
Ecological site: Gravelly
Pasture management group: 14

GyC—Greenvine clay, 2 to 5 percent slopes

Setting

Landform: Uplands
Landscape position: Backslopes
Slope: Gently sloping; plane or slightly convex
Shape of areas: Irregular
Size of areas: 8 to 50 acres
Native vegetation: Mid and tall grass prairie

Typical Profile

Surface layer:
0 to 7 inches—very dark gray, moderately alkaline clay

Subsoil:
7 to 35 inches—very dark gray, moderately alkaline clay that has grayish brown mottles

Underlying material:
35 to 60 inches—light gray, moderately alkaline, interbedded tuffaceous siltstone and shale

Soil Properties

Depth class: Moderately deep
Drainage class: Well drained
Depth to the water table: More than 6 feet

Flooding: None
Runoff: Medium
Permeability: Very slow
Available water capacity: Low
Root zone: Moderately deep
Natural soil fertility: Medium
Shrink-swell potential: Very high
Hazard of water erosion: Severe

Composition

• This map unit consists of about 90 percent Greenvine soil and similar soils. Contrasting soils make up about 10 percent of the unit.

Contrasting Soils

• Falba and Shalba soils, which have a loamy surface layer; in landscape positions similar to those of the Greenvine soil

Land Uses

Major land use: Pasture
Other land use: Rangeland

Management Concerns

Pasture

Major limitations:
• The low available water capacity limits the potential forage production.
• Water erosion is a concern unless an adequate cover of vegetation is maintained.
Minor limitations:
• The medium natural fertility limits the potential production of forage plants.

Cropland

Major limitations:
• The low available water capacity limits the potential production of most crops.
• Water erosion is a concern unless an adequate cover of vegetation is maintained.
Minor limitations:
• The medium natural fertility limits the potential production of most crops.

Rangeland

Major limitations:
• The low available water capacity limits the potential forage production.
• Water erosion is a concern unless an adequate cover of vegetation is maintained.
Minor limitations:
• The medium natural fertility limits the potential production of forage plants.

Urban development

Major limitations:
• Structures and roads are affected by the very high shrink-swell potential of the soil.
• Disposal of septic tank effluent is a concern because of the restricted permeability.
• Erosion-control measures are needed at construction sites.

Interpretive Groups

Land capability classification: 3e
Ecological site: Blackland
Pasture management group: 11

HbA—Highbank silty clay loam, 0 to 1 percent slopes, rarely flooded

Setting

Landform: Flood plains
Landscape position: Natural levees and main alluvial fans
Slope: Nearly level; plane or slightly convex
Shape of areas: Irregular or elongated
Size of areas: 10 to 200 acres
Native vegetation: Hardwood forest of pecan, elm, hackberry, and cottonwood and an understory of briars, vines, and mid grasses

Typical Profile

Surface layer:
0 to 15 inches—reddish brown, moderately alkaline silty clay loam

Subsoil:
15 to 19 inches—reddish brown, moderately alkaline silty clay
19 to 80 inches—reddish brown, moderately alkaline clay

Soil Properties

Depth class: Very deep
Drainage class: Well drained
Depth to the water table: More than 6 feet
Flooding: Rare
Runoff: Slow
Permeability: Slow
Available water capacity: High
Root zone: Very deep
Natural soil fertility: High
Shrink-swell potential: High
Hazard of water erosion: None

Composition

• This map unit consists of about 90 percent Highbank

soil and similar soils. Contrasting soils make up 10 percent of the unit.

Contrasting Soils

- Weswood and Coarsewood soils, which are loamy throughout; in positions close to levees adjacent to channels
- Ships soils, which are more clayey than the Highbank soil; in the slightly lower backwater positions

Land Uses

Major land use: Cropland
Other land use: Pasture

Management Concerns

Pasture

Major limitations:
- No major limitations affect the use of this soil for pasture. High yields of adapted forage grasses can be produced.

Cropland

Major limitations:
- No major limitations affect the use of this soil as cropland. High yields of adapted crops can be produced.

Minor limitations:
- A plowpan can develop rapidly and can restrict the movement of water and roots.

Rangeland

Major limitations:
- No major limitations affect the use of this soil as rangeland; however, very few areas support native vegetation.

Urban development

Major limitations:
- This soil is not suitable for urban development unless it is protected from flooding.
- Structures and roads are affected by the high shrink-swell potential.
- Disposal of septic tank effluent is a concern because of the restricted permeability.

Interpretive Groups

Land capability classification: 2s
Ecological site: Loamy Bottomland
Pasture management group: 1

Ka—Kaufman clay, frequently flooded

Setting

Landform: Flood plains
Landscape position: Broad backwater areas
Slope: Nearly level; plane or slightly concave
Shape of areas: Elongated
Size of areas: 50 to 300 acres
Native vegetation: Hardwood forest

Typical Profile

Surface layer:
0 to 10 inches—very dark gray, strongly acid clay

Subsoil:
10 to 48 inches—very dark gray, moderately acid clay
48 to 80 inches—dark grayish brown, moderately alkaline clay

Soil Properties

Depth class: Very deep
Drainage class: Moderately well drained
Depth to the water table: 1.5 to 3.5 feet (perched)
Flooding: Frequent; very brief or brief duration
Runoff: Slow
Permeability: Very slow
Available water capacity: High
Root zone: Very deep
Natural soil fertility: High
Shrink-swell potential: Very high
Hazard of water erosion: None

Composition

- Based on transects, this map unit contains 70 percent soils of the Kaufman series. There is an 80 percent probability that Kaufman and similar soils make up 73 to 93 percent of the unit. Contrasting soils are Sandow and Uhland soils, but neither of these soils makes up as much as 15 percent of the unit.

Contrasting Soils

- The loamy Sandow and Uhland soils on natural levees and along stream channels

Land Uses

Major land use: Rangeland
Other land use: Pasture

Management Concerns

Pasture

Major limitations:
- Because of poor drainage and the flooding, only well adapted species of grasses should be established.

Minor limitations:
• The high content of clay limits water uptake and can result in droughtiness during the summer.

Cropland

Major limitations:
• This soil is not used for crops because of the flooding and poor drainage.

Rangeland

Major limitations:
• This soil is well suited to use as rangeland or for wildlife habitat, but production is limited by the flooding and poor drainage.

Urban development

Major limitations:
• This soil is not suited to urban development because of the flooding, poor drainage, and the shrink-swell potential.

Interpretive Groups

Land capability classification: 5w
Ecological site: Clayey Bottomland
Pasture management group: 6

KrD—Koether-Rock outcrop complex, 3 to 12 percent slopes

Setting

Landform: Uplands
Landscape position: Summit breaks
Slope: Gently sloping to strongly sloping
Shape of areas: Elongated
Size of areas: 10 to 50 acres
Native vegetation: Post oak savannah

Typical Profile

Koether

Surface layer:
0 to 12 inches—brown, slightly acid loamy fine sand that is 40 percent sandstone fragments

Underlying material:
12 to 20 inches—indurated sandstone

Soil Properties

Koether

Depth class: Shallow
Drainage class: Somewhat excessively drained
Depth to the water table: More than 6 feet
Flooding: None
Runoff: Rapid
Permeability: Rapid
Available water capacity: Very low
Root zone: Shallow
Natural soil fertility: Low
Shrink-swell potential: Very low
Hazard of water erosion: Slight

Characteristics of the Rock Outcrop

Kind of rock: Strongly cemented, coarse grained sandstone

Composition

• This map unit consists of about 70 to 80 percent Koether soil and similar soils and 15 to 25 percent Rock outcrop. Contrasting soils make up the rest of the unit.

Contrasting Soils

• Falba, Rehburg, Shalba, and Shiro soils, which are deeper than the Koether soil and have a clayey subsoil; in landscape positions similar to those of the Koether soil

Land Uses

Major land use: Rangeland
Other land use: Wildlife habitat

Management Concerns

Pasture

Major limitations:
• The areas of Rock outcrop and the rock fragments in the soil prevent tillage in most areas of this unit, and thus the establishment of pasture grasses is difficult. Some grasses may be established without tillage in areas where the soil is deeper and the Rock outcrop is minimal.

Cropland

Major limitations:
• This soil cannot be cultivated because of the content of rock fragments.

Rangeland

Major limitations:
• The very low available water capacity and low fertility limit the production of forage.

Urban development

Major limitations:
• The depth to rock and the rock fragments in the soil are problems affecting construction, but many areas of this unit have scenic value as overlooks.

Interpretive Groups

Land capability classification: Koether—7s; Rock outcrop—8s
Ecological site: Koether—Claypan Savannah
Pasture management group: Koether—14

KuC—Kurten fine sandy loam, 2 to 5 percent slopes

Setting

Landform: Uplands
Landscape position: Backslopes
Slope: Gently sloping; plane to convex
Shape of areas: Elongated
Size of areas: 10 to 100 acres
Native vegetation: Post oak savannah

Typical Profile

Surface layer:
0 to 4 inches—pale brown, slightly acid fine sandy loam

Subsoil:
4 to 11 inches—red, very strongly acid clay
11 to 33 inches—red, very strongly acid clay that has gray mottles
33 to 45 inches—grayish brown, very strongly acid clay that has red and yellowish brown mottles

Underlying material:
45 to 80 inches—grayish brown, very strongly acid shale that has clay texture and is stratified with loamy materials

Soil Properties

Depth class: Deep to shale
Drainage class: Well drained
Depth to the water table: More than 6 feet
Flooding: None
Runoff: Medium
Permeability: Very slow
Available water capacity: Moderate
Root zone: Very deep; restricted by the clayey subsoil
Natural soil fertility: Medium
Shrink-swell potential: High
Hazard of water erosion: Severe

Composition

• This map unit consists of about 85 percent Kurten soil and similar soils. Contrasting soils make up about 15 percent of the unit.

Contrasting Soils

• Luling soils, which have a clayey surface layer; in landscape positions similar to those of the Kurten soil
• Spiller soils, which have a sandy surface layer; on rounded summits

Land Uses

Major land use: Pasture
Other land use: Rangeland

Management Concerns

Pasture

Major limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.
• The available water capacity limits the potential forage production.
Minor limitations:
• The medium natural fertility limits the potential production of forage plants.

Cropland

Major limitations:
• Because of the hazard of erosion, conservation measures are needed.
• The available water capacity limits the potential production of most crops.
Minor limitations:
• The medium natural fertility limits the potential production of most crops.

Rangeland

Major limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.
• The available water capacity limits the potential forage production.
Minor limitations:
• The medium natural fertility limits the potential production of forage plants.

Urban development

Major limitations:
• Structures and roads are affected by the high shrink-swell potential in the subsoil.
• Erosion-control measures are needed in areas of this soil.
• Disposal of septic tank effluent is a concern because of the restricted permeability.

Interpretive Groups

Land capability classification: 4e
Ecological site: Claypan Savannah
Pasture management group: 9

KuD—Kurten fine sandy loam, 5 to 8 percent slopes

Setting

Landform: Uplands
Landscape position: Backslopes
Slope: Moderately sloping
Shape of areas: Elongated
Size of areas: 8 to 50 acres
Native vegetation: Post oak savannah

Typical Profile

Surface layer:
0 to 3 inches—pale brown, strongly acid fine sandy loam

Subsoil:
3 to 42 inches—brown, strongly acid clay that has gray and red mottles

Underlying material:
42 to 60 inches—pale brown, strongly acid clay

Soil Properties

Depth class: Deep to shale
Drainage class: Well drained
Depth to the water table: More than 6 feet
Flooding: None
Runoff: Rapid
Permeability: Very slow
Available water capacity: Moderate
Root zone: Very deep; restricted by the clayey subsoil
Natural soil fertility: Medium
Shrink-swell potential: High
Hazard of water erosion: Severe

Composition

• This map unit consists of about 85 percent Kurten soil and similar soils. Contrasting soils make up about 15 percent of the unit.

Contrasting Soils

• Luling soils, which have a clayey surface layer; in landscape positions similar to those of the Kurten soil
• Spiller soils, which have a sandy surface layer; on rounded summits

Land Uses

Major land use: Pasture
Other land use: Rangeland

Management Concerns

Pasture

Major limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.
• The moderate available water capacity and low natural fertility limit the potential forage production.

Cropland

Major limitations:
• Because of the hazard of erosion, conservation measures are needed.
• The moderate available water capacity and low natural fertility limit the potential production of most crops.

Rangeland

Major limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.
• The moderate available water capacity and low natural fertility limit the potential forage production.

Urban development

Major limitations:
• Structures and roads are affected by the high shrink-swell potential in the subsoil.
• Erosion-control measures are needed at construction sites.
• Disposal of septic tank effluent is a concern because of the restricted permeability.

Interpretive Groups

Land capability classification: 6e
Ecological site: Claypan Savannah
Pasture management group: 9

LfA—Lufkin fine sandy loam, 0 to 1 percent slopes

Setting

Landform: Stream terraces
Landscape position: Flats on interstream divides
Slope: Nearly level; plane to concave
Shape of areas: Circular or elongated
Size of areas: 8 to 50 acres
Native vegetation: Post oak savannah

Typical Profile

Surface layer:
0 to 6 inches—grayish brown, moderately acid fine sandy loam

Subsurface layer:
6 to 9 inches—light gray, moderately acid loam

Subsoil:
9 to 18 inches—grayish brown, strongly acid clay
18 to 25 inches—light grayish brown, strongly acid clay
25 to 80 inches—gray, neutral clay loam

Soil Properties

Depth class: Very deep
Drainage class: Moderately well drained
Depth to the water table: More than 6 feet (but the soil is saturated in the upper part for short periods after heavy rains)
Flooding: None
Runoff: Very slow
Permeability: Very slow
Available water capacity: Moderate
Root zone: Very deep; restricted by the clayey subsoil
Natural soil fertility: Medium
Shrink-swell potential: Very high in the subsoil
Hazard of water erosion: Slight

Composition

• This map unit consists of about 90 percent Lufkin soil and similar soils. Contrasting soils make up about 10 percent of the unit.

Contrasting Soils

• Falba soils, which are less than 60 inches thick; on side slopes
• Rader and Robco soils, which have a thicker sandy surface layer than that of the Lufkin soil; on mounds

Land Uses

Major land use: Pasture
Other land use: Rangeland

Management Concerns

Pasture

Major limitations:
• The moderate available water capacity and medium natural fertility limit the potential forage production.

Cropland

Major limitations:
• The moderate available water capacity and medium natural fertility limit the potential production of crops.

Rangeland

Major limitations:
• The moderate available water capacity and medium natural fertility limit the potential forage production.

Urban development

Major limitations:
• Structures and roads are affected by the very high shrink-swell potential in the subsoil.
• Disposal of septic tank effluent is a concern because of the restricted permeability.

Interpretive Groups

Land capability classification: 3w
Ecological site: Claypan Savannah
Pasture management group: 7

LuB—Luling clay, 1 to 3 percent slopes

Setting

Landform: Uplands
Landscape position: Broad summits and the upper backslopes
Slope: Very gently sloping; plane or slightly convex
Shape of areas: Circular or elongated
Size of areas: 10 to 300 acres
Native vegetation: Tall grass prairie

Typical Profile

Surface layer:
0 to 5 inches—dark grayish brown, moderately alkaline clay

Subsoil:
5 to 62 inches—grayish brown, moderately alkaline clay that has brown and gray mottles

Underlying material:
62 to 75 inches—mottled gray and brown, moderately alkaline clay

Soil Properties

Depth class: Very deep
Drainage class: Well drained
Depth to the water table: More than 6 feet
Flooding: None
Runoff: Medium
Permeability: Very slow
Available water capacity: High
Root zone: Very deep
Natural soil fertility: High
Shrink-swell potential: Very high
Hazard of water erosion: Moderate

Composition

• Based on transects, this map unit contains 77 percent soils of the Luling series. There is an 80 percent probability that Luling and similar soils make up 75 to 95 percent of the unit. Contrasting soils are

Benchley and Crockett soils, but neither of these soils makes up as much as 10 percent of the unit.

Contrasting Soils

• Benchley and Crockett soils, which have a loamy surface layer; in landscape positions similar to those of the Luling soil

Land Uses

Major land use: Pasture
Other land use: Rangeland

Management Concerns

Pasture

Major limitations:
• No major limitations affect the use of this soil for pasture. High yields of adapted forage grasses can be produced.
Minor limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.

Cropland

Major limitations:
• No major limitations affect the use of this soil as cropland. High yields of adapted crops can be produced.
Minor limitations:
• Because of the hazard of erosion, conservation measures are needed.

Rangeland

Major limitations:
• No major limitations affect the use of this soil as rangeland. High yields of native plants can be produced.
Minor limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.

Urban development

Major limitations:
• Structures and roads are affected by the very high shrink-swell potential in the subsoil.
• Disposal of septic tank effluent is a concern because of the restricted permeability.
• Erosion-control measures are needed on construction sites.
Minor limitations:
• The high content of clay is a concern affecting landscaping.

Interpretive Groups

Land capability classification: 2e
Ecological site: Blackland
Pasture management group: 6

LuD—Luling clay, 5 to 8 percent slopes

Setting

Landform: Uplands
Landscape position: Backslopes
Slope: Moderately sloping; plane or slightly convex
Shape of areas: Circular or elongated
Size of areas: 10 to 100 acres
Native vegetation: Tall grass prairie

Typical Profile

Surface layer:
0 to 11 inches—dark grayish brown, moderately alkaline clay

Subsoil:
11 to 65 inches—grayish brown, moderately alkaline clay that has brown mottles

Underlying material:
65 to 75 inches—mottled gray and brown, moderately alkaline clay

Soil Properties

Depth class: Very deep
Drainage class: Well drained
Depth to the water table: More than 6 feet
Flooding: None
Runoff: Medium
Permeability: Very slow
Available water capacity: High
Root zone: Very deep
Natural soil fertility: High
Shrink-swell potential: Very high
Hazard of water erosion: Severe

Composition

• Based on transects, this map unit contains 83 percent soils of the Luling series. There is an 80 percent probability that Luling and similar soils make up 73 to 93 percent of the unit. Contrasting soils are Crockett and Kurten soils, but neither of these soils makes up as much as 10 percent of the unit.

Contrasting Soils

• Crockett and Kurten soils, which have a loamy surface layer; in landscape positions similar to those of the Luling soil

Land Uses

Major land use: Pasture
Other land use: Rangeland

Management Concerns

Pasture

Major limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.

Cropland

Major limitations:
• Because of the hazard of erosion, conservation measures are needed.

Rangeland

Major limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.

Urban development

Major limitations:
• Structures and roads are affected by the very high shrink-swell potential in the subsoil.
• Disposal of septic tank effluent is a concern because of the restricted permeability.
• Erosion-control measures are needed on construction sites.
Minor limitations:
• The high content of clay is a concern affecting urban development.

Interpretive Groups

Land capability classification: 4e
Ecological site: Blackland
Pasture management group: 6

MaA—Mabank loam, 0 to 1 percent slopes

Setting

Landform: Stream terraces and valley fills
Landscape position: Flats on interstream divides
Slope: Nearly level; slightly concave
Shape of areas: Circular or elongated
Size of areas: 8 to 100 acres
Native vegetation: Open savannah with mid and tall grasses

Typical Profile

Surface layer:
0 to 8 inches—light brownish gray, moderately acid loam

Subsoil:
8 to 10 inches—dark gray, slightly acid clay loam
10 to 24 inches—black, neutral clay
24 to 31 inches—very dark gray, neutral clay
31 to 65 inches—dark grayish brown, neutral clay loam

Underlying material:
65 to 80 inches—dark grayish brown, neutral clay loam that has dark brown, yellow, and red mottles

Soil Properties

Depth class: Very deep
Drainage class: Moderately well drained
Depth to the water table: More than 6 feet (but the soil is saturated in the upper part for short periods after heavy rains)
Flooding: None
Runoff: Very slow
Permeability: Very slow
Available water capacity: Moderate
Root zone: Very deep; restricted by the clayey subsoil
Natural soil fertility: Low
Shrink-swell potential: High in the subsoil
Hazard of water erosion: Slight or moderate

Composition

• This map unit consists of about 90 percent Mabank soil and similar soils. Contrasting soils make up about 10 percent of the unit.

Contrasting Soils

• Boonville and Rader soils, which have a thicker loamy surface layer than that of the Mabank soil; in landscape positions similar to those of the Mabank soil
• Burleson soils, which have a surface layer of clay; in landscape positions similar to those of the Mabank soil

Land Uses

Major land uses: Rangeland and pasture

Management Concerns

Pasture

Major limitations:
• The limited available water capacity results in low production during dry seasons.
Minor limitations:
• The low natural fertility results in low production unless fertilizer is applied.
• Water erosion is a concern unless an adequate cover of vegetation is maintained.

Cropland

Major limitations:
• The limited available water capacity results in low production during dry seasons.

Minor limitations:
• Because of the hazard of erosion, conservation measures are needed.
• Low natural fertility results in low production unless fertilizer is applied.

Rangeland

Major limitations:
• The limited available water capacity results in low production during dry seasons.
Minor limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.
• Low natural fertility results in low production.

Urban development

Major limitations:
• Structures and roads are affected by the high shrink-swell potential in the subsoil.
• Erosion-control measures are needed at construction sites.
• Disposal of septic tank effluent is a concern because of the restricted permeability.

Interpretive Groups

Land capability classification: 3w
Ecological site: Claypan Prairie
Pasture management group: 7

MrA—Mabank-Rader complex, 0 to 1 percent slopes

Setting

Landform: Stream terraces and valley fills
Landscape position: Flats along streams and interstream divides
Slope: Nearly level; low mounds
Shape of areas: Elongated
Size of areas: 50 to 400 acres
Native vegetation: Open savannah with mid grasses

Typical Profile

Mabank

Surface layer:
0 to 5 inches—dark brown, slightly acid loam

Subsoil:
5 to 16 inches—very dark gray, slightly alkaline clay
16 to 48 inches—grayish brown, moderately alkaline clay loam
48 to 65 inches—light grayish brown, moderately alkaline clay loam

Underlying material:
65 to 70 inches—mottled gray and yellow, alkaline clay loam

Rader

Surface layer:
0 to 17 inches—brown, slightly acid fine sandy loam

Subsurface layer:
17 to 23 inches—brown, neutral loam

Subsoil:
23 to 27 inches—mottled gray and brownish yellow, slightly acid sandy clay loam
27 to 35 inches—dark gray, slightly alkaline sandy clay
35 to 70 inches—light gray, slightly alkaline sandy clay loam that has brown and red mottles

Soil Properties

Depth class: Very deep
Drainage class: Moderately well drained
Depth to the water table: Mabank—more than 6 feet (but the soil may be saturated in the surface layer for short periods after heavy rains); Rader—2 to 4 feet (perched)
Flooding: None
Runoff: Mabank—very slow; Rader—slow
Permeability: Very slow
Available water capacity: Moderate
Root zone: Very deep; restricted by the clayey subsoil
Natural soil fertility: Low or medium
Shrink-swell potential: High in the subsoil
Hazard of water erosion: Slight

Composition

• This map unit consists of about 55 to 65 percent Mabank soil and similar soils and 25 to 35 percent Rader and similar soils. Contrasting soils make up the rest of the unit.

Contrasting Soils

• Derly soils, which have a gray subsoil; in depressions
• Robco soils, which have a thick, sandy surface layer; on the larger mounds

Land Uses

Major land uses: Rangeland and pasture

Management Concerns

Pasture

Major limitations:
• The limited available water capacity of the

Mabank soil results in low production during dry seasons.
• The low natural fertility of the Mabank soil results in low production unless fertilizer is applied.
Minor limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.

Cropland

Major limitations:
• The limited available water capacity of the Mabank soil results in low production during dry seasons.
• The low natural fertility of the Mabank soil results in low production unless fertilizer is applied.
Minor limitations:
• Because of the hazard of erosion, conservation measures are needed.
• Seasonal wetness is a concern in most years.

Rangeland

Major limitations:
• The limited available water capacity of the Mabank soil results in low production during dry seasons.
• The low natural fertility of the Mabank soil results in low production.
Minor limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.

Urban development

Major limitations:
• Structures and roads are affected by the high shrink-swell potential in the subsoil.
• Erosion-control measures are needed at construction sites.
• Disposal of septic tank effluent is a concern because of the restricted permeability and the short periods of soil saturation.

Interpretive Groups

Land capability classification: Mabank—3w; Rader—2w
Ecological site: Mabank—Claypan Prairie; Rader—Sandy Loam
Pasture management group: 7

NvB—Navasan loamy fine sand, 0 to 3 percent slopes

Setting

Landform: Stream terraces
Landscape position: Low sandy ridges and knolls
Slope: Nearly level and very gently sloping
Shape of areas: Circular or elongated
Size of areas: 15 to 200 acres
Native vegetation: Post oak savannah

Typical Profile

Surface layer:
0 to 4 inches—brown, strongly acid loamy fine sand

Subsurface layer:
4 to 51 inches—very pale brown, moderately acid or strongly acid loamy fine sand

Subsoil:
51 to 66 inches—brown, strongly acid fine sandy loam that has yellowish brown mottles
66 to 90 inches—light gray, strongly acid sandy clay loam that has gray, yellow, and brown mottles

Soil Properties

Depth class: Very deep
Drainage class: Moderately well drained
Depth to the water table: 4 to 6 feet (perched)
Flooding: None
Runoff: Slow
Permeability: Moderately slow
Available water capacity: Low
Root zone: Very deep
Natural soil fertility: Low
Shrink-swell potential: Very low
Hazard of water erosion: Slight

Composition

• This map unit consists of about 90 percent Navasan soil and similar soils. Contrasting soils make up about 10 percent of the unit.

Contrasting Soils

• Dutek and Desan soils, which have a subsoil within a depth of 80 inches; in the slightly more sloping positions
• The frequently flooded Sandow soils in small, linear areas on flood plains

Land Uses

Major land uses: Rangeland and pasture

Management Concerns

Pasture

Major limitations:
• The low natural fertility results in low production unless fertilizer is applied.
• The low available water capacity results in low production, especially during dry seasons.

Minor limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.

Cropland

Major limitations:
• The low natural fertility results in low production unless fertilizer is applied.
• The low available water capacity results in low production, especially during dry seasons.
Minor limitations:
• Because of the hazard of erosion, conservation measures are needed.

Rangeland

Major limitations:
• The low natural fertility results in low production.
• The low available water capacity results in low production, especially during dry seasons.
Minor limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.

Urban development

Major limitations:
• Disposal of septic tank effluent is a concern because of poor filtration in the upper part of the soil and restricted permeability in the lower part.
Minor limitations:
• The sidewalls of excavations are unstable because of the sandy texture of the soil.

Interpretive Groups

Land capability classification: 3s
Ecological site: Deep Sand
Pasture management group: 2

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

Setting

Landform: Uplands and terraces
Landscape position: Summits and the upper backslopes adjacent to streams
Slope: Gently sloping
Shape of areas: Circular or elongated
Size of areas: 8 to 100 acres
Native vegetation: Post oak savannah

Typical Profile

Surface layer:
0 to 8 inches—light yellowish brown, moderately acid loamy fine sand

Subsurface layer:
8 to 62 inches—very pale brown, moderately acid loamy fine sand

Subsoil:
62 to 71 inches—yellowish brown, strongly acid fine sandy loam and loamy fine sand
71 to 82 inches—mottled red, yellowish red, and light gray, strongly acid sandy clay loam

Soil Properties

Depth class: Very deep
Drainage class: Well drained
Depth to the water table: More than 6 feet
Flooding: None
Runoff: Slow
Permeability: Rapid in the upper part; moderate in the subsoil
Available water capacity: Low
Root zone: Very deep
Natural soil fertility: Low
Shrink-swell potential: Very low
Hazard of water erosion: Slight or moderate

Composition

• Based on transects, this map unit contains 43 percent soils of the Padina series. There is an 80 percent probability that Padina and similar soils make up 68 to 88 percent of the unit. Contrasting soils are Derly, Eufaula, Robco, and Silawa soils, but neither of these soils makes up as much as 15 percent of the unit.

Contrasting Soils

• Derly soils, which have a gray, clayey subsoil; in small depressions
• Eufaula soils, which have a discontinuous loamy subsoil; in landscape positions similar to those of the Padina soil
• Robco and Silawa soils, which have a sandy surface layer less than 40 inches thick; in landscape positions similar to those of the Padina soil

Land Uses

Major land uses: Rangeland and pasture

Management Concerns

Pasture

Major limitations:
• The low natural fertility results in low production unless fertilizer is applied.
• The low available water capacity results in low production, especially during dry seasons.

Minor limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.

Cropland

Major limitations:
• The low natural fertility results in low production unless fertilizer is applied.
• The low available water capacity results in low production, especially during dry seasons.
Minor limitations:
• Because of the hazard of erosion, conservation measures are needed.

Rangeland

Major limitations:
• The low natural fertility results in low production.
• The low available water capacity results in low production, especially during dry seasons.
Minor limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.

Urban development

Major limitations:
• Disposal of septic tank effluent is a concern because of poor filtration in the upper part of the soil.
Minor limitations:
• The sidewalls of excavations are unstable because of the sandy texture of the soil.

Interpretive Groups

Land capability classification: 3e
Ecological site: Deep Sand
Pasture management group: 2

Pt—Pits

General Description

• This map units consists of areas from which soils and the underlying strata have been removed. The material that was removed was used as a source of gravel, sand, or clay for road bases or embankments. Individual areas of this unit range in depth from a few feet to more than 10 feet. In the shallower pits, the subsoil has not been excessively disturbed. These pits were used mostly as sources of surface gravel. The deeper pits were used as borrow pits for clay. They have steep vertical walls and are difficult to reclaim. Many of the pits hold water throughout the year. Some of the large pits are shown on the soil maps as bodies of water. The land capability classification of this map unit is 8s.

RaB—Rader fine sandy loam, 0 to 2 percent slopes

Setting

Landform: Stream terraces and valley fills
Landscape position: Broad flats and toeslopes
Slope: Nearly level and very gently sloping
Shape of areas: Elongated or circular
Size of areas: 10 to 30 acres
Native vegetation: Post oak savannah

Typical Profile

Surface layer:
0 to 11 inches—brown, slightly acid fine sandy loam

Subsurface layer:
11 to 17 inches—very pale brown, moderately acid fine sandy loam

Subsoil:
17 to 28 inches—yellowish brown, strongly acid sandy clay loam that has light yellowish brown and red mottles
28 to 35 inches—yellowish brown, strongly acid clay that has grayish brown and red mottles
35 to 48 inches—yellowish brown, slightly acid clay loam that has light gray and red mottles
48 to 65 inches—gray, slightly alkaline clay that has yellowish brown and red mottles

Soil Properties

Depth class: Very deep
Drainage class: Moderately well drained
Depth to the water table: 2 to 4 feet (perched)
Flooding: None
Runoff: Slow
Permeability: Very slow
Available water capacity: Moderate
Root zone: Very deep
Natural soil fertility: Medium
Shrink-swell potential: High in the subsoil
Hazard of water erosion: Slight

Composition

• Based on transects, this map unit contains 94 percent soils of the Rader series. There is an 80 percent probability that Rader and similar soils make up 90 to 100 percent of the unit. Contrasting soils are Derly and Robco soils, but neither of these soils makes up as much as 10 percent of the unit.

Contrasting Soils

• Derly soils, which have a gray, clayey subsoil and a thin, loamy surface layer; in small depressions

• Robco soils, which have a sandy surface layer 20 to 40 inches thick; in landscape positions similar to those of the Rader soil

Land Uses

Major land uses: Rangeland and pasture
Other land use: Cropland

Management Concerns

Pasture

Major limitations:
• The available water capacity limits forage production, especially during dry seasons.
Minor limitations:
• The medium fertility limits the potential for forage production.

Cropland

Major limitations:
• The available water capacity limits production, especially during dry seasons.
Minor limitations:
• Seasonal wetness is a concern in most years.
• The medium fertility limits the potential for crop production.

Rangeland

Major limitations:
• The available water capacity limits forage production, especially during dry seasons.
Minor limitations:
• The medium fertility limits the potential for forage production.

Urban development

Major limitations:
• Structures and roads are affected by the high shrink-swell potential in the subsoil.
• Erosion-control measures are needed at construction sites.
• Disposal of septic tank effluent is a concern because of the restricted permeability and short periods of soil saturation.

Interpretive Groups

Land capability classification: 3e
Ecological site: Sandy Loam
Pasture management group: 4

RbA—Rader-Tabor complex, 1 to 3 percent slopes

Setting

Landform: Stream terraces and valley fills
Landscape position: Rader—mounds; Tabor—intermounds
Slope: Very gently sloping
Shape of areas: Irregular or elongated
Size of areas: 20 to 100 acres
Native vegetation: Post oak savannah

Typical Profile

Rader

Surface layer:
0 to 11 inches—brownish gray, strongly acid fine sandy loam

Subsurface layer:
11 to 28 inches—light brownish gray, strongly acid fine sandy loam

Subsoil:
28 to 35 inches—mottled grayish brown and brownish yellow, strongly acid sandy clay loam
35 to 65 inches—mottled grayish brown and brownish yellow, strongly acid clay loam

Tabor

Surface layer:
0 to 3 inches—dark grayish brown, moderately acid fine sandy loam

Subsurface layer:
3 to 12 inches—light brownish gray, moderately acid fine sandy loam

Subsoil:
12 to 29 inches—mottled brownish gray, yellowish red, yellowish brown, and brownish yellow, moderately acid clay
29 to 62 inches—mottled yellowish brown and brown, moderately alkaline clay

Underlying material:
62 to 70 inches—mottled light gray, light yellowish brown, and yellowish red, moderately alkaline clay

Soil Properties

Depth class: Very deep
Drainage class: Moderately well drained
Depth to the water table: Rader—2 to 4 feet (perched);

Tabor—more than 6 feet (but the soil may be saturated at a depth of 0.5 foot to 1.5 feet for short periods after heavy rains)
Flooding: None
Runoff: Slow
Permeability: Very slow
Available water capacity: Moderate
Root zone: Very deep
Natural soil fertility: Medium
Shrink-swell potential: High
Hazard of water erosion: Rader—moderate; Tabor—severe

Composition

• Based on transects, this map unit contains 75 percent soils of the Rader and Tabor series. There is an 80 percent probability that Rader and similar soils make up 35 to 55 percent of the unit and Tabor and similar soils make up 20 to 40 percent. Contrasting soils are Lufkin and Robco soils, but neither of these soils makes up as much as 25 percent of the unit.

Contrasting Soils

• Lufkin soils, which have a gray, clayey subsoil; on intermound flats
• Robco soils, which have a thick, sandy surface layer; on large mounds

Land Uses

Major land uses: Rangeland and pasture

Management Concerns

Pasture

Major limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.
• The available water capacity limits forage production, especially during dry seasons.
Minor limitations:
• The medium fertility limits the potential for forage production.
• Additions of lime may be needed because of the acid conditions.

Cropland

Major limitations:
• The available water capacity can limit production, especially during dry seasons.
• Because of the hazard of erosion, conservation measures are needed.
Minor limitations:
• Seasonal wetness is a concern in most years.
• The medium fertility limits the potential for crop production. Moderate or high production can be expected if fertilizer is applied.

Rangeland

Major limitations:
• The available water capacity limits forage production, especially during dry seasons.
• Water erosion is a concern unless an adequate cover of vegetation is maintained.
Minor limitations:
• The medium fertility limits the potential for forage production.

Urban development

Major limitations:
• Structures and roads are affected by the high shrink-swell potential in the subsoil.
• Erosion-control measures are needed at construction sites.
• Disposal of septic tank effluent is a concern because of the restricted permeability and the short periods of soil saturation.

Interpretive Groups

Land capability classification: Rader—3e; Tabor—3e
Ecological site: Rader—Sandy Loam; Tabor—Sandy Loam
Pasture management group: 4

ReC—Rehburg loamy fine sand, 1 to 5 percent slopes

Setting

Landform: Uplands
Landscape position: Summits and shoulders
Slope: Gently sloping
Shape of areas: Circular or elongated
Size of areas: 10 to 50 acres
Native vegetation: Post oak savannah

Typical Profile

Surface layer:
0 to 12 inches—brown, moderately acid loamy fine sand

Subsurface layer:
12 to 24 inches—pinkish gray, moderately acid loamy fine sand

Subsoil:
24 to 35 inches—grayish brown, strongly acid clay loam that has grayish brown mottles
35 to 46 inches—light brownish gray, strongly acid

sandy clay loam that has light brownish gray and brownish yellow mottles

Underlying material:
46 to 60 inches—very pale brown, strongly acid, stratified tuffaceous clay loam and sandstone

Soil Properties

Depth class: Deep
Drainage class: Moderately well drained
Depth to the water table: 3 to 4 feet (perched)
Flooding: None
Runoff: Slow
Permeability: Rapid in the upper part; very slow in the subsoil
Available water capacity: Low
Root zone: Deep
Natural soil fertility: Low
Shrink-swell potential: Moderate
Hazard of water erosion: Moderate or severe

Composition

• This map unit consists of about 85 percent Rehburg soil and similar soils. Contrasting soils make up about 15 percent of the unit.

Contrasting Soils

• Koether soils, which are shallow or very shallow to sandstone; on slope breaks
• Shiro soils, which have a thin, sandy surface layer; on small ridges and hilltops

Land Uses

Major land uses: Rangeland and pasture

Management Concerns

Pasture

Major limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.
• The low natural fertility limits production unless fertilizer is applied.
• The low available water capacity results in low production, especially during dry seasons.

Cropland

Major limitations:
• Because of the hazard of erosion, conservation measures are needed.
• The low natural fertility limits production unless fertilizer is applied.
• The low available water capacity results in low production, especially during dry seasons.

Rangeland

Major limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.
• The low natural fertility limits production.
• The low available water capacity results in low production, especially during dry seasons.

Urban development

Major limitations:
• Disposal of septic tank effluent is a concern because of the restricted permeability and short periods of saturation.
Minor limitations:
• Structures and roads are affected by the moderate shrink-swell potential in the subsoil.

Interpretive Groups

Land capability classification: 3e
Ecological site: Sandy
Pasture management group: 8

RoB—Robco loamy fine sand, 1 to 3 percent slopes

Setting

Landform: Uplands and terraces
Landscape position: Summits and shoulders
Slope: Very gently sloping
Shape of areas: Circular or elongated
Size of areas: 10 to 50 acres
Native vegetation: Post oak savannah

Typical Profile

Surface layer:
0 to 15 inches—brown, slightly acid loamy fine sand

Subsurface layer:
15 to 28 inches—pale brown, moderately acid loamy fine sand

Subsoil:
28 to 33 inches—brownish yellow, moderately acid sandy clay loam and light gray loamy fine sand
33 to 47 inches—light gray, strongly acid sandy clay loam that has red and yellowish brown mottles
47 to 65 inches—light gray, strongly acid clay loam that has red mottles
65 to 82 inches—red, strongly acid sandy clay loam that has light gray mottles

Soil Properties

Depth class: Very deep

Drainage class: Moderately well drained
Depth to the water table: 1.5 to 3.5 feet (perched)
Flooding: None
Runoff: Slow
Permeability: Rapid in the upper part; slow in the subsoil
Available water capacity: Moderate
Root zone: Very deep
Natural soil fertility: Low
Shrink-swell potential: High
Hazard of water erosion: Slight or moderate

Composition

• Based on transects, this map unit contains 44 percent soils of the Robco series. There is an 80 percent probability that Robco and similar soils make up 80 to 100 percent of the unit. Contrasting soils are Padina, Rader, and Tabor soils, but neither of these soils makes up as much as 10 percent of the unit.

Contrasting Soils

• Padina soils, which have a sandy surface layer 40 to 80 inches thick; in landscape positions similar to those of the Robco soil
• Rader and Tabor soils, which have a thinner surface layer than that of the Robco soil; in plane or slightly concave positions

Land Uses

Major land uses: Rangeland and pasture

Management Concerns

Pasture

Major limitations:
• The low natural fertility results in low production unless fertilizer is applied.
Minor limitations:
• The available water capacity limits forage production, especially during dry seasons.
• Water erosion is a concern unless an adequate cover of vegetation is maintained.

Cropland

Major limitations:
• The low natural fertility limits production unless fertilizer is applied.
Minor limitations:
• Because of the hazard of erosion, conservation measures are needed.
• The limited available water capacity results in low production, especially during dry seasons.

Rangeland

Major limitations:
• The low natural fertility limits production.
Minor limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.
• The available water capacity limits forage production, especially during dry seasons.

Urban development

Major limitations:
• Structures and roads are affected by the high shrink-swell potential in the subsoil.
• Erosion-control structures are needed on construction sites.
• Disposal of septic tank effluent is a concern because of the restricted permeability in the subsoil and short periods of soil saturation.

Interpretive Groups

Land capability classification: 2e
Ecological site: Sandy
Pasture management group: 2

Rr—Roetex clay, frequently flooded

Setting

Landform: Flood plains
Landscape position: Depressional backwater areas
Slope: Nearly level
Shape of areas: Elongated
Size of areas: 10 to 100 acres
Native vegetation: Hardwood forest of elm, willow, pecan, and oak and an understory of wildrye, switchgrass, and sedges

Typical Profile

Surface layer:
0 to 15 inches—dark brown, moderately alkaline clay

Subsurface layer:
15 to 23 inches—dark brown, moderately alkaline clay that has reddish brown mottles

Subsoil:
23 to 56 inches—reddish brown, moderately alkaline clay that has brown and dark gray mottles
56 to 80 inches—reddish brown, moderately alkaline clay that has brown mottles

Soil Properties

Depth class: Very deep

Drainage class: Somewhat poorly drained
Seasonal high water table: 0.5 foot above to 2.0 feet below the surface
Flooding: Frequent; long or very long duration
Runoff: Very slow
Permeability: Very slow
Available water capacity: High
Root zone: Very deep
Natural soil fertility: High
Shrink-swell potential: Very high
Hazard of water erosion: Slight

Composition

• This map unit consists of about 90 percent Roetex soil and similar soils. Contrasting soils make up 10 percent of the unit.

Contrasting Soils

• Ships soils, which are better drained than the Roetex soil and are subject to only rare flooding; in the slightly higher positions
• Weswood soils, which are loamy throughout; in the higher positions

Land Uses

Major land uses: Rangeland and wildlife habitat
Other land use: Pasture

Management Concerns

Pasture

Major limitations:
• This soil is suited to pasture if species that are tolerant of wet conditions are selected.

Cropland

Major limitations:
• This soil is not suited to use as cropland because of the flooding and wetness.

Rangeland

Major limitations:
• Good production of native plants is possible in areas of this soil, but grazing is limited by the wetness.

Urban development

Major limitations:
• This soil is not suited to urban development because of the flooding, the wetness, and the shrink-swell potential.

Interpretive Groups

Land capability classification: 7w
Ecological site: Clayey Bottomland
Pasture management group: 14

RsC—Rosanky fine sandy loam, 2 to 5 percent slopes

Setting

Landform: Uplands
Landscape position: Narrow summits and shoulders
Slope: Gently sloping
Shape of areas: Elongated
Size of areas: 8 to 20 acres
Native vegetation: Post oak savannah

Typical Profile

Surface layer:
0 to 8 inches—brown, moderately acid fine sandy loam

Subsoil:
8 to 25 inches—red, moderately acid clay
25 to 41 inches—red, strongly acid and very strongly acid clay that has brownish mottles
41 to 48 inches—red, very strongly acid sandy clay loam that has brownish mottles

Underlying material:
48 to 65 inches—dark reddish brown, very strongly acid clay loam that has strata of light gray and reddish yellow
65 to 80 inches—weakly cemented sandstone interbedded with gray clay

Soil Properties

Depth class: Very deep
Drainage class: Well drained
Depth to the water table: More than 6 feet
Flooding: None
Runoff: Moderate
Permeability: Moderately slow
Available water capacity: Moderate
Root zone: Deep
Natural soil fertility: Medium
Shrink-swell potential: Moderate
Hazard of water erosion: Moderate or severe

Composition

• This map unit consists of about 85 percent Rosanky soil and similar soils. Contrasting soils make up 15 percent of the unit.

Contrasting Soils

• Axtell and Gredge soils, which are less acid than the Rosanky soil and have a mottled subsoil; in positions on stream terraces similar to those of the Rosanky soil

Land Uses

Major land uses: Rangeland and pasture

Management Concerns

Pasture

Major limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.
Minor limitations:
• The available water capacity limits forage production, especially during dry seasons.
• The medium natural fertility results in low production unless fertilizer is applied.

Cropland

Major limitations:
• Because of the hazard of erosion, conservation measures are needed.
Minor limitations:
• The available water capacity limits production, especially during dry seasons.
• The medium natural fertility results in low production unless fertilizer is applied.

Rangeland

Major limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.
Minor limitations:
• The available water capacity limits forage production, especially during dry seasons.
• The medium natural fertility results in low production.

Urban development

Major limitations:
• Erosion-control measures are needed at construction sites.
• Disposal of septic tank effluent is a concern because of the restricted permeability.
Minor limitations:
• Structures and roads are affected by the moderate shrink-swell potential in the subsoil.

Interpretive Groups

Land capability classification: 3e
Ecological site: Sandy Loam
Pasture management group: 5

RsD—Rosanky fine sandy loam, 5 to 8 percent slopes

Setting

Landform: Uplands
Landscape position: Shoulders and the upper backslopes
Slope: Moderately sloping
Shape of areas: Elongated
Size of areas: 10 to 30 acres
Native vegetation: Post oak savannah

Typical Profile

Surface layer:
0 to 6 inches—brown, moderately acid fine sandy loam

Subsoil:
6 to 58 inches—dark reddish brown, strongly acid clay

Underlying material:
58 to 70 inches—weakly cemented sandstone and interbedded shale

Soil Properties

Depth class: Very deep
Drainage class: Well drained
Depth to the water table: More than 6 feet
Flooding: None
Runoff: Rapid
Permeability: Moderately slow
Available water capacity: Moderate
Root zone: Deep
Natural soil fertility: Low or medium
Shrink-swell potential: Moderate
Hazard of water erosion: Severe

Composition

• This map unit consists of about 85 percent Rosanky soil and similar soils. Contrasting soils make up 15 percent of the unit.

Contrasting Soils

• Axtell and Gredge soils, which are less acid than the Rosanky soil and have a mottled subsoil; in positions on stream terraces similar to those of the Rosanky soil

Land Uses

Major land uses: Rangeland and pasture

Management Concerns

Pasture

Major limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.
• The limited natural fertility results in low production unless fertilizer is applied.
Minor limitations:
• The available water capacity limits forage production, especially during dry seasons.

Cropland

Major limitations:
• Because of the hazard of erosion, conservation measures are needed.
• The limited natural fertility results in low production unless fertilizer is applied.
Minor limitations:
• The available water capacity limits production, especially during dry seasons.

Rangeland

Major limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.
• The limited natural fertility results in low production.
Minor limitations:
• The available water capacity limits forage production, especially during dry seasons.

Urban development

Major limitations:
• Erosion-control measures are needed at construction sites.
• Disposal of septic tank effluent is a concern because of the restricted permeability.
Minor limitations:
• Structures and roads are affected by the moderate shrink-swell potential in the subsoil.

Interpretive Groups

Land capability classification: 4e
Ecological site: Sandy Loam
Pasture management group: 5

RtC—Rosanky soils, graded, 1 to 5 percent slopes

Setting

Landform: Uplands
Landscape position: Shoulders and the upper backslopes
Slope: Gently sloping
Shape of areas: Elongated or circular
Size of areas: 8 to 50 acres
Native vegetation: Post oak savannah

Typical Profile

Surface layer:
0 to 2 inches—brown, moderately acid loam

Subsoil:
2 to 24 inches—red, moderately acid clay
24 to 65 inches—red, very strongly acid clay that has pale brown mottles

Underlying material:
65 to 80 inches—slightly cemented sandstone

Soil Properties

Depth class: Very deep
Drainage class: Well drained
Depth to the water table: More than 6 feet
Flooding: None
Runoff: Medium
Permeability: Moderately slow
Available water capacity: Low
Root zone: Deep
Natural soil fertility: Low
Shrink-swell potential: Moderate
Hazard of water erosion: Severe

Composition

• This map unit consists of about 85 percent Rosanky and similar soils. Contrasting components make up about 15 percent of the unit.

Contrasting Components

• Axtell and Gredge soils, which are less acid than the Rosanky soils and have a mottled subsoil; in positions on stream terraces similar to those of the Rosanky soils
• Small, shallow pits

Land Uses

Major land uses: Rangeland and pasture

Management Concerns

Pasture

Major limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.
• The low available water capacity limits production, especially during dry seasons.
• The limited natural fertility results in low production unless fertilizer is applied.

Cropland

Major limitations:
• These soils are not suited to cultivated crops because most of the surface soil has been removed. Also, rock fragments on the surface restrict cultivation.

Rangeland

Major limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.

• The low available water capacity limits production, especially during dry seasons.
• The limited natural fertility results in low production.

Urban development

Major limitations:
• Erosion-control measures are needed at construction sites.
• Disposal of septic tank effluent is a concern because of the restricted permeability.
Minor limitations:
• Structures and roads are affected by the moderate shrink-swell potential in the subsoil.

Interpretive Groups

Land capability classification: 6s
Ecological site: Sandy Loam
Pasture management group: 14

RuC—Rosanky-Urban land complex, 2 to 5 percent slopes

Setting

Landform: Uplands
Landscape position: Shoulders and the upper backslopes
Slope: Gently sloping
Shape of areas: Elongated
Size of areas: 8 to 100 acres
Native vegetation: Post oak savannah

Typical Profile

Rosanky

Surface layer:
0 to 8 inches—brown, moderately acid fine sandy loam

Subsoil:
8 to 25 inches—red, moderately acid clay
25 to 35 inches—red, strongly acid clay
35 to 65 inches—red, very strongly acid clay that has pale brown mottles

Underlying material:
65 to 80 inches—weakly cemented sandstone

Soil Properties

Rosanky

Depth class: Very deep
Drainage class: Well drained
Depth to the water table: More than 6 feet
Flooding: None
Runoff: Medium
Permeability: Moderately slow
Available water capacity: Moderate
Root zone: Deep
Natural soil fertility: Medium
Shrink-swell potential: Moderate
Hazard of water erosion: Moderate or severe

Composition

• This map unit consists of about 50 to 60 percent Rosanky soil and 30 to 40 percent Urban land. Contrasting soils make up the rest of the unit.

Contrasting Soils

• Axtell and Gredge soils, which are less acid than the Rosanky soil and have a mottled subsoil; in positions on stream terraces similar to those of the Rosanky soil

Land Uses

Major land use: Urban development
Other land use: Idle land

Management Concerns

Pasture

Major limitations:
• This unit is not suitable for use as pasture because of the urban development.

Cropland

Major limitations:
• This unit is not suitable for crops because of the urban development.

Rangeland

Major limitations:
• This unit is not suitable for use as rangeland because of the urban development.

Urban development

Major limitations:
• Erosion-control measures are needed at construction sites.
• Disposal of septic tank effluent is a concern because of the restricted permeability.
Minor limitations:
• Structures and roads are affected by the moderate shrink-swell potential in the subsoil.

Interpretive Groups

Land capability classification: None assigned
Ecological site: None assigned
Pasture management group: None assigned

Sa—Sandow loam, frequently flooded

Setting

Landform: Flood plains along local streams
Landscape position: Flats and natural levees
Slope: Nearly level
Shape of areas: Elongated
Size of areas: 10 to 500 acres
Native vegetation: Hardwood forest of elm, ash, pecan, and oak and an understory of mid and tall grasses

Typical Profile

Surface layer:
0 to 6 inches—grayish brown, slightly acid loam

Subsurface layer:
6 to 15 inches—grayish brown, slightly acid loam

Subsoil:
15 to 20 inches—pale brown, slightly acid fine sandy loam
20 to 28 inches—brown, slightly acid sandy clay loam
28 to 54 inches—stratified, moderately acid and slightly acid sandy clay loam and fine sandy loam in shades of brown and gray
54 to 80 inches—pale brown, slightly acid fine sandy loam

Soil Properties

Depth class: Very deep
Drainage class: Moderately well drained
Depth to the water table: 3.5 to 6.0 feet (perched)
Flooding: Frequent; brief duration (fig. 10)
Runoff: Slow
Permeability: Moderately slow
Available water capacity: High
Root zone: Very deep
Natural soil fertility: High
Shrink-swell potential: Low
Hazard of water erosion: Slight

Composition

• Based on transects, this map unit contains 64 percent soils of the Sandow series. There is an 80 percent probability that Sandow and similar soils make up 77 to 97 percent of the unit. Contrasting soils are Gladewater, Kaufman, and Uhland soils, but neither of these soils makes up as much as 10 percent of the unit.

Contrasting Soils

• Gladewater and Kaufman soils, which are clayey throughout; in broad backwater areas
• Uhland soils, which are more sandy than the Sandow soil; on natural levees

Land Uses

Major land uses: Rangeland and pasture
Other land use: Wildlife habitat

Management Concerns

Pasture

Major limitations:
• No major limitations affect the use of this soil for pasture. High yields of adapted species can be produced.
Minor limitations:
• Flooding is a problem affecting livestock management.

Cropland

Major limitations:
• This soil is not suited to use as cropland because of the flooding.

Rangeland

Major limitations:
• No major limitations affect the use of this soil as rangeland. High yields of native plants can be produced.

Urban development

Major limitations:
• This soil is not suited to urban development because of the flooding.

Interpretive Groups

Land capability classification: 5w
Ecological site: Loamy Bottomland
Pasture management group: 1

Sb—Sandow-Urban land complex, frequently flooded

Setting

Landform: Flood plains along local streams
Landscape position: Flats and natural levees
Slope: Nearly level
Shape of areas: Elongated
Size of areas: 10 to 500 acres
Native vegetation: Hardwood forest of elm, ash, pecan, and oak and an understory of mid and tall grasses

Figure 10.—An area of Sandow loam, frequently flooded, along a local stream.

Typical Profile

Sandow

Surface layer:
0 to 6 inches—grayish brown, slightly acid loam

Subsurface layer:
6 to 15 inches—grayish brown, slightly acid loam

Subsoil:
15 to 20 inches—pale brown, slightly acid fine sandy loam
20 to 28 inches—brown, slightly acid sandy clay loam
28 to 54 inches—stratified, moderately acid sandy clay loam and fine sandy loam in shades of brown and gray
54 to 80 inches—pale brown, slightly acid fine sandy loam

Soil Properties

Sandow

Depth class: Very deep
Drainage class: Moderately well drained
Depth to the water table: 3.5 to 6.0 feet (perched)
Flooding: Frequent; brief duration
Runoff: Slow
Permeability: Moderately slow
Available water capacity: High
Root zone: Very deep
Natural soil fertility: High
Shrink-swell potential: Low
Hazard of water erosion: Slight

Composition

• This map unit consists of about 45 to 55 percent Sandow soil and similar soils and 20 to 30 percent Urban land. Contrasting soils make up the rest of the unit.

Contrasting Soils

• Small areas of soils that are not subject to flooding; on uplands and on low terraces

Land Uses

Major land use: Urban development
Other land use: Idle land

Management Concerns

Pasture

Major limitations:
• This unit is not suitable for use as pasture because of the urban development.

Cropland

Major limitations:
• This unit is not suitable for use as cropland because of the urban development.

Rangeland

Major limitations:
• This unit is not suitable for use as rangeland because of the urban development.

Urban development

Major limitations:
• This unit is not suited to urban development unless it is protected from flooding. Channel work and other improvements have reduced the frequency of flooding in some areas.

Interpretive Groups

Land capability classification: None assigned
Ecological site: None assigned
Pasture management group: None assigned

ScC—Shalba-Rock outcrop complex, 2 to 6 percent slopes

Setting

Landform: Uplands
Landscape position: Shoulders
Slope: Gently sloping
Shape of areas: Elongated
Size of areas: 10 to 50 acres
Native vegetation: Open post oak savannah

Typical Profile

Shalba

Surface layer:
0 to 4 inches—light brownish gray, moderately acid fine sandy loam

Subsoil:
4 to 12 inches—grayish brown, strongly acid clay
12 to 18 inches—dark grayish brown, moderately acid silty clay

Underlying material:
18 to 30 inches—white, slightly cemented siltstone

Soil Properties

Shalba

Depth class: Shallow or very shallow
Drainage class: Moderately well drained
Depth to the water table: More than 6 feet
Flooding: None
Runoff: Medium
Permeability: Very slow
Available water capacity: Very low
Root zone: Very shallow or shallow
Natural soil fertility: Low
Shrink-swell potential: High
Hazard of water erosion: Severe

Characteristics of the Rock Outcrop

Kind of rock: White, strongly cemented siltstone and sandstone

Composition

• This map unit consists of about 45 to 55 percent Shalba soil and similar soils and 15 to 25 percent Rock outcrop. Contrasting soils make up the rest of the unit.

Contrasting Soils

• The sandy Koether soils, which are thin over hard bedrock; on slope breaks
• Rehburg soils, which have a thick, sandy surface layer; in positions similar to or slightly higher than those of the Shalba soil

Land Uses

Major land uses: Rangeland and wildlife habitat

Management Concerns

Pasture

Major limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.
• The low available water capacity limits production, especially during dry seasons.
• The limited natural fertility results in low production unless fertilizer is applied.

Cropland

Major limitations:
• Because of the hazard of erosion, conservation measures are needed.
• The low available water capacity limits production, especially during dry seasons.
• The limited natural fertility results in low production unless fertilizer is applied.

Rangeland

Major limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.
• The low available water capacity limits production, especially during dry seasons.
• The limited natural fertility results in low production.

Urban development

Major limitations:
• Structures and roads are affected by the high shrink-swell potential in the subsoil.
• Erosion-control measures are needed at construction sites.
• Disposal of septic tank effluent is a concern because of the restricted permeability and the depth to rock.

Interpretive Groups

Land capability classification: Shalba—4s; Rock outcrop—8s
Ecological site: Claypan Savannah
Pasture management group: Shalba—14

ShA—Ships clay, 0 to 1 percent slopes, rarely flooded

Setting

Landform: Flood plains
Landscape position: Broad flats
Slope: Nearly level
Shape of areas: Irregular or elongated
Size of areas: 15 to 500 acres
Native vegetation: Hardwood forest of pecan and elm and an understory of switchgrass, wildrye, and bluestems

Typical Profile

Surface layer:
0 to 8 inches—reddish brown, moderately alkaline clay

Subsoil:
8 to 32 inches—reddish brown, moderately alkaline clay
32 to 47 inches—brown, moderately alkaline clay
47 to 80 inches—reddish brown, moderately alkaline clay that has dark reddish brown mottles

Soil Properties

Depth class: Very deep
Drainage class: Moderately well drained
Depth to the water table: More than 6 feet
Flooding: Rare
Runoff: Slow
Permeability: Very slow
Available water capacity: High
Root zone: Very deep
Natural soil fertility: High
Shrink-swell potential: Very high
Hazard of water erosion: Slight

Composition

• Based on transects, this map unit contains 82 percent soils of the Ships series. There is an 80 percent probability that Ships and similar soils make up 90 to 100 percent of the map unit. Contrasting soils are Roetex and Weswood soils and soils that are clayey in the upper part and loamy below a depth of 20 inches. None of these contrasting soils makes up as much as 10 percent of the unit.

Contrasting Soils

• The somewhat poorly drained Roetex soils in slight depressions and on flats
• The somewhat poorly drained Weswood soils on natural levees
• Soil that are loamy below a depth of 20 inches; in areas near the natural levees

Land Uses

Major land use: Cropland (fig. 11)
Other land use: Pasture

Management Concerns

Pasture

Major limitations:
• The high clay content of the soil restricts the rate of water infiltration and hinders the establishment of pasture plants.

Cropland

Major limitations:
• No major limitations affect the use of this soil for crops.
Minor limitations:
• Because of the content of clay, this soil is difficult to manage.
• A plowpan can develop rapidly and can restrict the movement of water and roots.

Rangeland

Major limitations:
• No major limitations affect the use of this soil as rangeland; however, very few areas support native vegetation.

Urban development

Major limitations:
• This unit is not suitable for urban development unless it is protected from flooding.
• Disposal of septic tank effluent is a concern because of the restricted permeability.
• The shrink-swell potential is a concern affecting structures and roads.

Figure 11.—Irrigated cotton ready to be harvested in an area of Ships clay, 0 to 1 percent slopes, rarely flooded.

Interpretive Groups

Land capability classification: 2s
Ecological site: Clayey Bottomland
Pasture management group: 6

ShC—Ships clay, 1 to 5 percent slopes, rarely flooded

Setting

Landform: Flood plains
Landscape position: Shoulders and the upper backslopes above drainageways and depressions
Slope: Gently sloping
Shape of areas: Elongated
Size of areas: 15 to 50 acres
Native vegetation: Hardwood forest of pecan and elm and an understory of switchgrass, wildrye, and bluestems

Typical Profile

Surface layer:
0 to 7 inches—reddish brown, moderately alkaline clay

Subsoil:
7 to 65 inches—reddish brown and dark brown, moderately alkaline clay

Soil Properties

Depth class: Very deep
Drainage class: Moderately well drained
Depth to the water table: More than 6 feet
Flooding: Rare
Runoff: Slow
Permeability: Very slow

Available water capacity: High
Root zone: Very deep
Natural soil fertility: High
Shrink-swell potential: Very high
Hazard of water erosion: Moderate or severe

Composition

• This map unit consists of about 85 percent Ships soil and similar soils. Contrasting soils make up 15 percent of the unit.

Contrasting Soils

• The loamy Coarsewood and Weswood soils on natural levees

Land Uses

Major land uses: Cropland and pasture

Management Concerns

Pasture

Major limitations:
• The high content of clay can restrict the rate of water infiltration and hinder the establishment of pasture plants.

Cropland

Major limitations:
• The more sloping areas are susceptible to erosion.
Minor limitations:
• A plowpan can develop rapidly and can restrict the movement of water and roots.

Rangeland

Major limitations:
• Erosion is a concern unless an adequate cover of vegetation is maintained.

Urban development

Major limitations:
• This unit is not suitable for urban development unless it is protected from flooding.
• Disposal of septic tank effluent is a concern because of the restricted permeability.
• Structures and roads are affected by the very high shrink-swell potential.
• Erosion-control measures are needed at construction sites.

Interpretive Groups

Land capability classification: 3e
Ecological site: Clayey Bottomland
Pasture management group: 6

SkB—Shiro loamy fine sand, 1 to 3 percent slopes

Setting

Landform: Uplands
Landscape position: Summits
Slope: Very gently sloping; rounded
Shape of areas: Circular or elongated
Size of areas: 10 to 75 acres
Native vegetation: Post oak savannah

Typical Profile

Surface and subsurface layers:
0 to 15 inches—pinkish gray, moderately acid loamy fine sand

Subsoil:
15 to 24 inches—reddish brown, moderately acid clay that has brownish gray mottles
24 to 34 inches—light brownish gray, moderately acid clay that has reddish brown mottles

Underlying material:
34 to 50 inches—light gray, tuffaceous siltstone

Soil Properties

Depth class: Moderately deep
Drainage class: Well drained
Depth to the water table: More than 6 feet
Flooding: None
Runoff: Slow
Permeability: Slow
Available water capacity: Low
Root zone: Moderately deep
Natural soil fertility: Low
Shrink-swell potential: High
Hazard of water erosion: Severe

Composition

• This map unit consists of about 90 percent Shiro soil and similar soils. Contrasting soils make up 10 percent of the unit.

Contrasting Soils

• Koether soils, which are shallow over hard bedrock; on the upper slope breaks
• Rehburg soils, which have a thicker sandy surface layer than that of the Shiro soil; in the higher, more convex positions

Land Uses

Major land uses: Pasture and rangeland

Management Concerns

Pasture

Major limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.
• The low available water capacity limits production, especially during dry seasons.
• The limited natural fertility results in low production unless fertilizer is applied.

Cropland

Major limitations:
• Because of the hazard of erosion, conservation measures are needed.
• The low available water capacity limits production, especially during dry seasons.
• The limited natural fertility results in low production unless fertilizer is applied.

Rangeland

Major limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.
• The low available water capacity limits production, especially during dry seasons.
• The limited natural fertility results in low production.

Urban development

Major limitations:
• Structures and roads may be affected by the high shrink-swell potential in the subsoil.
• Erosion-control measures are needed at construction sites.
• Disposal of septic tank effluent is a concern because of the restricted permeability.

Interpretive Groups

Land capability classification: 3e
Ecological site: Sandy Loam
Pasture management group: 8

SmC—Silawa fine sandy loam, 2 to 5 percent slopes

Setting

Landform: Stream terraces
Landscape position: Summits and shoulders
Slope: Gently sloping; convex
Shape of areas: Elongated
Size of areas: 10 to 30 acres
Native vegetation: Post oak savannah

Typical Profile

Surface layer:
0 to 5 inches—dark grayish brown, slightly acid fine sandy loam

Subsurface layer:
5 to 9 inches—grayish brown, slightly acid fine sandy loam

Subsoil:
9 to 51 inches—reddish brown, moderately acid sandy clay loam that has brown mottles
51 to 80 inches—reddish yellow, slightly acid loamy sand

Soil Properties

Depth class: Very deep
Drainage class: Well drained
Depth to the water table: More than 6 feet
Flooding: None
Runoff: Slow
Permeability: Moderate
Available water capacity: Moderate
Root zone: Very deep
Natural soil fertility: Medium
Shrink-swell potential: Moderate
Hazard of water erosion: Moderate

Composition

• Based on transects, this map unit contains 59 percent soils of the Silawa series. There is an 80 percent probability that Silawa and similar soils make up 75 to 95 percent of the unit. Contrasting soils are Gredge, Rader, and Robco soils, but neither of these soils makes up as much as 10 percent of the unit.

Contrasting Soils

• Gredge soils, which have a clayey subsoil; in landscape positions similar to those of the Silawa soil
• Rader and Robco soils, which have a thick, sandy surface layer; in landscape positions similar to those of the Silawa soil

Land Uses

Major land uses: Rangeland and pasture

Management Concerns

Pasture

Major limitations:
• No major limitations affect the use of this soil for pasture.
Minor limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.

• The medium natural fertility results in low production unless fertilizer is applied.
• The available water capacity limits forage production, especially during dry seasons.

Cropland

Major limitations:
• Because of the hazard of erosion, conservation measures are needed.
Minor limitations:
• The medium natural fertility results in low production unless fertilizer is applied.
• The available water capacity limits production, especially during dry seasons.

Rangeland

Major limitations:
• No major limitations affect the use of this soil as rangeland.
Minor limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.
• The medium natural fertility results in low production.
• The available water capacity limits forage production, especially during dry seasons.

Urban development

Major limitations:
• No major limitations affect the use of this soil for urban development.
Minor limitations:
• Structures and roads are affected somewhat by the moderate shrink-swell potential in the subsoil.
• The sidewalls of excavations are unstable because of the sandy texture of the soil.

Interpretive Groups

Land capability classification: 3e
Ecological site: Sandy Loam
Pasture management group: 5

SmD—Silawa fine sandy loam, 5 to 8 percent slopes

Setting

Landform: Stream terraces
Landscape position: Shoulders and the upper backslopes
Slope: Moderately sloping; convex
Shape of areas: Elongated
Size of areas: 10 to 50 acres
Native vegetation: Post oak savannah

Typical Profile

Surface layer:
0 to 15 inches—brown, slightly acid fine sandy loam

Subsoil:
15 to 24 inches—reddish brown, moderately acid sandy clay loam
24 to 50 inches—red, moderately acid sandy clay loam
50 to 60 inches—red, moderately acid fine sandy loam

Soil Properties

Depth class: Very deep
Drainage class: Well drained
Depth to the water table: More than 6 feet
Flooding: None
Runoff: Medium
Permeability: Moderate
Available water capacity: Moderate
Root zone: Very deep
Natural soil fertility: Medium
Shrink-swell potential: Moderate
Hazard of water erosion: Severe

Composition

• Based on transects, this map unit contains 56 percent soils of the Silawa series. There is an 80 percent probability that Silawa and similar soils make up 64 to 84 percent of the unit. Contrasting soils are Desan, Gredge, Padina, and Robco soils, but neither of these soils makes up as much as 10 percent of the unit.

Contrasting Soils

• Desan and Padina soils, which have a thick, sandy surface layer; on the convex upper slopes
• Gredge soils, which have a clayey subsoil; in landscape positions similar to those of the Silawa soil
• Robco soils, which have a thick, sandy surface layer; in landscape positions similar to those of the Silawa soil

Land Uses

Major land uses: Rangeland and pasture

Management Concerns

Pasture

Major limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.
Minor limitations:
• The medium natural fertility results in low production unless fertilizer is applied.

• The available water capacity limits forage production, especially during dry seasons.

Cropland

Major limitations:
• Because of the hazard of erosion, conservation measures are needed.
Minor limitations:
• The medium natural fertility results in low production unless fertilizer is applied.
• The available water capacity limits production, especially during dry seasons.

Rangeland

Major limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.
Minor limitations:
• The medium natural fertility results in low production.
• The available water capacity limits forage production, especially during dry seasons.

Urban development

Major limitations:
• Erosion-control structures are needed at construction sites.
Minor limitations:
• Structures and roads are affected somewhat by the moderate shrink-swell potential in the subsoil.

Interpretive Groups

Land capability classification: 4e
Ecological site: Sandy Loam
Pasture management group: 5

SnB—Singleton fine sandy loam, 1 to 3 percent slopes

Setting

Landform: Uplands
Landscape position: Backslopes
Slope: Very gently sloping; plane surfaces
Shape of areas: Irregular or elongated
Size of areas: 10 to 100 acres
Native vegetation: Post oak savannah

Typical Profile

Surface layer:
0 to 9 inches—light brownish gray, slightly acid fine sandy loam

Subsoil:
9 to 17 inches—pale brown, very strongly acid clay that has common yellowish brown mottles
17 to 28 inches—very pale brown, strongly acid clay that has brownish yellow and grayish brown mottles

Underlying material:
28 to 60 inches—stratified white, brown, and yellowish brown, tuffaceous siltstone

Soil Properties

Depth class: Moderately deep
Drainage class: Moderately well drained
Depth to the water table: More than 6 feet (but the soil is saturated in the upper part for short periods after heavy rains)
Flooding: None
Runoff: Slow
Permeability: Very slow
Available water capacity: Low
Root zone: Moderately deep
Natural soil fertility: Low
Shrink-swell potential: High
Hazard of water erosion: Severe

Composition

• Based on transects, this map unit contains 97 percent soils of the Singleton series. There is an 80 percent probability that Singleton and similar soils make up 87 to 100 percent of the unit. Contrasting soils are Gredge and Tabor soils, but neither of these soils makes up as much as 10 percent of the unit.

Contrasting Soils

• Gredge and Tabor soils, which do not have cemented materials within a depth of 60 inches

Land Uses

Major land uses: Pasture and rangeland

Management Concerns

Pasture

Major limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.
• The low available water capacity limits production, especially during dry seasons.
• The limited natural fertility results in low production unless fertilizer is applied.

Cropland

Major limitations:
• Because of the hazard of erosion, conservation measures are needed.
• The low available water capacity limits production, especially during dry seasons.

• The limited natural fertility results in low production unless fertilizer is applied.

Rangeland

Major limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.
• The low available water capacity limits production, especially during dry seasons.
• The limited natural fertility results in low production.

Urban development

Major limitations:
• Structures and roads are affected by the high shrink-swell potential in the subsoil.
• Erosion-control measures are needed at construction sites.
• Disposal of septic tank effluent is a concern because of the restricted permeability and the depth to rock.

Interpretive Groups

Land capability classification: 4e
Ecological site: Claypan Savannah
Pasture management group: 11

SpB—Spiller loamy fine sand, 1 to 3 percent slopes

Setting

Landform: Uplands
Landscape position: Summits and the upper backslopes
Slope: Very gently sloping
Shape of areas: Elongated or irregular
Size of areas: 10 to 50 acres
Native vegetation: Post oak savannah

Typical Profile

Surface layer:
0 to 15 inches—brown, slightly acid loamy fine sand

Subsurface layer:
15 to 18 inches—light yellowish brown, slightly acid loamy fine sand

Subsoil:
18 to 24 inches—brownish yellow, slightly acid sandy clay that has red mottles
24 to 33 inches—light yellowish brown, moderately acid sandy clay that has red and brownish yellow mottles
33 to 43 inches—pale brown, moderately acid sandy clay that has brownish yellow, red, and light brownish gray mottles
43 to 54 inches—brownish yellow, moderately acid sandy clay loam that has red mottles

Underlying material:
54 to 85 inches—brownish yellow, moderately alkaline, stratified loamy material and shale

Soil Properties

Depth class: Very deep
Drainage class: Moderately well drained
Depth to the water table: More than 6 feet
Flooding: None
Runoff: Medium
Permeability: Slow
Available water capacity: Moderate
Root zone: Very deep
Natural soil fertility: Medium
Shrink-swell potential: Moderate
Hazard of water erosion: Slight or moderate

Composition

• Based on transects, this map unit contains 58 percent soils of the Spiller series. There is an 80 percent probability that Spiller and similar soils make up 75 to 95 percent of the unit. Contrasting soils are Rader and Tabor soils, but neither of these soils makes up as much as 10 percent of the unit.

Contrasting Soils

• Rader and Tabor soils, which have a loamy surface layer and a clayey subsoil; in the lower positions

Land Uses

Major land uses: Rangeland and pasture
Other land uses: Cropland

Management Concerns

Pasture

Major limitations:
• No major limitations affect the use of this soil for pasture.
Minor limitations:
• The moderate available water capacity and medium natural fertility limit the potential forage production.

Cropland

Major limitations:
• No major limitations affect the use of this soil as cropland.
Minor limitations:
• The moderate available water capacity and medium natural fertility limit production.

• Because of the hazard of erosion, conservation measures are needed in some areas.

Rangeland

Major limitations:
• No major limitations affect the use of this soil as rangeland.
Minor limitations:
• The moderate available water capacity and medium natural fertility limit production.

Urban development

Major limitations:
• No major limitations affect the use of this soil for urban development.
Minor limitations:
• Structures and roads are affected by the moderate shrink-swell potential in the subsoil.
• Erosion-control measures are needed at construction sites.
• Disposal of septic tank effluent is a concern because of the restricted permeability.

Interpretive Groups

Land capability classification: 3e
Ecological site: Sandy Loam
Pasture management group: 5

SxB—Styx loamy fine sand, 1 to 3 percent slopes

Setting

Landform: Stream terraces
Landscape position: Summits
Slope: Very gently sloping
Shape of areas: Circular or elongated
Size of areas: 10 to 50 acres
Native vegetation: Post oak savannah

Typical Profile

Surface layer:
0 to 8 inches—yellowish brown, neutral loamy fine sand

Subsurface layer:
8 to 24 inches—very pale brown, neutral loamy fine sand

Subsoil:
24 to 30 inches—brownish yellow, slightly acid sandy clay loam
30 to 68 inches—red, moderately acid sandy clay loam that has light brownish gray, brownish yellow, and light yellowish brown mottles

Soil Properties

Depth class: Very deep
Drainage class: Well drained
Depth to the water table: 3.5 to 4.5 feet (perched)
Flooding: None
Runoff: Slow
Permeability: Moderate
Available water capacity: Moderate
Root zone: Very deep
Natural soil fertility: Low
Shrink-swell potential: Low
Hazard of water erosion: Slight

Composition

• This map unit consists of about 90 percent Styx soil and similar soils. Contrasting soils make up 10 percent of the unit.

Contrasting Soils

• Chazos soils, which have a thin, sandy surface layer; on ridges and hilltops
• Desan, Eufaula, and Padina soils, which have a thick, sandy surface layer; in landscape positions similar to those of the Styx soil

Land Uses

Major land uses: Rangeland and pasture

Management Concerns

Pasture

Major limitations:
• The low natural fertility limits production unless fertilizer is applied.
• The available water capacity limits forage production, especially during dry seasons.

Cropland

Major limitations:
• The low natural fertility limits production unless fertilizer is applied.
• The limited available water capacity results in moderate production, especially during dry seasons.
Minor limitations:
• Because of the hazard of erosion, conservation measures are needed in some areas.

Rangeland

Major limitations:
• The low natural fertility and moderate available water capacity limit production.

Urban development

Major limitations:
• No major limitations affect the use of this soil for urban development.
Minor limitations:
• The sidewalls of excavations are unstable because of the sandy texture of the soil.
• Erosion-control measures may be needed at construction sites.
• Disposal of septic tank effluent may be a concern because of short periods of saturation.

Interpretive Groups

Land capability classification: 3e
Ecological site: Sandy
Pasture management group: 2

TaA—Tabor fine sandy loam, 0 to 2 percent slopes

Setting

Landform: Stream terraces
Landscape position: Summits and toeslopes
Slope: Very gently sloping
Shape of areas: Elongated or circular
Size of areas: 10 to 30 acres
Native vegetation: Post oak savannah

Typical Profile

Surface layer:
0 to 6 inches—pale brown, strongly acid fine sandy loam

Subsurface layer:
6 to 14 inches—pale brown, strongly acid fine sandy loam

Subsoil:
14 to 23 inches—brown, strongly acid clay that has yellowish brown and dark red mottles
23 to 42 inches—light brownish gray, moderately acid clay that has yellowish brown and dark red mottles
42 to 57 inches—brownish yellow, neutral clay loam that has brown and strong brown mottles
57 to 67 inches—light gray, neutral sandy clay loam that has yellowish brown and red mottles
67 to 80 inches—white, neutral sandy clay loam that has brownish yellow, red, and yellowish red mottles

Soil Properties

Depth class: Very deep
Drainage class: Moderately well drained
Depth to the water table: More than 6 feet (but the soil is saturated at a depth of 0.5 foot to 1.5 feet for short periods after heavy rains)
Flooding: None
Runoff: Slow
Permeability: Very slow
Available water capacity: Moderate
Root zone: Very deep; restricted by the clay subsoil
Natural soil fertility: Medium
Shrink-swell potential: High
Hazard of water erosion: Severe

Composition

• Based on transects, this map unit contains 64 percent soils of the Tabor series. There is an 80 percent probability that Tabor and similar soils make up 72 to 92 percent of the unit. Contrasting soils are Lufkin, Mabank, and Robco soils, but neither of these soils makes up as much as 10 percent of the unit.

Contrasting Soils

• Lufkin and Mabank soils, which have a thin, loamy surface layer; on flats or in slight depressions
• Robco soils, which have a sandy surface layer 20 to 40 inches thick; in landscape positions similar to those of the Tabor soil

Land Uses

Major land uses: Rangeland and pasture
Other land use: Cropland

Management Concerns

Pasture

Major limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.
Minor limitations:
• The medium natural fertility slightly limits production.
• The available water capacity limits forage production, especially during dry seasons.

Cropland

Major limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.
Minor limitations:
• The medium natural fertility slightly limits production.
• The limited available water capacity results in moderate production, especially during dry seasons.

Rangeland

Major limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.

Minor limitations:
• The medium natural fertility slightly limits production.
• The available water capacity limits forage production, especially during dry seasons.

Urban development

Major limitations:
• Structures and roads are affected by the high shrink-swell potential in the subsoil.
• Erosion-control measures are needed at construction sites.
• Disposal of septic tank effluent is a concern because of the restricted permeability.

Interpretive Groups

Land capability classification: 3e
Ecological site: Sandy Loam
Pasture management group: 4

TgB—Tabor very gravelly fine sandy loam, 1 to 3 percent slopes

Setting

Landform: Stream terraces
Landscape position: Summits and toeslopes
Slope: Very gently sloping; plane surfaces
Shape of areas: Elongated
Size of areas: 10 to 50 acres
Native vegetation: Post oak savannah

Typical Profile

Surface layer:
0 to 18 inches—dark grayish brown, moderately acid very gravelly fine sandy loam

Subsoil:
18 to 72 inches—red, strongly acid clay that has gray and yellowish brown mottles
72 to 80 inches—gray, moderately acid clay

Soil Properties

Depth class: Very deep
Drainage class: Moderately well drained
Depth to the water table: More than 6 feet (but the soil is saturated at a depth of 0.5 foot to 1.5 feet for short periods after heavy rains)
Flooding: None
Runoff: Slow
Permeability: Very slow
Available water capacity: Moderate
Root zone: Very deep; restricted by the clayey subsoil
Natural soil fertility: Medium
Shrink-swell potential: High
Hazard of water erosion: Slight

Composition

• This map unit consists of about 85 percent Tabor soil and similar soils. Contrasting components make up 15 percent of the unit.

Contrasting Components

• Tabor soils that are not gravelly
• Tabor soils that are eroded
• Small gravel pits

Land Uses

Major land uses: Rangeland and pasture
Other land use: Wildlife habitat

Management Concerns

Pasture

Major limitations:
• Because of the gravel on the surface, establishing vegetation is difficult in areas of this soil.
Minor limitations:
• The medium natural fertility limits production unless fertilizer is applied.
• The available water capacity limits forage production, especially during dry seasons.

Cropland

Major limitations:
• This soil is not suited to crops because of the content of gravel.

Rangeland

Major limitations:
• The medium natural fertility and moderate available water capacity limit production.

Urban development

Major limitations:
• The content of gravel in this soil interferes with some urban uses.
• Structures and roads are affected by the high shrink-swell potential in the subsoil.
• Erosion-control measures are needed during construction.
• Disposal of septic tank effluent is a concern because of the restricted permeability.

Interpretive Groups

Land capability classification: 6s
Ecological site: Gravelly
Pasture management group: 14

TuA—Tabor-Urban land complex, 0 to 2 percent slopes

Setting

Landform: Stream terraces
Landscape position: Summits and toeslopes
Slope: Nearly level and very gently sloping
Shape of areas: Elongated or irregular
Size of areas: 10 to 1,000 acres
Native vegetation: Post oak savannah

Typical Profile

Tabor

Surface layer:
0 to 15 inches—brown, strongly acid fine sandy loam

Subsoil:
15 to 67 inches—red, gray, and brownish yellow, strongly acid clay
67 to 80 inches—light gray, neutral clay loam

Soil Properties

Tabor

Depth class: Very deep
Drainage class: Moderately well drained
Depth to the water table: More than 6 feet (but the soil is saturated at a depth of 0.5 foot to 1.5 feet for short periods after heavy rains)
Flooding: None
Runoff: Slow
Permeability: Very slow
Available water capacity: Moderate
Root zone: Very deep; restricted by the clay subsoil
Natural soil fertility: Medium
Shrink-swell potential: High
Hazard of water erosion: Severe

Composition

• This map unit consists of about 50 to 60 percent Tabor soil and 30 to 40 percent Urban land. Contrasting soils make up the rest of the unit.

Contrasting Soils

• Lufkin and Mabank soils, which have a thin, loamy surface layer; on flats or in slight depressions
• Robco soils, which have a sandy surface layer 20 to 40 inches thick; in landscape positions similar to those of the Tabor soil

Land Uses

Major land use: Urban development
Other land use: Idle land

Management Concerns

Pasture

Major limitations:
• This unit is not suitable for use as pasture because of the urban development.

Cropland

Major limitations:
• This unit is not suitable for use as cropland because of the urban development.

Rangeland

Major limitations:
• This unit is not suitable for use as rangeland because of the urban development.

Urban development

Major limitations:
• Erosion-control measures are needed at construction sites.
• Disposal of septic tank effluent is a concern because of the restricted permeability.
• Structures and roads are affected by the high shrink-swell potential in the soil.

Interpretive Groups

Land capability classification: None assigned
Ecological site: None assigned
Pasture management group: None assigned

Uh—Uhland loam, frequently flooded

Setting

Landform: Flood plains
Landscape position: Flats and natural levees
Slope: Nearly level
Shape of areas: Elongated
Size of areas: 10 to 500 acres
Native vegetation: Hardwood forest of elm, ash, pecan, and oak and an understory of mid and tall grasses

Typical Profile

Surface layer:
0 to 7 inches—grayish brown, neutral loam

Subsoil:
7 to 20 inches—yellowish brown, neutral fine sandy loam that has grayish brown mottles
20 to 65 inches—pale brown, slightly acid fine sandy loam that has grayish brown mottles

Soil Properties

Depth class: Very deep
Drainage class: Moderately well drained
Depth to the water table: 2.0 to 3.5 feet
Flooding: Frequent; brief duration
Runoff: Slow
Permeability: Moderately slow
Available water capacity: Moderate
Root zone: Very deep
Natural soil fertility: High
Shrink-swell potential: Low
Hazard of water erosion: Slight

Composition

• Based on transects, this map unit contains 58 percent soils of the Uhland series. There is an 80 percent probability that Uhland and similar soils make up 81 to 100 percent of the unit. Contrasting soils are Gladewater and Kaufman soils and soils that have a thick, dark surface layer. Neither of these contrasting soils makes up as much as 10 percent of the unit.

Contrasting Soils

• Gladewater and Kaufman soils, which are clayey throughout; in broad backwater areas
• Soils that have a dark surface layer; on natural levees

Land Uses

Major land uses: Rangeland and pasture
Other land use: Wildlife habitat

Management Concerns

Pasture

Major limitations:
• No major limitations affect the use of this soil for pasture if adapted species are used.
Minor limitations:
• The available water capacity limits forage production, especially during dry seasons.

Cropland

Major limitations:
• This soil is not suited to use as cropland because of the flooding.

Rangeland

Major limitations:
• No major limitations affect the use of this soil as rangeland.
Minor limitations:
• The available water capacity limits forage production, especially during dry seasons.

Urban development

Major limitations:
• This soil is not suited to urban development because of the flooding.

Interpretive Groups

Land capability classification: 5w
Ecological site: Loamy Bottomland
Pasture management group: 3

Ur—Urban land

General Description

• This map unit consists of areas that are 75 to 100 percent works and structures, such as houses; office buildings; hotels; railroad yards; multiple-unit dwellings; shopping centers; churches; schools; streets; and service, banking, professional, educational, entertainment, and government buildings. Most of the rainfall in areas of this unit runs off and reaches major drains rapidly. Included in mapping are some built-up areas in which buildings and structures cover less than 75 percent of the surface. Also included are small areas of soils that have been covered by fill material. These included areas make up as much as 25 percent of the unit. The soils in areas of this map unit have been altered and obscured to the extent that they cannot be classified.

Us—Ustarents, clayey

Setting

Landform: Flood plains and stream terraces
Landscape position: Areas that have been strip mined for gravel (the overburden has been leveled in some areas)
Slope: Nearly level to steep
Shape of areas: Circular or elongated
Size of areas: 10 to 300 acres
Native vegetation: Woody species

Typical Profile

Surface layer:
0 to 80 inches—mixed, moderately alkaline to neutral clay or clay loam in various shades of red, black, and gray

Soil Properties

Depth class: Very deep
Drainage class: Well drained to somewhat poorly drained

Depth to the water table: More than 6 feet
Flooding: Rare
Runoff: Slow to rapid
Permeability: Very slow
Available water capacity: High
Root zone: Very deep
Natural soil fertility: Medium or high
Shrink-swell potential: Very high
Hazard of water erosion: Slight

Composition

• This map unit consists of about 85 percent Ustarents and similar soils. Contrasting components make up 15 percent of the unit.

Contrasting Components

• Burleson, Axtell, and Ships soils, which have not been mined for gravel; in adjacent areas
• Shallow pits, some of which hold water for extended periods

Land Uses

Major land use: Wildlife habitat
Other land use: Pasture

Management Concerns

Pasture

Major limitations:
• These soils are difficult to work because of the clay textures.
• The adaptability of plants is limited because the soil material is not biologically active.

Cropland

Major limitations:
• Most areas of these soils are not suitable for cultivation because of the slope and the presence of pits. If the areas are leveled, a few selected crops can be grown.

Rangeland

Major limitations:
• Some areas are not accessible to livestock.

Urban development

Major limitations:
• Because of the slope and the presence of pits, areas of these soils are unsuitable for urban development.

Interpretive Groups

Land capability classification: 6e
Ecological site: None assigned
Pasture management group: None assigned

WeA—Weswood silt loam, 0 to 1 percent slopes, rarely flooded

Setting

Landform: Flood plains
Landscape position: Natural levees adjacent to stream channels
Slope: Nearly level; slightly convex
Shape of areas: Elongated
Size of areas: 10 to 100 acres
Native vegetation: Hardwood forest of pecan, elm, hackberry, and cottonwood and an understory of briars, vines, and mid grasses

Typical Profile

Surface layer:
0 to 8 inches—brown, moderately alkaline silt loam

Subsoil:
8 to 24 inches—light brown, moderately alkaline silt loam

Underlying material:
24 to 30 inches—stratified light brown, brown, and yellowish brown, moderately alkaline silt loam
30 to 80 inches—stratified brown and light brown, moderately alkaline silt loam

Soil Properties

Depth class: Very deep
Drainage class: Well drained
Depth to the water table: More than 6 feet
Flooding: Rare
Runoff: Slow
Permeability: Moderate
Available water capacity: High
Root zone: Very deep
Natural soil fertility: High
Shrink-swell potential: Low
Hazard of water erosion: Slight

Composition

• Based on transects, this map unit contains 81 percent soils of the Weswood series. There is an 80 percent probability that Weswood and similar soils make up 95 to 100 percent of the unit. Contrasting soils are Highbank and Ships soils, but neither of these soils makes up as much as 10 percent of the unit.

Contrasting Soils

• Highbank and Ships soils, which are more clayey than the Weswood soil; in the slightly lower positions

Land Uses

Major land use: Cropland
Other land use: Pasture

Management Concerns

Pasture

Major limitations:
• No major limitations affect the use of this soil for pasture. High yields of adapted forage grasses can be produced.

Cropland

Major limitations:
• No major limitations affect the use of this soil as cropland. High yields of adapted crops can be produced.
Minor limitations:
• A plowpan can develop rapidly and can restrict the movement of water, air, and roots.

Rangeland

Major limitations:
• No major limitations affect the use of this soil as rangeland. High yields of native grasses can be produced.

Urban development

Major limitations:
• This unit is not suitable for urban development unless it is protected from flooding.

Interpretive Groups

Land capability classification: 1
Ecological site: Loamy Bottomland
Pasture management group: 1

WeC—Weswood silt loam, 1 to 5 percent slopes, rarely flooded

Setting

Landform: Flood plains
Landscape position: Natural levees adjacent to stream channels
Slope: Gently sloping; slightly convex
Shape of areas: Elongated
Size of areas: 10 to 100 acres
Native vegetation: Hardwood forest of pecan, elm, hackberry, and cottonwood and an understory of briars, vines, and mid grasses

Typical Profile

Surface layer:
0 to 8 inches—light reddish brown, moderately alkaline silt loam

Subsoil:
8 to 22 inches—reddish brown, moderately alkaline silty clay loam

Underlying material:
22 to 65 inches—stratified brown, light brown, and strong brown, moderately alkaline silt loam

Soil Properties

Depth class: Very deep
Drainage class: Well drained
Depth to the water table: More than 6 feet
Flooding: Rare
Runoff: Slow or medium
Permeability: Moderate
Available water capacity: High
Root zone: Very deep
Natural soil fertility: High
Shrink-swell potential: Low
Hazard of water erosion: Severe

Composition

• This map unit consists of about 90 percent Weswood soil and similar soils. Contrasting soils make up about 10 percent of the unit.

Contrasting Soils

• Highbank and Ships soils, which are more clayey than the Weswood soil; in the lower positions

Land Uses

Major land use: Cropland
Other land use: Pasture

Management Concerns

Pasture

Major limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.

Cropland

Major limitations:
• Water erosion is a concern unless conservation measures are applied.
Minor limitations:
• A plowpan can develop rapidly and can restrict the movement of water, air, and roots.

Rangeland

Major limitations:
• No major limitations affect the use of this soil as rangeland.

Urban development

Major limitations:
• This unit is not suitable for urban development unless it is protected from flooding.
Minor limitations:
• Erosion-control measures are needed during construction.

Interpretive Groups

Land capability classification: 3e
Ecological site: Loamy Bottomland
Pasture management group: 1

WwA—Weswood silty clay loam, 0 to 1 percent slopes, rarely flooded

Setting

Landform: Flood plains
Landscape position: Natural levees adjacent to stream channels
Slope: Nearly level; slightly convex
Shape of areas: Elongated
Size of areas: 10 to 100 acres
Native vegetation: Hardwood forest of pecan, elm, hackberry, and cottonwood and an understory of briars, vines, and mid grasses

Typical Profile

Surface layer:
0 to 8 inches—brown, moderately alkaline silty clay loam

Subsoil:
8 to 48 inches—light reddish brown, moderately alkaline silt loam

Underlying material
48 to 65 inches—stratified light brown, brown, and yellowish brown, moderately alkaline silt loam

Soil Properties

Depth class: Very deep
Drainage class: Well drained
Depth to the water table: More than 6 feet
Flooding: Rare
Runoff: Slow
Permeability: Moderate
Available water capacity: High
Root zone: Very deep
Natural soil fertility: High
Shrink-swell potential: Low
Hazard of water erosion: Slight

Composition

• This map unit consists of about 90 percent Weswood soil and similar soils. Contrasting soils make up 10 percent of the unit.

Contrasting Soils

• Highbank and Ships soils, which are more clayey than the Weswood soil; in the lower positions

Land Uses

Major land use: Cropland
Other land use: Pasture

Management Concerns

Pasture

Major limitations:
• No major limitations affect the use of this soil for pasture. High yields of adapted forage grasses can be produced.

Cropland

Major limitations:
• No major limitations affect the use of this soil as cropland. High yields of adapted crops can be produced.
Minor limitations:
• A plowpan can develop rapidly and can restrict the movement of water, air, and roots.

Rangeland

Major limitations:
• No major limitations affect the use of this soil as rangeland. High yields of native grasses can be produced.

Urban development

Major limitations:
• This unit is not suitable for urban development unless it is protected from flooding.

Interpretive Groups

Land capability classification: 1
Ecological site: Loamy Bottomland
Pasture management group: 1

Wy—Weswood-Yahola complex, frequently flooded

Setting

Landform: Flood plains
Landscape position: Undulating areas adjacent to stream channels
Slope: Gently sloping or moderately sloping
Shape of areas: Elongated
Size of areas: 20 to 80 acres
Native vegetation: Hardwood forest of pecan, elm, willow, and cottonwood and an understory of briars, vines, and mid grasses

Typical Profile

Weswood

Surface layer:
0 to 6 inches—reddish brown, moderately alkaline silt loam

Subsurface layer:
6 to 38 inches—stratified light reddish brown and brown, moderately alkaline silt loam
38 to 65 inches—stratified reddish brown and brown, moderately alkaline silt loam and very fine sandy loam

Yahola

Surface layer:
0 to 6 inches—pink, moderately alkaline very fine sandy loam

Subsurface layer:
6 to 12 inches—light reddish brown, moderately alkaline very fine sandy loam
12 to 60 inches—stratified light reddish brown and pink, moderately alkaline very fine sandy loam

Soil Properties

Depth class: Very deep
Drainage class: Well drained
Depth to the water table: More than 6 feet
Flooding: Frequent; very brief or brief duration
Runoff: Slow
Permeability: Moderate
Available water capacity: Moderate or high
Root zone: Very deep
Natural soil fertility: High
Shrink-swell potential: Low
Hazard of water erosion: Slight

Composition

• This map unit consists of about 50 to 60 percent Weswood and similar soils and 30 to 35 percent Yahola and similar soils. Contrasting soils make up the rest of the unit.

Contrasting Soils

• Roetex and Ships soils, which are clayey throughout; in slightly concave positions

Land Uses

Major land uses: Rangeland and pasture
Other land use: Wildlife habitat

Management Concerns

Pasture

Major limitations:
• No major limitations affect the use of these soils for pasture. High yields of adapted pasture grasses can be produced.
Minor limitations:
• Flooding is a problem affecting livestock management.

Cropland

Major limitations:
• Because of the slope and the flooding, these soils are not suitable for cultivation.

Rangeland

Major limitations:
• No major limitations affect the use of these soils as rangeland. The soils are well suited to the production of native forage plants.
Minor limitations:
• Flooding is a problem affecting livestock management.

Urban development

Major limitations:
• These soils are not suited to urban development because of the flooding.

Interpretive Groups

Land capability classification: Weswood—5w; Yahola—5w
Ecological site: Weswood—Loamy Bottomland; Yahola—Loamy Bottomland
Pasture management group: 1

WzA—Wilson loam, 0 to 1 percent slopes

Setting

Landform: Stream terraces and valley fills
Landscape position: Summits
Slope: Nearly level; slightly concave

Shape of areas: Circular or elongated
Size of areas: 8 to 100 acres
Native vegetation: Oak savannah with mid and tall grasses

Typical Profile

Surface layer:
0 to 8 inches—grayish brown, moderately acid loam

Subsoil:
8 to 21 inches—dark gray, slightly acid clay
21 to 34 inches—gray, slightly acid clay
34 to 61 inches—dark gray, moderately acid clay
61 to 80 inches—gray, slightly alkaline clay that has strong brown and yellowish brown mottles

Soil Properties

Depth class: Very deep
Drainage class: Moderately well drained
Depth to the water table: More than 6 feet (but the soil is saturated in the upper part for short periods after heavy rains)
Flooding: None
Runoff: Very slow
Permeability: Very slow
Available water capacity: Moderate
Root zone: Very deep; restricted by the clayey subsoil
Natural soil fertility: Low
Shrink-swell potential: High
Hazard of water erosion: Slight or moderate

Composition

• Based on transects, this map unit contains 89 percent soils of the Wilson series. There is an 80 percent probability that Wilson and similar soils make up 95 to 100 percent of the unit. Contrasting soils are Boonville and Burleson soils, but neither of these soils makes up as much as 10 percent of the unit.

Contrasting Soils

• Boonville soils, which have a thick, loamy surface layer; in landscape positions similar to those of the Wilson soil
• Burleson soils, which are clayey throughout; in landscape positions similar to those of the Wilson soil

Land Uses

Major land uses: Rangeland and pasture

Management Concerns

Pasture

Major limitations:
• The available water capacity limits forage production, especially during dry seasons.
• The limited natural fertility results in low production unless fertilizer is applied.
Minor limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.

Cropland

Major limitations:
• The available water capacity limits forage production, especially during dry seasons.
• The limited natural fertility results in low production unless fertilizer is applied.
Minor limitations:
• Because of the hazard of erosion, conservation measures are needed.

Rangeland

Major limitations:
• The available water capacity limits forage production, especially during dry seasons.
• The limited natural fertility results in low production.
Minor limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.

Urban development

Major limitations:
• Structures and roads are affected by the high shrink-swell potential in the subsoil.
• Erosion-control measures are needed at construction sites.
• Disposal of septic tank effluent is a concern because of the restricted permeability.

Interpretive Groups

Land capability classification: 3w
Ecological site: Claypan Prairie
Pasture management group: 7

YaA—Yahola fine sandy loam, 0 to 1 percent slopes, rarely flooded

Setting

Landform: Flood plains
Landscape position: Natural levees adjacent to stream channels
Slope: Nearly level; slightly convex
Shape of areas: Elongated
Size of areas: 10 to 100 acres
Native vegetation: Hardwood forest of pecan, elm, hackberry, and cottonwood and an understory of briars, vines, and mid grasses

Typical Profile

Surface layer:
0 to 12 inches—reddish brown, moderately alkaline fine sandy loam

Underlying material:
12 to 24 inches—pink, moderately alkaline fine sandy loam
24 to 42 inches—stratified, pink, moderately alkaline fine sandy loam
42 to 80 inches—stratified, light reddish brown and pink, moderately alkaline silt loam, silty clay loam, and loamy fine sand

Soil Properties

Depth class: Very deep
Drainage class: Well drained
Depth to the water table: More than 6 feet
Flooding: Rare
Runoff: Slow
Permeability: Moderately rapid
Available water capacity: Moderate
Root zone: Very deep
Natural soil fertility: High
Shrink-swell potential: Low
Hazard of water erosion: Slight

Composition

• This map unit consists of about 85 percent Yahola soil and similar soils. Contrasting soils make up 15 percent of the unit.

Contrasting Soils

• Highbank and Ships soils, which are clayey throughout; in the lower positions

Land Uses

Major land use: Cropland
Other land use: Pasture

Management Concerns

Pasture

Major limitations:
• No major limitations affect the use of this soil for pasture. High yields of adapted forage grasses can be produced.
Minor limitations:
• The available water capacity limits forage production, especially during dry periods.

Cropland

Major limitations:
• No major limitations affect the use of this soil as cropland. High yields of adapted crops can be produced.
Minor limitations:
• A plowpan can develop rapidly and can restrict the movement of water, air, and roots.
• The available water capacity limits production, especially in dry seasons.

Rangeland

Major limitations:
• No major limitations affect the use of this soil as rangeland.
Minor limitations:
• The available water capacity limits forage production, especially in dry seasons.

Urban development

Major limitations:
• This unit is not suitable for urban development unless it is protected from flooding.

Interpretive Groups

Land capability classification: 2e
Ecological site: Loamy Bottomland
Pasture management group: 3

ZaB—Zack very fine sandy loam, 1 to 5 percent slopes

Setting

Landform: Uplands
Landscape position: Summits and the upper backslopes
Slope: Gently sloping; slightly convex or plane surfaces
Shape of areas: Elongated or irregular
Size of areas: 8 to 150 acres
Native vegetation: Post oak savannah

Typical Profile

Surface layer:
0 to 7 inches—dark brown, strongly acid very fine sandy loam

Subsoil:
7 to 18 inches—mottled dark grayish brown, dark reddish brown, and dark red, slightly acid clay
18 to 24 inches—dark brown, neutral clay
24 to 36 inches—mottled light yellowish brown and very dark grayish brown, moderately alkaline sandy clay loam

Underlying material:
36 to 60 inches—thinly bedded, moderately alkaline loam in shades of gray, brown, and red

Soil Properties

Depth class: Moderately deep to loamy and clayey sediments
Drainage class: Moderately well drained
Depth to the water table: More than 6 feet
Flooding: None
Runoff: Medium
Permeability: Very slow
Available water capacity: Low
Root zone: Moderately deep; restricted by the clayey subsoil
Natural soil fertility: Low
Shrink-swell potential: High
Hazard of water erosion: Severe

Composition

• Based on transects, this map unit contains 84 percent soils of the Zack series. There is an 80 percent probability that Zack and similar soils make up 74 to 94 percent of the unit. Contrasting soils are Boonville and Rader soils, but neither of these soils makes up as much as 15 percent of the unit.

Contrasting Soils

• Boonville and Rader soils, which have a thicker surface layer than that of the Zack soil and do not have shale within a depth of 60 inches; in the less sloping positions

Land Uses

Major land uses: Rangeland and pasture

Management Concerns

Pasture

Major limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.
• The low available water capacity limits production, especially during dry seasons.
• The limited natural fertility results in low production unless fertilizer is applied.

Cropland

Major limitations:
• Because of the hazard of erosion, conservation measures are needed.
• The low available water capacity limits production, especially during dry seasons.
• The limited natural fertility results in low production unless fertilizer is applied.

Rangeland

Major limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.
• The low available water capacity limits production, especially during dry seasons.
• The limited natural fertility results in low production.

Urban development

Major limitations:
• Structures and roads are affected by the high shrink-swell potential in the subsoil.
• Erosion-control measures are needed at construction sites.
• Disposal of septic tank effluent is a concern because of the restricted permeability.

Interpretive Groups

Land capability classification: 4e
Ecological site: Claypan Prairie
Pasture management group: 11

ZaC2—Zack very fine sandy loam, 2 to 5 percent slopes, eroded

Setting

Landform: Uplands
Landscape position: Summits and the upper backslopes
Slope: Gently sloping; slightly convex or plane surfaces
Shape of areas: Elongated or irregular
Size of areas: 8 to 25 acres
Native vegetation: Post oak savannah

Typical Profile

Surface layer:
0 to 2 inches—dark yellowish brown, slightly acid very fine sandy loam

Subsoil:
2 to 12 inches—brown, moderately acid clay that has red mottles
12 to 24 inches—light yellowish brown, moderately acid clay
24 to 38 inches—mottled light yellowish brown and very dark grayish brown, neutral clay loam

Underlying material:
38 to 60 inches—gray and brown, moderately alkaline shale that has clay loam texture

Soil Properties

Depth class: Moderately deep to shale
Drainage class: Moderately well drained
Depth to the water table: More than 6 feet
Flooding: None
Runoff: Medium
Permeability: Very slow
Available water capacity: Low
Root zone: Moderately deep; restricted by the clayey subsoil
Natural soil fertility: Low
Shrink-swell potential: High
Hazard of water erosion: Severe

Composition

• This map unit consists of about 85 percent Zack soil and similar soils. Contrasting soils make up 15 percent of the unit.

Contrasting Soils

• Chazos soils, which have a sandy surface layer; on rounded hilltops

Land Uses

Major land uses: Rangeland and pasture

Management Concerns

Pasture

Major limitations:
• Additional water erosion is a concern unless an adequate cover of vegetation is maintained.
• The low available water capacity limits production, especially during dry seasons.
• The limited natural fertility results in low production unless fertilizer is applied.

Cropland

Major limitations:
• Because of the hazard of erosion, conservation measures are needed.
• The low available water capacity limits production, especially during dry seasons.
• The limited natural fertility results in low production unless fertilizer is applied.

Rangeland

Major limitations:
• Additional water erosion is a concern unless an adequate cover of vegetation is maintained.
• The low available water capacity limits production, especially during dry seasons.
• The limited natural fertility results in low production.

Urban development

Major limitations:
• Structures and roads are affected by the high shrink-swell potential in the subsoil.
• Erosion-control measures are needed at construction sites.
• Disposal of septic tank effluent is a concern because of the restricted permeability.

Interpretive Groups

Land capability classification: 4e
Ecological site: Claypan Prairie
Pasture management group: 13

ZaD—Zack very fine sandy loam, 5 to 8 percent slopes

Setting

Landform: Uplands
Landscape position: Upper backslopes
Slope: Moderately sloping; slightly convex or plane surfaces
Shape of areas: Elongated or irregular
Size of areas: 8 to 50 acres
Native vegetation: Post oak savannah

Typical Profile

Surface layer:
0 to 3 inches—dark brown, strongly acid very fine sandy loam

Subsoil:
3 to 17 inches—yellowish red, strongly acid clay that has dark grayish brown mottles
17 to 30 inches—light yellowish brown, moderately acid clay

Underlying material:
30 to 45 inches—light gray and yellowish brown, slightly acid shale that has clay loam texture

Soil Properties

Depth class: Moderately deep
Drainage class: Moderately well drained
Depth to the water table: More than 6 feet
Flooding: None
Runoff: Rapid
Permeability: Very slow
Available water capacity: Low
Root zone: Moderately deep; restricted by the clayey subsoil
Natural soil fertility: Low

Shrink-swell potential: High
Hazard of water erosion: Severe

Composition

• This map unit consists of about 85 percent Zack soil and similar soils. Contrasting soils make up 15 percent of the unit.

Contrasting Soils

• Chazos soils, which have a sandy surface layer; on rounded ridges and hilltops

Land Uses

Major land uses: Rangeland and pasture

Management Concerns

Pasture

Major limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.
• The low available water capacity limits production, especially during dry seasons.
• The low natural fertility limits production unless fertilizer is applied.

Cropland

Major limitations:
• Because of the hazard of erosion, conservation measures are needed.
• The low available water capacity limits production, especially during dry seasons.
• The low natural fertility limits production unless fertilizer is applied.

Rangeland

Major limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.
• The low available water capacity limits production, especially during dry seasons.
• The low natural fertility also limits production.

Urban development

Major limitations:
• Structures and roads are affected by the high shrink-swell potential in the subsoil.
• Erosion-control measures are needed at construction sites.
• Disposal of septic tank effluent is a concern because of the restricted permeability.

Interpretive Groups

Land capability classification: 6e
Ecological site: Claypan Prairie
Pasture management group: 13

ZaE3—Zack very fine sandy loam, 8 to 25 percent slopes, severely eroded

Setting

Landform: Uplands
Landscape position: Shoulders and the upper backslopes
Slope: Strongly sloping and steep
Shape of areas: Elongated
Size of areas: 10 to 200 acres
Native vegetation: Post oak savannah

Typical Profile

Surface layer:
0 to 3 inches—dark brown, strongly acid very fine sandy loam

Subsoil:
3 to 25 inches—yellowish red, strongly acid clay that has dark grayish brown mottles
25 to 30 inches—light yellowish brown, moderately acid clay

Underlying material:
30 to 45 inches—light gray and yellowish brown, slightly acid shale that has clay loam texture

Soil Properties

Depth class: Moderately deep
Drainage class: Moderately well drained
Depth to the water table: More than 6 feet
Flooding: None
Runoff: Rapid
Permeability: Very slow
Available water capacity: Low
Root zone: Moderately deep; restricted by the clayey subsoil
Natural soil fertility: Low
Shrink-swell potential: High
Hazard of water erosion: Severe

Composition

• This map unit consists of about 85 percent Zack soil and similar soils. Contrasting areas make up 15 percent of the unit.

Contrasting Areas

• Severely eroded areas, many of which are gullies 10 to 50 feet deep and 10 to 100 feet wide (most have vertical banks that do not support vegetation, but some vegetation grows in the basins of the gullies)

Land Uses

Major land uses: Rangeland and wildlife habitat

Management Concerns

Pasture

Major limitations:
- In most areas of this unit, gullies are so severe that pastures cannot be established.
- Water erosion is a concern unless an adequate cover of vegetation is maintained.
- The low available water capacity limits production, especially during dry seasons.

Minor limitations:
- The low natural fertility limits production unless fertilizer is applied.

Cropland

Major limitations:
- This unit is not suited to cultivation because of the gullies and the slope.

Rangeland

Major limitations:
- Water erosion is a concern unless an adequate cover of vegetation is maintained.
- The low available water capacity limits production, especially during dry seasons.

Minor limitations:
- The low natural fertility limits production.

Urban development

Major limitations:
- This unit is not suited to urban development because of the slope and the gullies.

Interpretive Groups

Land capability classification: 7e
Ecological site: Claypan Prairie
Pasture management group: 14

ZcB—Zack-Urban land complex, 1 to 5 percent slopes

Setting

Landform: Uplands
Landscape position: Summits and the upper backslopes
Slope: Gently sloping; slightly convex or plane surfaces
Shape of areas: Elongated or irregular
Size of areas: 8 to 300 acres
Native vegetation: Post oak savannah

Typical Profile

Zack

Surface layer:
0 to 7 inches—dark brown, strongly acid very fine sandy loam

Subsoil:
7 to 18 inches—mottled dark grayish brown and reddish brown, moderately acid clay
18 to 24 inches—dark brown, neutral clay
24 to 36 inches—mottled light yellowish brown and very dark grayish brown, moderately alkaline clay

Underlying material:
36 to 60 inches—stratified gray, brown, and red, moderately alkaline loam

Soil Properties

Zack

Depth class: Moderately deep
Drainage class: Moderately well drained
Depth to the water table: More than 6 feet
Flooding: None
Runoff: Medium
Permeability: Very slow
Available water capacity: Low
Root zone: Moderately deep; restricted by the clayey subsoil
Natural soil fertility: Low
Shrink-swell potential: High
Hazard of water erosion: Severe

Composition

- This map unit consists of about 55 to 65 percent Zack soil and 35 to 45 percent Urban land. Contrasting soils make up the rest of the unit.

Contrasting Soils

- Boonville and Rader soils, which have a thicker surface layer than that of the Zack soil and do not have shale within a depth of 60 inches; in the less sloping positions

Land Uses

Major land use: Urban development
Other land use: Idle land

Management Concerns

Pasture

Major limitations:
- This unit is not suitable for use as pasture because of the urban development.

Cropland

Major limitations:
• This unit is not suitable for use as cropland because of the urban development.

Rangeland

Major limitations:
• This unit is not suitable for use as rangeland because of the urban development.

Urban development

Major limitations:
• Structures and roads are affected by the high shrink-swell potential in the subsoil.
• Erosion-control measures are needed at construction sites.
• Disposal of septic tank effluent is a concern because of the restricted permeability.

Interpretive Groups

Land capability classification: None assigned
Ecological site: None assigned
Pasture management group: None assigned

ZcD—Zack-Urban land complex, 5 to 8 percent slopes

Setting

Landform: Uplands
Landscape position: Shoulders
Slope: Moderately sloping; slightly convex or plane surfaces
Shape of areas: Elongated or irregular
Size of areas: 8 to 100 acres
Native vegetation: Post oak savannah

Typical Profile

Zack

Surface layer:
0 to 3 inches—dark brown, strongly acid very fine sandy loam

Subsoil:
3 to 17 inches—yellowish red, strongly acid clay that has dark grayish brown mottles
17 to 30 inches—light yellowish brown, moderately acid clay

Underlying material:
30 to 45 inches—light gray and yellowish brown, slightly acid shale that has clay loam texture

Soil Properties

Zack

Depth class: Moderately deep
Drainage class: Moderately well drained
Depth to the water table: More than 6 feet
Flooding: None
Runoff: Rapid
Permeability: Very slow
Available water capacity: Low
Root zone: Moderately deep; restricted by the clayey subsoil
Natural soil fertility: Low
Shrink-swell potential: High
Hazard of water erosion: Severe

Composition

• This map unit consists of about 55 to 65 percent Zack soil and 35 to 45 percent Urban land. Contrasting soils make up the rest of the unit.

Contrasting Soils

• Boonville and Rader soils, which have a thicker surface layer than that of the Zack soil and do not have shale within a depth of 60 inches; in the less sloping positions

Land Uses

Major land use: Urban development
Other land use: Idle land

Management Concerns

Pasture

Major limitations:
• This unit is not suitable for use as pasture because of the urban development.

Cropland

Major limitations:
• This unit is not suitable for use as cropland because of the urban development.

Rangeland

Major limitations:
• This unit is not suitable for use as rangeland because of the urban development.

Urban development

Major limitations:
• Structures and roads are affected by the high shrink-swell potential in the subsoil.

• Erosion-control measures are needed at construction sites.
• Disposal of septic tank effluent is a concern because of the restricted permeability.

Interpretive Groups

Land capability classification: None assigned
Ecological site: None assigned
Pasture management group: None assigned

ZuB—Zulch fine sandy loam, 1 to 3 percent slopes

Setting

Landform: Uplands
Landscape position: Lower backslopes
Slope: Very gently sloping; plane surfaces
Shape of areas: Irregular or elongated
Size of areas: 10 to 300 acres
Native vegetation: Post oak savannah

Typical Profile

Surface layer:
0 to 5 inches—grayish brown, moderately acid fine sandy loam

Subsoil:
5 to 13 inches—dark grayish brown, slightly acid clay
13 to 27 inches—dark gray, neutral clay
27 to 36 inches—gray, slightly alkaline clay

Underlying material:
36 to 60 inches—mottled grayish brown and light gray clay interbedded with soft shale

Soil Properties

Depth class: Moderately deep
Drainage class: Moderately well drained
Depth to the water table: More than 6 feet
Flooding: None
Runoff: Slow
Permeability: Very slow
Available water capacity: Low
Root zone: Deep; restricted by the clayey subsoil
Natural soil fertility: Low
Shrink-swell potential: High
Hazard of water erosion: Severe

Composition

• Based on transects, this map unit contains 54 percent soils of the Zulch series. There is an 80 percent probability that Zulch and similar soils make up 90 to 100 percent of the map unit. Contrasting soils are Boonville, Chazos, and Robco soils, but neither of these soils makes up as much as 10 percent of the unit.

Contrasting Soils

• Chazos and Robco soils, which have a sandy surface layer; in the higher, more convex positions
• Boonville soils, which have a thicker loamy surface layer than that of the Zulch soil; on footslopes

Land Uses

Major land uses: Pasture and rangeland

Management Concerns

Pasture

Major limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.
• The low available water capacity limits production, especially during dry seasons.
• The low natural fertility limits production unless fertilizer is applied.

Cropland

Major limitations:
• Because of the hazard of erosion, conservation measures are needed.
• The low available water capacity limits production, especially during dry seasons.
• The low natural fertility limits production unless fertilizer is applied.

Rangeland

Major limitations:
• Water erosion is a concern unless an adequate cover of vegetation is maintained.
• The low available water capacity limits production, especially during dry seasons.
• The low natural fertility also limits production.

Urban development

Major limitations:
• Structures and roads are affected by the high shrink-swell potential in the subsoil.
• Erosion-control measures are needed at construction sites.
• Disposal of septic tank effluent is a concern because of the restricted permeability.

Interpretive Groups

Land capability classification: 3e
Ecological site: Claypan Prairie
Pasture management group: 11

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help 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; 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 potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment. 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

Duane Garner, district conservationist, and John C. Copeland, area resource conservationist, Natural Resources Conservation Service, helped prepare this section.

General management needed for crops is suggested in this section. The estimated yields of the main crops are listed, the system of land capability classification used by the Natural Resources Conservation Service is explained, and prime farmland is described.

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 Cooperative Extension.

Cropland is a very important land use for the economy of Brazos County. Approximately 10 percent of the acreage in the county is used for crops. Most of the cropland is in areas of bottom land along the Brazos River, but some crops are grown in the uplands in the northern and western parts of the county. The major crops grown in areas of bottom land are cotton, corn, and grain sorghum and smaller quantities of small grain and soybeans. Most upland fields are planted to small grain and forage sorghum for grazing or hay production.

Perhaps the most important management practice applied in the county is irrigation water management. About one-half of the approximately 40,000 acres of bottom-land cropland is irrigated in any given year. Irrigation water is drawn from wells and from the Brazos River. Replacing the existing inefficient irrigation systems with buried irrigation pipeline would greatly improve irrigation efficiency. Land leveling also improves irrigation water management by facilitating proper control of irrigation water and improving drainage of excess rain water. Surface drainage is very important in areas of clayey soils.

The timing of irrigation applications ranges from applications on a regular basis to applications based on moisture monitoring with gyp blocks, neutron probe, or tensiometers. Water close to the surface and relatively inexpensive fuel currently contribute to the high frequency of irrigation that is more common than precise applications.

The major irrigated soils in the area are Coarsewood, Highbank, Ships, Weswood, and Yahola soils. The clayey Highbank and Ships soils have very slow permeability and a low intake rate. The loamy

Coarsewood, Weswood, and Yahola soils have favorable permeability and intake rates in a natural condition. Because of numerous cultivations and other vehicle trips over the fields during the cropping season, plowpans can be a problem in areas of these loamy soils, which have a high silt content that also contributes to the formation of a plowpan. Also, many years of cultivation have reduced the content of organic matter. Using a rotation of corn and grain sorghum with cotton can improve the content of organic matter. Recently, additional deep tillage methods have been used to break up plowpans. Such methods, however, must be repeated almost annually unless a rotation using high-residue crops is applied and fewer trips are made with vehicles. A plowpan reduces the intake rate of the soils and restricts the penetration of roots. Also, planting may be delayed if a wet winter and spring occur after a deep tillage method has been used. Because of the low intake rate resulting from a plowpan, the risk of contamination of runoff water with agricultural chemicals is high. Proper irrigation management involves using the most current pest-control methods, growth regulators, fertilizer, and adapted crop varieties. In some situations, dryland production may be more feasible than irrigation.

Soil fertility is naturally medium or high in the soils on flood plains. It varies considerably in upland soils. Most of the clayey upland soils have medium or high fertility. The loamy soils generally have medium fertility, and the sandy soils are low or medium in fertility.

Nitrogen, phosphorus, and potassium are needed on most loamy and sandy soils, and some loamy and sandy soils require lime. Soils that are clay loam or clay typically require only nitrogen and phosphorus. For all soils, additions of lime and fertilizer should be based on the results of soil tests, the needs of the crop, and the expected yield. The Texas Cooperative Extension can help determine the kinds and amounts of fertilizer and lime to be applied.

Erosion is an important consideration on upland fields and sloping bottom-land fields. Productivity is reduced when the surface layer is lost and part of the subsoil is incorporated into the plow layer. Erosion is especially damaging on soils that have a clayey subsoil and a loamy surface layer.

Erosion-control practices provide a protective cover of vegetation, reduce the runoff rate, and increase the rate of water infiltration. A cropping system that keeps vegetation on the soil for extended periods can hold soil losses to an amount that will not reduce the productive capacity of the soil. Keeping a cover of crop residue on the surface minimizes surface crusting, helps to prevent the compaction of the surface by rain and by farm machinery, and conserves soil moisture.

Crop 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 map units in the survey area 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 also are 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.

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

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

The local office of the Natural Resources Conservation Service or of the Texas Cooperative Extension can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The 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, or for engineering purposes.

In the capability system, soils are generally grouped at three levels—capability class, subclass, and unit (USDA, 1961). Only class and subclass are used in this survey.

Capability classes, the broadest groups, are designated by the numbers 1 through 8. The numbers indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class 1 soils have few limitations that restrict their use.

Class 2 soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class 3 soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class 4 soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class 5 soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class 6 soils have severe limitations that make them generally unsuitable for cultivation.

Class 7 soils have very severe limitations that make them unsuitable for cultivation.

Class 8 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, 2e. 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 1 there are no subclasses because the soils of this class have few limitations. Class 5 contains only the subclasses indicated by *w, s,* or *c* because the soils in class 5 are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

The capability classification of map units in this survey area is given in the section “Detailed Soil Map Units” and in the yields table.

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 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. Slope ranges mainly from 0 to 5 percent. More detailed information about the criteria for prime farmland is available at the local office of the Natural Resources Conservation Service.

About 98,000 acres in the survey area, or about 26 percent of the total acreage, meets the soil requirements for prime farmland. Most of the prime farmland soils are along the prairie area in the northwestern part of the county and on the flood plain along the Brazos River. About 42,500 acres on this flood plain is used for cotton, corn, and grain sorghum. Most of the remaining acreage of prime farmland soils has been cultivated in the past and is now pasture or is planted to small grain used for livestock grazing.

A recent trend in land use in some parts of the survey area has been the loss of some prime farmland to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal

lands, which generally are more erodible, droughty, and less productive and cannot be easily cultivated.

The map units in the survey area that are considered prime farmland are listed at the end of this section. This list does not constitute a recommendation for a particular land use. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps. The soil qualities that affect use and management are described under the heading "Detailed Soil Map Units."

BeA Benchley loam, 0 to 1 percent slopes
BeB Benchley loam, 1 to 3 percent slopes
BuB Burleson clay, 1 to 3 percent slopes
BuC Burleson clay, 3 to 5 percent slopes
ChC Chazos loamy fine sand, 1 to 5 percent slopes
CoA Coarsewood silt loam, 0 to 1 percent slopes, rarely flooded
DmA Dimebox clay, 0 to 1 percent slopes
GyC Greenvine clay, 2 to 5 percent slopes
HbA Highbank silty clay loam, 0 to 1 percent slopes, rarely flooded
LuB Luling clay, 1 to 3 percent slopes
RaB Rader fine sandy loam, 0 to 2 percent slopes
RbA Rader-Tabor complex, 1 to 3 percent slopes
RsC Rosanky fine sandy loam, 2 to 5 percent slopes
ShA Ships clay, 0 to 1 percent slopes, rarely flooded
ShC Ships clay, 1 to 5 percent slopes, rarely flooded
SmC Silawa fine sandy loam, 2 to 5 percent slopes
SpB Spiller loamy fine sand, 1 to 3 percent slopes
WeA Weswood silt loam, 0 to 1 percent slopes, rarely flooded
WeC Weswood silt loam, 1 to 5 percent slopes, rarely flooded
WwA Weswood silty clay loam, 0 to 1 percent slopes, rarely flooded
YaA Yahola fine sandy loam, 0 to 1 percent slopes, rarely flooded

Pasture and Hayland

Rick Leopold, agronomist, Natural Resources Conservation Service, helped prepare this section.

Land used for pasture and hay in Brazos County is mainly planted to introduced grasses that respond to recommended management practices. Some of the species used are common and hybrid varieties of bermudagrass, bahiagrass, and kleingrass. Established bermudagrass and many other grass species can be overseeded with winter annuals, such as adapted clovers, ryegrass, or small grain, for additional winter and early spring forage. Some cropland fields are used continuously for annual winter pasture production. Fall-seeded annual forage crops planted on prepared seedbeds typically yield 20 to 50 percent more than those overseeded on perennial warm-season grass pasture.

Well managed perennial warm-season pasture grasses typically produce more forage than is needed during the peak of the growing season. The excess grass is often harvested as hay for use during the winter. Some perennial grass is managed strictly for hay production. Annual plantings of forage sorghum provide an additional source of hay and some grazing.

Year-round forage programs can be developed by selecting and managing adapted winter forage species. Such a planned grazing system maximizes production by providing a guide to stocking rates, allowing timely rest periods from grazing, and providing more efficient forage harvest.

Recommended pasture management practices include adequate fence arrangement for rotation grazing and efficient use of forage. Proper use of forage ensures that plant vigor remains high for continued production and for protection from erosion. The selection of the best-adapted plants that meet the yield and economic goals of the operation is important. In a well managed pasture, weeds and brush are controlled, fertilizer is applied at the proper time and in the recommended amount, and an adequate supply of water is available for livestock.

Application of recommended amounts of fertilizer should be accomplished by splitting applications throughout the growing season, such as after grazing cycles in pasture or after harvest on hayland. This practice is particularly important on sandy soils because of the potential for nitrogen and other nutrients to leach into ground water. Split applications should also be used on sloping clay soils because of their high runoff potential. In some pastures, applications of agricultural limestone are needed to correct acidity problems and to allow better utilization of applied nutrients by plants. Soil pH should be maintained at a minimum of 5.5 for most grasses. If legumes are to be overseeded, a pH of at least 6.0 should be maintained.

Hay production requires the same high management standards as pasture production. Also, cutting the forage at the proper interval and height based on species requirements helps to maintain stand vigor and promotes timely regrowth. Large areas are used for quality hay production. Various methods

of harvest are used to store the hay. Maintaining high fertility and following recommended growth periods help to produce large amounts of high-protein hay.

Pasture and Hayland Yields

For the purpose of determining potential annual pasture yields, the soils of Brazos County have been rated and assigned to pasture management groups based on characteristics that affect plant establishment and growth. Some of these characteristics include surface texture, thickness of the topsoil, drainage, erosion, available water capacity, permeability, and overall soil depth. The pasture management group for the soils in the survey area is given under the heading "Detailed Soil Map Units."

The yields shown in the pasture management groups represent current (1993) yield estimates for established grasses, which are usually attainable by following recommended management practices, assuming average weather patterns. Recommended management practices include setting economically feasible yield goals and establishing and maintaining the proper fertility levels based on the results of current soil tests; applying a system of intensive rotation grazing; controlling weeds, insects, and diseases; and applying brush management. Many soils in Brazos County have a very slowly permeable clay subsoil that restricts water infiltration and root penetration, and thus they have a less than desirable soil-plant-water relationship.

The yield for pasture is expressed in animal unit months (AUM) for the grass most commonly grown in each group. An animal unit month is the length of time that the forage produced on 1 acre will feed one animal unit at a given utilization rate. An animal unit is the equivalent of one 1,000-pound animal. For example, a yield of 8 animal unit months provides forage for one animal unit for 8 months. Thus, 1.5 acres producing at this rate is needed to provide adequate forage for one animal unit for a year. Estimated forage yields are given in table 5 for all soils suitable for pasture. These yields are based on a utilization rate of 60 percent. Utilization rate is the amount of the total forage produced that is actually consumed by the livestock. The remaining forage may be lost to grazing because of trampling or fouling by manure, or it can be left to ensure erosion control and continued productivity. Utilization typically decreases as the rotation period lengthens. Hay yields in tons per acre can be estimated by multiplying the AUMs listed in table 5 by 1.67.

The following descriptions of the pasture management groups list the soil characteristics that affect pasture production, the major adapted grasses and legumes, yield estimates of major grasses, management problems, and soil limitations associated with forage production. Additional information is provided in the sections "Detailed Soil Map Units" and "Soil Series and Their Morphology."

Pasture Management Group 1 includes the Benchley, Highbank, Sandow, and Weswood soils in map units BeA, BeB, HbA, Sa, WeA, WeC, WwA, and Wy. These nearly level soils are on uplands and flood plains and are moderately well drained or well drained. They have a loamy surface layer over a loamy and clayey subsoil.

These soils are very well suited to the production of grasses and legumes and have no major limitations for pasture production. Adapted grasses include hybrid bermudagrass, common bermudagrass, kleingrass, old world bluestem, and switchgrass. Bahiagrass can be grown on Benchley and Sandow soils because of the pH levels of these soils. Bigbee berseem clover, hairy vetch, and singletary peas are adapted legumes that are suitable for all of the soils, except the Benchley and Sandow soils. Crimson clover, arrowleaf clover, subterranean clover, rose clover, and hairy vetch are legumes suitable for the Benchley and Sandow soils. If recommended management is applied, hybrid bermudagrass can produce about 8 animal unit months of grazing in a normal year.

Pasture Management Group 2 includes the Dutek, Navasan, Padina, Robco, and Styx soils in map units DuC, NvB, PaC, RoB, and SxB. These sloping soils are on terraces and are moderately well drained or well drained. They have a sandy surface layer that is 20 to 40 inches thick over a loamy subsoil.

These soils are very well suited to the production of grasses and legumes. The available water capacity is a limitation resulting from the sandy textures. The movement of fertilizer and chemicals through the soil is restricted.

Adapted grasses include hybrid bermudagrass, lovegrass, and switchgrass. Legumes that are adapted are crimson clover, hop clover, rose clover, and hairy vetch. If recommended management is applied, hybrid bermudagrass can produce about 7 animal unit months of grazing in a normal year.

Pasture Management Group 3 includes the Coarsewood, Uhland, and Yahola soils in map units CoA, Uh, and YaA. These nearly level soils are on flood plains and are moderately well drained or well drained. They are loamy throughout.

These soils are very well suited to the production of grasses and legumes. The available water capacity is a limitation.

Adapted grasses include hybrid bermudagrass,

kleingrass, and switchgrass. Adapted legumes that are suitable for the alkaline soils are bigbee berseem clover, hairy vetch, and singletary pea. Bahiagrass, crimson clover, arrowleaf clover, subterranean clover, rose clover, and hairy vetch are adapted to the more acid Uhland soils. If recommended management is applied, hybrid bermudagrass can produce about 7 animal unit months of grazing in a normal year.

Pasture Management Group 4 includes the Rader and Tabor soils in map units RaB, RbA, and TaA. These nearly level to gently sloping soils are on uplands and terraces and are moderately well drained. They have a loamy surface layer that is 10 to 20 inches thick over a clayey subsoil.

These soils are very well suited to the production of grasses and legumes. The available water capacity is a limitation. In areas that have slopes of more than 1 percent, erosion is a hazard during pasture establishment or renovation and if pastures are overgrazed.

Adapted grasses are hybrid bermudagrass, bahiagrass, common bermudagrass, kleingrass, old world bluestem, and switchgrass. Adapted legumes are ball clover, crimson clover, arrowleaf clover, subterranean clover, rose clover, and hairy vetch. If recommended management is applied, hybrid bermudagrass can produce about 7 animal unit months of grazing in a normal year.

Pasture Management Group 5 includes the Chazos, Rosanky, Silawa, and Spiller soils in map units ChC, ChD, RsC, RsD, SmC, SmD, and SpB. These nearly level to moderately sloping soils are on uplands and terraces and are moderately well drained or well drained. They have a loamy surface layer and a subsoil that ranges from loamy to clayey.

These soils are well suited to the production of grasses and legumes. The available water capacity is a limitation. In areas that have slopes of more than 1 percent, erosion is a hazard during pasture establishment or renovation and if pastures are overgrazed. Yields are lower in the steeper areas.

Adapted grasses include hybrid bermudagrass, bahiagrass, common bermudagrass, and switchgrass. Adapted legumes include crimson clover, arrowleaf clover, rose clover, and hairy vetch. If recommended management is applied, hybrid bermudagrass can produce about 6 to 7 animal unit months of grazing in a normal year.

Pasture Management Group 6 includes the Burleson, Dimebox, Kaufman, Luling, and Ships soils in map units BuA, BuB, BuC, DmA, Ka, LuB, LuD, ShA, and ShC. These nearly level to moderately sloping soils are on uplands and flood plains and are moderately well drained or well drained. They are clayey throughout.

These soils are well suited to the production of grasses and legumes. Clay textures are a limitation affecting water intake and recovery after dry seasons. In areas that have slopes of more than 1 percent, erosion is a hazard during pasture establishment or renovation and if pastures are overgrazed. The use of soils on flood plains may be restricted during wet seasons.

Adapted grasses are hybrid bermudagrass, kleingrass, bahiagrass, common bermudagrass, old world bluestems, and switchgrass. Adapted legumes are subterranean clover, rose clover, and hairy vetch. If recommended management is applied, hybrid bermudagrass can produce about 6 animal unit months of grazing in a normal year.

Pasture Management Group 7 includes the Axtell, Boonville, Crockett, Gredge, Lufkin, Mabank, and Wilson soils in map units AxB, BoA, BoB, CrB, GrC, LfA, MaA, MrA, and WzA. These nearly level to gently sloping soils are on uplands and terraces and are somewhat poorly drained to well drained. They have a loamy surface layer over a dense, clayey subsoil.

These soils are well suited to the production of grasses and legumes. The available water capacity is a limitation. In areas that have slopes of more than 1 percent, erosion is a hazard during pasture establishment or renovation and if pastures are overgrazed.

Adapted grasses are hybrid bermudagrass, bahiagrass, kleingrass, common bermudagrass, old world bluestems, and switchgrass. Adapted legumes are ball clover, subterranean clover, rose clover, and hairy vetch. If recommended management is applied, hybrid bermudagrass can produce about 6 animal unit months of grazing in a normal year.

Pasture Management Group 8 includes the Rehburg and Shiro soils in map units ReC and SkB. These gently sloping soils are on uplands and are moderately well drained or well drained. They have a sandy surface layer over a loamy subsoil.

These soils are moderately suited to the production of grasses and legumes. The available water capacity is a limitation. Erosion is a hazard during pasture establishment or renovation and if pastures are overgrazed.

Adapted grasses include hybrid bermudagrass, common bermudagrass, bahiagrass, lovegrass, and switchgrass. Adapted legumes are arrowleaf clover, crimson clover, hop clover, and hairy vetch. If recommended management is applied, hybrid

bermudagrass can produce about 5 to 6 animal unit months of grazing in a normal year.

Pasture Management Group 9 includes the Crockett, Gredge, and Kurten soils in map units CrB2, GrC2, GrD, KuC, and KuD. These gently sloping to moderately sloping soils are on uplands and terraces and are moderately well drained. They have a thin, loamy surface layer over a dense, clayey subsoil.

These soils are moderately well suited to the production of grasses and legumes. The available water capacity is a limitation. Erosion is a hazard during pasture establishment or renovation and if pastures are overgrazed.

Adapted grasses are hybrid bermudagrass, bahiagrass, kleingrass, common bermudagrass, old world bluestems, and switchgrass. Adapted legumes are ball clover, subterranean clover, rose clover, and hairy vetch. If recommended management is applied, hybrid bermudagrass can produce about 5 animal unit months of grazing in a normal year.

Pasture Management Group 10 includes the Desan and Eufaula soils in map units DfC and EuB. These gently sloping soils are on terraces and are somewhat excessively drained. They have a sandy surface layer that is more than 40 inches thick over a subsoil that ranges from loamy to sandy.

These soils are moderately suited to the production of grasses and legumes. The low available water capacity and excessive drainage are limitations. The leaching of fertilizer and chemicals may be a problem.

Adapted grasses are hybrid bermudagrass, lovegrass, and switchgrass. Adapted legumes are crimson clover, hop clover, and hairy vetch. If recommended management is applied, hybrid bermudagrass can produce about 4 to 5 animal unit months of grazing in a normal year.

Pasture Management Group 11 includes the Falba, Singleton, Zack, and Zulch soils in map units FaB, SnB, ZaB, and ZuB. These gently sloping soils are on uplands and are moderately well drained. They have a thin, loamy surface layer over a dense, clayey subsoil and have parent material within a depth of 40 inches.

These soils are moderately suited to the production of grasses and legumes. The available water capacity is a limitation. Erosion is a hazard during pasture establishment or renovation and if pastures are overgrazed.

Adapted grasses are hybrid bermudagrass, bahiagrass, common bermudagrass, kleingrass, old world bluestem, and switchgrass. Adapted legumes are ball clover, crimson clover, arrowleaf clover, subterranean clover, rose clover, and hairy vetch. If recommended management is applied, hybrid bermudagrass can produce about 4 animal unit months of grazing in a normal year.

Pasture Management Group 12 includes the Derly and Rader soils in map unit DeA. These nearly level, moundy soils are on terraces and are poorly drained to moderately well drained. They have a loamy surface layer over a clayey subsoil.

These soils are moderately suited to the production of grasses and legumes. The available water capacity is a limitation in areas of the Derly soil. Drainage is a problem during certain seasons in areas of the Derly soil.

Adapted grasses are hybrid bermudagrass, bahiagrass, common bermudagrass, old world bluestems, and switchgrass. Adapted legumes are white clover and ball clover. If recommended management is applied, hybrid bermudagrass can produce about 4 animal unit months of grazing in a normal year (based on map unit composition of 70 percent Derly soil and 30 percent Rader soil).

Pasture Management Group 13 includes the Burlewash and Zack soils in map units BwC, ZaC2, and ZaD. These moderately sloping or strongly sloping soils are on uplands and are moderately well drained. They have a thin, loamy surface layer over a dense, clayey subsoil.

These soils are very poorly suited to the production of grasses and legumes. The low available water capacity and low natural fertility are limitations. Some areas are already eroded, and further erosion is a hazard, especially during pasture establishment or renovation and if pastures are overgrazed.

Adapted grasses are hybrid bermudagrass, bahiagrass, common bermudagrass, kleingrass, old world bluestem, and switchgrass. Adapted legumes are ball clover, crimson clover, arrowleaf clover, subterranean clover, rose clover, and hairy vetch. If recommended management is applied, hybrid bermudagrass can produce about 2 animal unit months of grazing in a normal year.

Pasture Management Group 14 includes the Burlewash, Gladewater, Gredge, Koether, Roetex, Rosanky, Shalba, Tabor, and Zack soils in map units BwD, Gd, GvC, KrD, Rr, RtC, ScC, TgB, and ZaE3. These soils are not considered suitable for pasture of hybrid grasses and legumes. Most have yields of 2 animal unit months or less because of flooding, shallow depth to bedrock, a gravelly surface, the loss of topsoil, the slope, or large gullies. These soils are suitable only for use as rangeland or wildlife habitat or as intensive treatment areas for erosion control without livestock grazing.

Rangeland

John C. Copeland, area resource conservationist, and Duane Garner, district conservationist, Natural Resources Conservation Service, prepared this section.

The native forage in Brazos County consists of rangeland vegetation of the Southern Blackland Prairie and the Southern Claypan Major Land Resource Areas (USDA, 1981).

Rangeland is land on which the native vegetation (the historic climax plant community or the potential natural plant community) is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing use. Rangeland receives no regular or frequent cultural treatment. Management that is designed to conserve the soil and water and improve production is accomplished by balancing livestock numbers to forage production and by rotating livestock so that the vigor of desirable plants is improved and the plants are allowed to produce seed and establish seedlings. In Brazos County, about 109,000 acres, or 29 percent of the total acreage, is rangeland.

When Brazos County was first settled by Europeans, the rangelands were open prairies and open post oak/blackjack oak savannahs. The flood plains along the Brazos and Navasota Rivers were heavily wooded and had only a few open areas of herbaceous vegetation. The open upland prairies were along the northern boundary of the county and at the extreme southern tip.

The climax prairie vegetation consisted of little bluestem, indiangrass, switchgrass, big bluestem, native legumes, and forbs. A few large oak, elm, and hackberry trees grew along the draws or in scattered motts. The climax savannah typically was an open stand of trees or motts of trees and an understory of little bluestem, indiangrass, purpletop, brownseed paspalum and other paspalums, and low panicums. The savannah also supported a variety of native legumes, forbs, and woody shrubs and vines.

The trees on flood plains consisted of oak, elm, hackberry, pecan, cottonwood, ash, black willow, and sycamore. The understory included hawthorns, Alabama supplejack, green briar, peppervine, trumpetcreeper, honeysuckle, grapes, and berry vines.

In the moist, open areas of bottom land along the rivers, the herbaceous vegetation included sedges, Virginia wildrye, Canada wildrye, Florida paspalum, hairawn muhly, and Texas bluegrass but was dominated by switchgrass, indiangrass, big bluestem, eastern gamagrass, vine mesquite, and beaked panicum. In the drier open areas, little bluestem was dominant along with midheight perennial panicums, paspalums, dropseeds, Texas wintergrass, bristlegrass, and sideoats grama.

Wildfires were a natural part of the rangeland ecosystem on the uplands in the county. The repeated burning of the area by wildfires helped to control the spread and thickening of the trees and underbrush and promoted the production of the tall grasses, legumes, and forbs. After the county was settled, a number of events changed the climax range vegetation. Most of the rangelands were plowed up and planted to cotton, corn, and cane. Wildfires were suppressed, fences were constructed, and domestic livestock were confined on the remaining rangelands, resulting in overgrazing of the tall grasses, legumes, and forbs. This overgrazing led to a rapid increase in the savannah areas of a woody canopy of oak and associated brush species that shaded the understory plant community. The sun-loving native tall grasses were grazed and shaded out, the more shade-tolerant perennials increased, and annuals, such as sixweeks fescue, invaded. Increased grazing pressure on any remaining prairie rangelands caused a decrease in the most productive tall species and an increase in the less productive mid grasses and invading species.

A large portion of the current rangeland in the county has been farmed in the past. Farming of cropland fields was discontinued, and herbaceous and woody vegetation was allowed to become reestablished. The vegetation consists of species that were able to reestablish from surrounding seed sources. Only a few areas of this type of range were managed for the purpose of promoting the better native species. Consequently, most rangeland does not currently support vegetation similar to that which grew before the county was settled. Forage production is now very limited both in areas of prairie and in areas of oak thickets that were once lush grasslands. A few small isolated areas that still produce good range vegetation have been protected from grazing or have had only limited grazing for many years.

In areas that have similar climate and topography, differences in the kind and amount of vegetation produced on rangeland are closely related to the kind of soil. Effective management is based on the relationship between the soils and vegetation and water.

Table 6 shows, for each soil that supports rangeland vegetation, the ecological site and the potential annual production of vegetation in favorable, normal, and unfavorable years. An explanation of the column headings in the table follows.

An *ecological site*, sometimes called a range site, is the product of all the environmental factors

responsible for its development. It has characteristic soils that have developed over time throughout the soil development process; a characteristic hydrology, particularly infiltration and runoff, that has developed over time; and a characteristic plant community (kind and amount of vegetation). The hydrology of a site is influenced by development of the soil and plant community. The vegetation, soils, and hydrology are all interrelated. Each is influenced by the others and influences the development of the others. The plant community on an ecological site is typified by an association of species that differs from that of other ecological sites in the kind and/or proportion of species or in total production. Descriptions of ecological sites are provided at the end of this section and in the Field Office Technical Guide, which is available in local offices of the Natural Resources Conservation Service.

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, normal, and unfavorable years. In a favorable year, the amount and distribution of precipitation and the temperatures make growing conditions substantially better than average. In a normal year, growing conditions are about average. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture. Yields are adjusted to a common percent of air-dry moisture content.

Range management requires a knowledge of the kinds of soil and of the potential natural plant community. It also requires an evaluation of the present range similarity index and rangeland trend. Range similarity index is determined by comparing the present plant community with the potential natural plant community on a particular rangeland ecological site. The more closely the existing community resembles the potential community, the higher the range similarity index. Rangeland trend is defined as the direction of change in an existing plant community relative to the potential natural plant community. Further information about the range similarity index and rangeland trend is available in chapter 4 of the "National Range and Pasture Handbook" (http://www.ftw.nrcs.usda.gov/glti/NRPH.html).

The objective in range management is to control grazing so that the plants growing on a site are about the same in kind and amount as the potential natural plant community for that site. Sometimes, however, an area with a range similarity index somewhat below the potential meets grazing needs, provides wildlife habitat, and protects soil and water resources.

The primary range management practices used in Brazos County include prescribed grazing, stock-water development, and fences. If undesirable plants become dominant, range seeding, brush management, or prescribed burning is commonly used. Effective range management conserves rainfall, enhances water quality, reduces the hazard of downstream flooding, improves yields and provides forage for livestock and wildlife, enhances recreational opportunities, and controls soil erosion.

The ten ecological sites in the survey area are: Blackland, Clay Loam, Clayey Bottomland, Claypan Prairie, Claypan Savannah, Deep Sand, Gravelly, Loamy Bottomland, Sandy, and Sandy Loam.

Blackland Ecological Site

The Burleson, Dimebox, Greenvine, and Luling soils in map units BuA, BuB, BuC, DmA, GyC, LuB, and LuD are in the Blackland ecological site. The climax vegetation is a tall grass prairie and a few large live oak, elm, and hackberry trees along the draws and in scattered motts. The composition, by weight, is 85 percent grasses, 5 percent woody plants, and 10 percent forbs. This site has high natural fertility.

Little bluestem, indiangrass, and big bluestem produce 75 percent of the forage in climax condition. Many other grasses, mainly switchgrass, sideoats grama, Texas wintergrass, Texas cupgrass, tall dropseed, silver bluestem, longspike tridens, Florida paspalum, and Virginia wildrye, make up the other 10 percent. Woody plants are live oak, elm, hackberry, bumelia, and coralberry. About 34 forbs grow on this site.

Overgrazing by cattle eventually kills out the little bluestem, big bluestem, indiangrass, switchgrass, and eastern gamagrass. These species are replaced by silver bluestem, Texas wintergrass, sideoats grama, tall dropseed, and other mid grasses. If these grasses are overgrazed, buffalograss will dominate the site with annual forbs and an invasion of mesquite, huisache, osageorange, winged elm, honeylocust, Texas grama, and tumblegrass.

Clay Loam Ecological Site

The Benchley soils in map units BeA and BeB are in the Clay Loam ecological site. The climax plant community is a tall grass prairie that is highly productive. Hackberry, elm, and pecan trees grow along drainageways, and oak trees may be widely

scattered over the site. The composition, by weight, is 90 percent grasses, 5 percent woody plants, and 5 percent forbs.

About 70 percent of the climax plant community is little bluestem, indiangrass, and big bluestem. Sideoats grama, switchgrass, Florida paspalum, Canada wildrye, silver bluestem, tall dropseed, and Texas wintergrass make up 15 percent. Other short grasses, such as buffalograss, make up 5 percent. The woody plants include hackberry, elm, pecan, and oak. The forbs are Maximilian sunflower, Engelmann daisy, and bundleflower.

Continued overgrazing by cattle decreases big bluestem, little bluestem, indiangrass, switchgrass, Florida paspalum, and palatable forbs. These grasses are replaced by increasers, such as sideoats grama, silver bluestem, Texas wintergrass, tall dropseed, low panicums, and less palatable forbs. If these plants are grazed out, the site will be dominated by buffalograss, Texas wintergrass, Texas grama, hairy grama, threeawn, windmillgrass, tumblegrass, western ragweed, and prairie coneflower and by woody plants, such as mesquite.

Clayey Bottomland Ecological Site

The Gladewater, Kaufman, Roetex, and Ships soils in map units Gd, Ka, Rr, ShA, and ShC are in the Clayey Bottomland ecological site. The climax plant community is a savannah with a 40 percent canopy of oak, elm, hackberry, cottonwood, ash, black willow, pecan, and other large trees. The canopy generally is heavier adjacent to streams. Cool-season grasses and sedges grow under the canopy, and warm-season grasses and forbs dominate the openings. The composition, by weight, is 70 percent grasses, 25 percent woody plants, and 5 percent forbs.

Sedges, Virginia wildrye, Canada wildrye, and rustyseed paspalum produce 35 percent of the composition by weight. Beaked panicum, switchgrass, indiangrass, little bluestem, big bluestem, eastern gamagrass, vine mesquite, and Florida paspalum produce 25 percent. Buffalograss, longleaf uniola, knotroot bristlegrass, and other grasses produce 10 percent. Woody plants include oak, elm, cottonwood, hackberry, black willow, pecan, and hawthorn trees and woody vines. The forbs are tickclover, snoutbean, lespedeza, and gayfeather.

This ecological site is preferred by livestock. Heavy grazing and suppression of fire reduce the warm-season grasses and forbs and allow the brush to form a dense canopy. Shade-tolerant grasses then dominate the herbaceous production, and total usable forage is drastically reduced.

Claypan Prairie Ecological Site

The Boonville, Crockett, Mabank, Wilson, Zack, and Zulch soils in map units BoA, BoB, CrB, CrB2, MaA, MrA, WzA, ZaB, ZaC2, ZaD, ZaE3, and ZuB are in the Claypan Prairie ecological site. The climax plant community is a tall grass prairie or a very open savannah with a few scattered live oak, elm, and hackberry trees along watercourses or in scattered motts.

Little bluestem and indiangrass compose 65 percent of the climax plant community. Switchgrass, big bluestem, Virginia wildrye, Canada wildrye, Florida paspalum, sideoats grama, meadow dropseed, Texas wintergrass, vine mesquite, and Texas cupgrass produce 15 percent. Purpletop, brownseed paspalum, longspike tridens, buffalograss, low panicums, fall witchgrass, and sedges make up 5 percent. Live oak, elm, hackberry, bumelia, coralberry, and post oak make up 5 percent of the total production. Many forbs, such as Maximilian sunflower, Engelmann daisy, halfshrub sundrop, western indigo, and prairie-clover, make up 10 percent of the composition.

If continued overgrazing is allowed, big bluestem, little bluestem, indiangrass, and switchgrass decrease and meadow dropseed, silver bluestem, sideoats grama, and Texas wintergrass increase. Finally, mesquite and pricklypear invade the site and buffalograss, Texas wintergrass, Texas grama, windmillgrass, and weedy forbs dominate.

Claypan Savannah Ecological Site

The Axtell, Burlewash, Derly, Falba, Gredge, Koether, Kurten, Lufkin, Shalba, and Singleton soils in map units AxB, BwC, BwD, DeA, FaB, GrC, GrC2, GrD, KrD, KuC, KuD, LfA, ScC, and SnB are in the Claypan Savannah ecological site. The climax plant community is a post oak and blackjack oak savannah with trees shading 20 to 25 percent of the ground. Mid and tall grasses dominate the understory. The composition, by weight, is about 75 percent grasses, 20 percent woody plants, and 5 percent forbs.

About 60 percent 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, sensitivebriar, tickclover, wildbean, and lespedeza.

If retrogression occurs as a result of heavy grazing

or fire suppression (or both), 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 Ecological Site

The Desan, Eufaula, Navasan, and Padina soils in map units DfC, EuB, NvB, and PaC are in the Deep Sand ecological site. The climax vegetation is a savannah of bluejack oak, blackjack oak, and post oak with 20 to 25 percent woody canopy. The composition, by weight, is 80 percent grasses, 15 percent woody plants, and 5 percent forbs.

About 65 percent of the composition is little bluestem, indiangrass, switchgrass, sand lovegrass, and purpletop. Other grasses are low panicums, low paspalums, purple lovegrass, sand dropseed, and splitbeard bluestem. Woody plants, such as bluejack oak, blackjack oak, and post oak, make up 10 percent of the composition. Other woody plants include shrubs, such as yaupon, hawthorn, and American beautyberry. The forbs include lespedeza, tickclover, wildbean, and partridge pea.

As retrogression takes place, little bluestem, sand lovegrass, indiangrass, and purpletop decrease and low panicums, low paspalums, purple lovegrass, and woolysheath threeawn increase on the site. Oak and yaupon increase to form a dense canopy. The decreasing and increasing plants are finally replaced by red lovegrass, tumble lovegrass, crabgrass, red sprangletop, sandbur, brackenfern, pricklypear, and queensdelight. Production of forage species is halted.

Gravelly Ecological Site

Gredge very gravelly fine sandy loam and Tabor gravelly fine sandy loam in map units GvC and TgB are in the Gravelly Ecological Site. The climax plant community is a post oak and blackjack oak savannah with trees shading about 15 to 20 percent of the ground. The composition, by weight, is about 75 percent grasses, 20 percent woody plants, and 5 percent forbs.

About 50 percent of the climax vegetation is little bluestem. Indiangrass, switchgrass, beaked panicum, and purpletop make up an additional 15 percent. Other grasses include brownseed paspalum, sideoats grama, purple lovegrass, hairy dropseed, low panicums, fall witchgrass, silver bluestem, arrowfeather threeawn, Carolina jointtrail, and sedges. Post oak and blackjack oak make up 15 percent of the total production. Other woody plants include hickory, hawthorns, American beautyberry, greenbriar, berry vines, and yaupon. Forbs include lespedezas, tickclover, bundleflowers, sensitivebriar, wildbean, snoutbeans, partridge pea, dayflowers, croton, and western ragweed.

As retrogression occurs, brownseed paspalum and woody plants increase and replace the more palatable grasses and forbs on the site. Oaks and brush, such as yaupon, greenbriar, hawthorns, and American beautyberry, commonly form a dense thicket, which severely limits herbaceous production. Other invading species include annual grasses, weeds, low-quality forbs, baccharis, eastern redcedar, mesquite, and winged elm.

Loamy Bottomland Ecological Site

The Coarsewood, Highbank, Sandow, Uhland, Weswood, and Yahola soils in map units CoA, HbA, Sa, Uh, WeA, WeC, WwA, Wy, and YaA are in the Loamy Bottomland ecological site. The climax plant community is a tall grass savannah with such trees as oak, pecan, hackberry, elm, cottonwood, black willow, sycamore, hickory, and ash shading about 40 percent of the ground. Underbrush consists of shrubs and vines. Cool-season grasses and sedges dominate the shaded areas, and warm-season plants dominate the openings. The composition, by weight, is 70 percent grasses, 25 percent woody plants, and 5 percent forbs.

Virginia wildrye, sedges, and rustyseed paspalum grow in the shaded and wet areas. They make up 25 percent of the composition. Switchgrass, beaked panicum, indiangrass, big bluestem, little bluestem, eastern gamagrass, plumegrass, vine mesquite, and purpletop grow in the open areas and make up 35 percent of the plant community. Redtop panicum, gaping panicum, low panicums, uniolas, buffalograss, knotroot bristlegrass, Texas wintergrass, and other grasses make up 10 percent. The woody plants include oaks, pecan, hackberry, elm, cottonwood, black willow, sycamore, hickory, ash, and many other underbrush species. The forbs are tickclover, lespedeza, snoutbean, partridge pea, and gayfeather.

This site is preferred by livestock. Overgrazing and fire suppression reduce the extent of warm-season grasses and forbs and increase the tree and brush canopy. Shade-tolerant grasses and forbs then dominate the herbaceous production, and forage production is drastically reduced.

Sandy Ecological Site

The Dutek, Rehburg, Robco, and Styx soils in map units DuC, ReC, RoB, and SxB are in the Sandy Ecological Site. The climax vegetation is an open

savannah of post oak and blackjack oak. These trees shade 25 to 30 percent of the ground. The interspaces are predominantly tall grasses. The composition, by weight, is 75 percent grasses, 20 percent woody plants, and 5 percent forbs.

About 50 percent of the composition is little bluestem, and indiangrass makes up 10 percent. Switchgrass, beaked panicum, sand lovegrass, purpletop, and brownseed paspalum total 10 percent. Other grasses are fringeleaf paspalum, purple lovegrass, tall dropseed, splitbeard bluestem, and low panicums. Post oak and blackjack oak make up about 15 percent of the total annual production. Woody plants in the understory are hawthorn, American beautyberry, greenbriar, yaupon, and berry vines. The forbs are lespedeza, tickclover, sensitivebriar, snoutbean, tephrosia, partridge pea, and western ragweed.

If continuous overgrazing is allowed and natural fires are suppressed, the taller grasses are grazed out, shaded out, or both by an increasing canopy of woody species. Little bluestem, indiangrass, and switchgrass are replaced by brownseed paspalum, tall dropseed, fall witchgrass, and other increasing species. These species, in turn, are grazed out and replaced by red lovegrass, yankeeweed, bullnettle, snakecotton, and croton. Other invading plants are broomsedge bluestem, smutgrass, sandbur, pricklypear, queensdelight, beebalm, pricklypoppy, baccharis, and waxmyrtle. Woody species increase and invade to form dense thickets.

Sandy Loam Ecological Site

The Chazos, Rader, Rosanky, Shiro, Silawa, Spiller, and Tabor soils in map units ChC, ChD, DeA, MrA, RaB, RbA, RsC, RsD, RtC, SkB, SmC, SmD, SpB, and TaA are in the Sandy Loam Ecological Site. The climax vegetation is a post oak and blackjack oak savannah with a 25 to 30 percent canopy. Tall grasses fill the interspaces. The composition, by weight, is 75 percent grasses, 20 percent woody plants, and 5 percent forbs.

The dominant grass on this site is little bluestem, which makes up 50 percent of the composition. Indiangrass makes up about 10 percent. Eastern gamagrass, switchgrass, big bluestem, brownseed paspalum, beaked panicum, and longleaf uniola make up 10 percent of the total composition, and numerous other grasses make up another 10 percent. Post oak and blackjack oak make up about 10 percent of the total annual production. Other woody plants include elm, hackberry, hickory, yaupon, greenbriar, American beautyberry, and berry vines. The forbs include Engelmann daisy, gayfeather, sensitivebriar, and native legumes.

If wildfires are suppressed and if overgrazing continues, this ecological site will deteriorate. The deterioration is characterized by an increase in woody canopy and a decline in tall grasses, such as little bluestem, indiangrass, big bluestem, and eastern gamagrass. These plants are replaced by an increase in such plants as brownseed paspalum. If overgrazing persists, the site deteriorates to thickets of oak and brush, annual grasses, forbs, and carpetgrass.

Gardening and Landscaping

Janell H. Zeigler, Texas master gardener, prepared this section.

Gardening in Brazos County can be a challenge because of the hot dry summers and the special characteristics of many of the soils. With proper plant selection and soil management, however, gardening can be successful.

Good landscape design is of foremost importance in creating a plan for the best possible use of the area. The current and future needs of the area should be considered. The services of a landscape architect are available to those who want professional help. Help is also available through the Texas Cooperative Extension. This soil survey can provide information regarding soil types and characteristics. Specific properties of the soil can also be determined from onsite observation.

The plants chosen should be suitable for the site. Important considerations when plants are selected include form, mature size, color, growth habits, maintenance needs, placement on the landscape, and soil, fertility, and water requirements.

In areas of the county where the soils have slow permeability, raised beds for landscaping and gardens are recommended. Additions of humus to the soil can be beneficial. Landscape timbers, railroad ties, and building blocks can be used for edging the raised beds. When plants are selected for home landscaping, the cultural needs of the plants should be considered. For example, eastern magnolia needs acid soil and cool roots. It can be grown as an understory tree, but if it is planted in an open area, the roots should be shaded until the tree can provide its own shade. Using plants that are naturally adapted (native) to the soil is easier than trying to adapt the soil to the plant. Good reference material is available at the local library and in the local offices of the Texas Cooperative Extension.

When home landscaping is planned, the principles

of low-maintenance landscaping and xeriscape land management should be considered. Low-maintenance landscaping is the use of plants that require very little care, such as dwarf varieties that require little pruning and ground cover that needs little or no mowing. Plants or trees that constantly drop blooms, seeds, twigs, and leaves should be avoided. Xeriscape management refers to water conservation through creative design. The seven basic principles are: 1) good design; 2) thorough soil preparation; 3) practical turf areas; 4) appropriate plant selection; 5) effective and efficient watering methods; 6) mulched flower and shrub beds; and 7) proper landscape maintenance. With proper use of plant selection (low water-demand plants) and good cultural practices, the xeriscape principle can be achieved.

In much of Brazos County, the soils have a thin, sandy or loamy surface layer over a dense, very slowly permeable clay subsoil. Reaction in most of these soils is slightly acid to moderately acid. If they are used for landscaping, these soils need drainage, additions of organic material, and added fertility. The modification of soil reaction depends on plant selection. Some of the soils, such as Silawa, Spiller, and Chazos soils, have a more permeable subsoil, are better drained, and are better suited to plant growth.

The sandy soils of the county, such as Styx, Dutek, Robco, Rehburg, Padina, Desan, Navasan, and Eufaula soils, have a limited available water capacity and a low content of organic matter.

The prairie soils of the county, such as Benchley, Wilson, Crockett, Dimebox, Luling, and Burleson soils, are alkaline in reaction and have a relatively high natural fertility. These soils, however, have a high content of clay and thus can be difficult to till.

Table 7 shows the suitability of various plants for landscaping. The soils on the flood plain along the Brazos River are included in the table because they are rarely flooded. Other soils on flood plains, however, are not included because they are frequently flooded and are generally not suited to urban development.

Table 8 provides information about the suitability of selected flowering plants.

Recreation

The soils of the survey area are rated in table 9 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 also are important. Soils that are 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 9, 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.

The information in table 9 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields and interpretations for dwellings without basements and for local roads and streets.

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

Gary Valentine, biologist, Natural Resources Conservation Service, helped prepare this section.

Brazos County is bordered on the west by the Brazos River and on the east by the Navasota River. Major tributaries of the Navasota River are Little Cedar Creek, Cedar Creek, Bowman Creek, Wickson Creek, Carters Creek, and Peach Creek. The Little Brazos River is the major tributary of the Brazos River.

Bryan Lake, an 828-acre impoundment heated by electrical generating effluent, is the largest public fishery in the county. Smaller public and private impoundments dot the countryside in addition to numerous farm ponds and stock-water tanks. The average size of these impoundments equals one-half surface acre.

The Texas Parks and Wildlife Department has identified four wildlife habitat types in Brazos County: (1) cropland on the flood plain along the Brazos River, (2) bottom-land hardwoods and wooded wetlands along the Navasota River, (3) native and introduced pastures around Bryan-College Station and along major highways radiating from the metroplex, and (4) post oak woodlands and savannah, which is the main habitat type in the county.

The cropland area on the Brazos River flood plain provides feeding grounds for certain resident and migratory wildlife. About 1,500 acres of Roetex soils consists of depressional areas that are subject to frequent flooding and prolonged inundation. Many of these areas are wetlands and provide excellent wildlife habitat.

The wooded bottom land along the Navasota River provides the most diverse and productive wildlife habitat in the county. Approximately 20,000 acres of Gladewater and Kaufman soils are subject to frequent flooding and prolonged inundation, and these areas provide habitat for resident and migratory wetland wildlife. Adjacent bottom-land hardwoods support an abundance of game and nongame species. Sandow and Uhland soils are dominant soils in loamy bottom-land areas.

The native and introduced pastures provide only limited cover and food sources for wildlife, especially where they are in close proximity to urbanization. Wooded corridors along streams in these areas provide the most beneficial habitat for wildlife.

Post oak woods and savannahs provide more than half the wildlife habitat in the county. This diverse upland habitat includes many wet depressions. Dominant soils are Boonville, Burlewash, Gredge, Rader, Spiller, Tabor, Zack, and Zulch soils. Derly soils are in the depressions.

The fish population in Bryan Lake is managed primarily for largemouth bass and channel catfish by the Texas Parks and Wildlife Department. The Navasota and Brazos Rivers are fished primarily for channel catfish, blue catfish, and flathead catfish. Other species commonly taken include smallmouth buffalo, freshwater drum, and common carp.

Most farm ponds and the larger private impoundments have been stocked. Technical assistance was provided by the Brazos Soil and Water Conservation District. The District stocking recommendation for ponds less than 1 surface acre is channel catfish. Fathead minnows or a commercial fish ration are recommended as a food source. Largemouth bass and channel catfish are recommended in ponds larger than 1 surface acre. Bluegill sunfish, redear sunfish, threadfin shad, and golden shiner are recommended for bass forage.

White-tailed deer are scattered throughout the county, but the highest population densities are in areas of bottom-land habitat along the Navasota River and its tributaries.

Brazos County does not offer good habitat for bobwhite. A covey of bobwhite, an immobile species, requires a mixture of shrubs, weeds, grasses, and bare ground arranged in proper proportions within a relatively small area, roughly 40 to 60 acres. Current land use and management in the county cannot provide the “patchwork” of covey ranges needed to support significant numbers of this species.

Mourning dove, a migratory and very mobile species, nests and raises young in woodlands and riparian areas. In late summer, birds concentrate in harvested grain fields along the Brazos River to feed on scattered waste grains.

The Texas Parks and Wildlife Department is releasing eastern wild turkey in areas of suitable habitat along the Navasota River and nearby post oak

woodlands. Local landowners are cooperating by protecting released birds from illegal hunting until populations become established.

Migratory waterfowl frequent natural wetlands, streams, and manmade reservoirs. Geese and sandhill cranes feed on small grain crops in areas of bottom land along the Brazos River. Coots, cormorants, ruddy duck, ring-necked duck, and scaups can be observed in open areas of the larger reservoirs. Ring-necked duck, gadwall, and widgeon use the smaller reservoirs and farm ponds during fall and winter. Mallard, pintail, teals, and wood duck feed and roost in shallows of reservoirs and natural wetlands.

Alligators are occasionally reported from natural wetlands along the Navasota River and its major tributaries. Southern bald eagles are known to nest in remote areas of the Navasota wooded bottom land.

Navasota ladies'-tresses, a federally endangered plant, can be found in post oak savannahs in areas of the Burlewash-Singleton general soil map unit. This rare orchid, which does not compete well with dense stands of native bunch grasses, grows best under partial shade where grasses are not dense.

Personnel from the Brazos Soil and Water Conservation District and the Natural Resources Conservation Service have been assisting landowners for 40 years in preparing conservation plans that include practices beneficial for fish and wildlife.

Many of the numerous farm ponds in the county have been built with the assistance of the Natural Resources Conservation Service. In addition to help with siting, designing, and constructing ponds, pond owners have been provided with management plans for recreational fisheries. These plans include recommendations for species and numbers of fish to stock, control of nuisance aquatic vegetation, fertilization, fish population, renovation, and regulation of fish removal by fishing.

Leaving motts (clumps) or strips of brush during brush management can provide "edge" habitat for wildlife. Seeding areas cleared during brush management to a mixture of grasses, legumes, and forbs (broad-leaved herbaceous vegetation) can improve wildlife food supplies.

Grazing systems that defer grazing by domestic livestock during the fawning and nesting seasons (April through June) are encouraged. Proper grazing and prescribed burning benefit many wildlife species in Brazos County.

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

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

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

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flooding. Soil temperature and soil moisture also are considerations. Grain sorghum, oats, wheat, corn, sunflowers, and soybeans are agricultural commodities produced in Brazos County that provide food for many wildlife species. Plantings of Elbon rye, grain sorghum, millets, sunflowers, cowpeas, and sesbania can be established in food plots and specifically benefit white-tailed deer, wild turkey, mourning dove, and waterfowl.

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 also are considerations. Oat and wheat fields and

winter pastures overseeded with annual ryegrass benefit deer, turkey, and geese as well as domestic livestock. Vetches and arrowleaf clover provide food for many wildlife species during the critical period from late winter through early spring.

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 also are considerations. Native grasses that produce large, hard seed consumed by wildlife are Florida paspalum, brownseed paspalum, vine mesquite, low panicums, and bristlegrasses. Little bluestem and tall dropseed have little food value but provide cover if properly managed. Rescuegrass, Canada wildrye, and Virginia wildrye provide winter forage for deer and turkey. Forbs beneficial to wildlife are crotons, snow-on-the-mountain, annual sunflower, annual broomweed, Engelmann daisy, ragweeds, and smartweeds. Legumes are important plants for wildlife. Examples are partridge pea, tickclover, wildbean, vetches, snoutbean, sesbania, and bundleflowers.

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, poplar, cherry, sweetgum, apple, hawthorn, dogwood, hickory, blackberry, and blueberry. Beneficial species in bottom-land habitat are water oak, willow oak, water hickory, pecan, sugarberry, and live oak. Hackberry, bois d'arc, persimmon, and prickly ash are important to wildlife in the open uplands. Post oak woodlands and savannahs support post oak, blackjack oak, black hickory, eastern redcedar, persimmon, Alabama supplejack, mustang grape, postoak grape, and gum elastic.

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. Shrubs that are important for wildlife habitat are greenbriars, dewberry, wild grape, yaupon, deciduous holly, American beautyberry, rusty blackhaw, coralberry, huckleberry, and hawthorns. Most soils in Brazos County are suitable for shrubs.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites, either at the water edge or in areas of deep, open water. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of plants that grow around edges and in shallow areas are arrowheads, sedges, bulrushes, spikesedges, rushes, cattails, smartweed, and umbrella sedge. Aquatic plants, such as water lilies, American lotus, sago pondweed, hydrilla, coontail, bushy pondweed, and longleaf pondweed, grow in the deeper water.

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. Shallow water occurs in areas of Roetex, Gladewater, and Kaufman soils on flood plains along the Navasota and Brazos Rivers. Derly soils on uplands also have natural areas of shallow water. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability.

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 geese, nighthawk, mourning dove, meadowlark, scissor-tailed flycatcher, eastern kingbird, kestrels, harriers, cattle egret, cottontail, coyote, and skunk.

Habitat for woodland wildlife in Brazos County consists mainly of bottom-land hardwoods. Wildlife attracted to these areas include white-tailed deer, wild turkey, squirrels, raccoon, feral hogs, woodpeckers, opossum, titmice, chickadees, nuthatches, vireos, gray fox, and owls.

Habitat for wetland wildlife consists of shallow water areas and margins of ponds and reservoirs. Some of the wildlife attracted to such areas are pied-billed grebe, ducks, great blue heron, green heron, Wilson snipe, kingfisher, greater yellowlegs, beaver, nutria, and alligators.

Habitat for rangeland wildlife consists of areas of shrubs and wild herbaceous plants interspersed with upland trees. Wildlife attracted to rangeland include white-tailed deer, red-tailed hawk, Harris sparrow, rufous-sided towhee, fox sparrow, bobcat, coyote, fox squirrel, cottontail, and raccoon.

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 data given in the tables described under the heading "Soil Properties."

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 aggregation, 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 11 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, or other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock or a very firm dense layer, stone content, soil texture, and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and depth to the water table. Soils that have a high shrink-swell potential can cause problems with shallow excavations. Shoring may be necessary in areas of these soils.

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.

The large number of clayey soils in the survey area that have a high shrink-swell potential and the extreme moisture variability result in considerable stress to foundations. Some site preparation prior to construction should be considered. Well compacted backfill may be needed in any excavation for utility trenches or in holes caused by the removal of tree stumps. Any loose surface soil should be removed, especially if it has a high content of organic matter. Proper compaction of cut and fill material is necessary. Drainage of the site should be considered. Trees and large shrubs should be kept away from foundations because they extract moisture from under the foundation and cause moisture changes. Applications of water around the foundation during dry seasons help to maintain a stable moisture condition. In areas of these clayey soils, foundations should be designed with additional reinforcement bars, proper cement-water ratios, and the proper number and sizes of beams. A type of foundation called “post tension” is being used (Godwin and others). Even under the best conditions, moisture changes can cause considerable stress to foundations.

A high water table, depth to bedrock, large stones, slope, and flooding affect the ease of excavation and construction of dwellings and small commercial buildings. 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, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic-supporting capacity.

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, 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 12 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.

The table 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, and flooding affect absorption of the effluent. Large stones and bedrock interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand or gravel 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.

Disposal of the effluent from septic systems can be a problem because of the large number of soils in the survey area in which the subsoil has very slow

permeability and because of the large number of rural residences that have onsite septic systems. The systems may fail, even if the filter fields are oversized. Filter fields other than the conventional type have been used successfully in the survey area. One example is a low-pressure pipe system in which a network of small-diameter perforated pipe is placed in a narrow trench and effluent is pumped through in controlled quantities so that uniform distribution is achieved. A mound system is another example. In this system, effluent is pumped through small-diameter pipes into an above-ground-level mound of desirable soil material. Other systems are currently being researched (Carlile and Osborne, 1979; Kleiss, 1981). Homeowners who have onsite septic systems should consider local and state regulations and obtain information about the latest techniques of effluent disposal.

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.

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

Excessive seepage 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 and bedrock can cause construction problems, and large stones can hinder compaction of the lagoon floor.

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

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

The ratings in the table are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench 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, rock 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 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 13 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, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet and 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 13, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable, loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal 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 14 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and for embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for

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

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Some parts of the survey area are characterized by highly dispersive soils. These are soils that have a higher relative content of dissolved sodium in the pore water. Construction of embankments of soil materials that contain highly dispersive soils presents both internal and external structural problems (McCook and McElroy, 1991). The origin of dispersive soils cannot always be identified with any degree of certainty. Presently, these soils are not associated with specific soil series. They are related to types of geology rather than to certain classifications of soils. Tests of construction material can be made to identify these characteristics, and design measures can be planned. Assistance from local experts who are familiar with the area should be considered.

Many farm ponds and small reservoirs have metal (steel) pipes through the embankment for use as a water-control device. Experience and research have shown that in some parts of the survey area these steel pipes were corroding out in a matter of a few years (Moore and Hallmark 1987; Moore and others, 1986). Because the water-control devices were not functioning, the embankments became unstable. Many structures have failed because of this situation. The condition can be predicted only through laboratory analysis of water samples from the drainage area. Recently, the use of aluminum pipe has resolved the problem.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and the potential for frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, 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. The performance of a system is affected by the depth of the root zone, the formation of plowpans, the intake rate, 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 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 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.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics. These results are reported in table 20.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help 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 15 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 (ASTM, 2001) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 2000).

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. The AASHTO classification for soils tested, with group index numbers in parentheses, is given in table 20.

Rock fragments 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 16 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.

Depth to the upper and lower boundaries of each layer is indicated.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In the 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 the soil is dried at 105 degrees C. In table 16, 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 retention of water and 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 the basis of 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*, 6 to 9 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. 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 16, 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 affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Table 17 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

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 very deep and 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.

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, and water standing in swamps and marshes is considered ponding rather than flooding.

The table 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). 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 (redoximorphic features) in the soil. Indicated in the table are depth to the seasonal high water table, the kind of water table, 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 the table.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

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.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors 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 also is expressed as *low, moderate,* or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Physical and Chemical Analyses of Selected Soils

The results of physical analysis of several typical pedons in the survey area are given in table 18 and the results of chemical analysis in table 19. The data are for soils sampled at carefully selected sites. Unless otherwise indicated, the pedons are typical of the series. They are described in the section "Soil Series and Their Morphology." Soil samples were analyzed by the Soil Characterization Laboratory, Texas Agricultural Experiment Station, College Station, Texas.

Most determinations, except those for grain-size analysis and bulk density, were made on soil material smaller than 2 millimeters in diameter. Measurements reported as percent or quantity of unit weight were calculated on an ovendry basis. The methods used in obtaining the data are indicated in the list that follows. The codes in parentheses refer to published methods (USDA, 1996).

Sand—(0.05-2.0 mm fraction) weight percentages of material less than 2 mm (3A1).

Silt—(0.002-0.05 mm fraction) pipette extraction, weight percentages of all material less than 2 mm (3A1).

Clay—(fraction less than 0.002 mm) pipette extraction, weight percentages of material less than 2 mm (3A1).

Water retained—pressure extraction, percentage of ovendry weight of less than 2 mm material; 1/3 or 1/10 bar (4B1), 15 bars (4B2).

Bulk density—of less than 2 mm material, saran-coated clods field moist (4A1a), 1/3 bar (4A1d), ovendry (4A1h).

Linear extensibility—change in clod dimension based on whole soil (4D).

Organic carbon—wet combustion. Walkley-Black modified acid-dichromate, ferric sulfate titration (6A1c).

Extractable cations—ammonium acetate pH 7.0, atomic absorption; calcium (6N2e), magnesium (6O2d), sodium (6P2b), potassium (6Q2b).

Cation-exchange capacity—ammonium acetate, pH 7.0, steam distillation (5A8b).
Base saturation—ammonium acetate, pH 7.0 (5C1).
Reaction (pH)—1:1 water dilution (8C1f).
Sodium adsorption ratio (5E).

Engineering Index Test Data

Table 20 shows laboratory test data for several pedons sampled at carefully selected sites in the survey area. The pedons are representative of the series described in the section "Soil Series and Their Morphology." The soil samples were tested by the Soil Mechanics Laboratory, Natural Resources Conservation Service, Fort Worth, Texas.

The testing methods generally are those of the American Association of State Highway and Transportation Officials (AASHTO) or the American Society for Testing and Materials (ASTM).

The tests and methods are AASHTO classification—M 145 (AASHTO), D 3282 (ASTM); Unified classification—D 2487 (ASTM); Mechanical analysis—T 88 (AASHTO), D 422 (ASTM), D 2217 (ASTM); Liquid limit—T 89 (AASHTO), D 4318 (ASTM); and Plasticity index—T 90 (AASHTO), D 4318 (ASTM).

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (Soil Survey Staff, 1998 and 1999). 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 21 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 Ustalf (*Ust*, referring to an ustic moisture regime, 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 Haplustalfs (*Hapl*, meaning minimal horizonation, plus *ustalf*, the suborder of the Alfisols that has an ustic 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. An example is Udertic Haplustalfs.

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 class, mineralogy class, cation-exchange activity class, soil temperature regime, soil depth, and reaction class. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine, mixed, active, thermic Udertic Haplustalfs.

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.

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" (Soil Survey Division Staff, 1993). Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" (Soil Survey Staff, 1999) and in "Keys to Soil Taxonomy" (Soil Survey Staff, 1998). Unless otherwise indicated, matrix colors in the descriptions are for dry soil. Following the pedon description is the range of important characteristics of the soils in the series.

Axtell Series

The Axtell series consists of very deep, moderately well drained, very slowly permeable, loamy soils that formed in loamy and clayey alluvium. These soils are on ancient stream terraces. Slopes range from 1 to 3 percent.

Typical pedon of Axtell fine sandy loam, 1 to 3 percent slopes; from the intersection of Farm Road

2038 and Cobb Road about 5 miles east of Kurten, 0.8 mile south on Cobb Road to Grassbur Road, 2.7 miles south and east on Grassbur Road, 0.6 mile east on Elmo Weedon Road, 0.2 mile east, in subdivision:

A—0 to 4 inches; grayish brown (10YR 5/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak fine subangular blocky structure; very hard, friable; many fine roots; strongly acid; clear wavy boundary.

E—4 to 8 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 5/3) moist; weak fine subangular blocky structure; very hard, friable; many fine roots; moderately acid; abrupt wavy boundary.

Bt—8 to 19 inches; strong brown (7.5YR 5/6) clay; moderate medium subangular blocky structure; very hard, very firm; common dark brown discontinuous clay films on faces of peds and in root channels; many fine roots; few pressure faces; few fine distinct pinkish gray (7.5YR 6/2) iron depletions with sharp boundaries and few fine faint dark brown (7.5YR 4/4) masses of iron accumulation with sharp boundaries; very strongly acid; gradual wavy boundary.

Btss1—19 to 29 inches; strong brown (7.5YR 5/6) clay; moderate medium angular blocky structure; very hard, very firm; many fine roots; common dark brown discontinuous clay films on faces of peds and in root channels; few pressure faces; common medium prominent grayish brown (10YR 5/2) iron depletions with sharp boundaries and common medium distinct yellowish red (5YR 5/6) masses of iron accumulation with sharp boundaries; strongly acid; gradual wavy boundary.

Btss2—29 to 40 inches; red (2.5YR 5/6) clay; weak coarse angular blocky structure; extremely hard, very firm; few discontinuous clay films on faces of peds and in root channels; few fine roots; common slickensides and pressure faces; common medium prominent strong brown (7.5YR 5/6) masses of iron accumulation with sharp boundaries and common medium distinct weak red (2.5YR 5/2) iron depletions with sharp boundaries; strongly acid; gradual wavy boundary.

Btss3—40 to 50 inches; light olive brown (2.5Y 5/4) clay; weak coarse angular blocky structure; extremely hard, very firm; few discontinuous brown (10YR 5/3) clay films lining root channels; common slickensides and pressure faces; few fine black (N 2/0) iron-manganese concretions; few fine roots; common medium prominent yellowish brown (10YR 5/8) masses of iron accumulation with sharp boundaries and common medium faint grayish brown (2.5Y 5/2) iron depletions with sharp boundaries; moderately acid; gradual wavy boundary.

BCky—50 to 80 inches; light olive brown (2.5Y 5/4) clay; weak coarse angular blocky structure; extremely hard, very firm; few fine roots; few fine calcium carbonate concretions; common fine gypsum crystals; few pressure faces and slickensides; common medium prominent yellowish brown (10YR 5/8) masses of iron accumulation with sharp boundaries and common medium faint grayish brown (2.5Y 5/2) iron depletions with sharp boundaries; slightly alkaline.

The thickness of the solum is more than 80 inches. These soils do not remain saturated long enough to develop aquic conditions, except in years that are much wetter than normal. Iron depletions are considered to be relict redoximorphic features.

The thickness of the A and E horizons is less than 10 inches but may be as thick as 15 inches over subsoil troughs. The A horizon is dark grayish brown, light brownish gray, pale brown, grayish brown, or brown. The E horizon is brown, very pale brown, light yellowish brown, or pale brown. Reaction in the A and E horizons ranges from strongly acid to slightly acid.

The Bt horizon has matrix colors of red, yellowish red, reddish yellow, and strong brown. The texture is clay loam or clay. Reaction is very strongly acid or strongly acid.

The Btss horizon is light olive brown and has redoximorphic features in shades of red, brown, yellow, and gray. The texture is clay loam or clay. Reaction ranges from strongly acid to neutral.

The BCky horizon has shades of brown, red, and yellow and has gray iron depletions. The texture is clay loam or clay. Reaction ranges from moderately acid to moderately alkaline.

Benchley Series

The Benchley series consists of very deep, moderately well drained, slowly permeable, loamy soils that formed in clayey marine sediments. These soils are on uplands. Slopes range from 0 to 3 percent.

Typical pedon of Benchley loam, 1 to 3 percent slopes; from the intersection of Texas Highway 21 and Texas Highway 6 in Bryan, 6.3 miles north on Texas Highway 6 to intersection with Old San Antonio Road (OSR), 50 feet east and 75 feet south, in a pasture:

A—0 to 10 inches; very dark grayish brown (10YR 3/2) loam, dark brown (10YR 2/2) moist; moderate medium granular structure; hard, friable; common very fine and fine roots; common fine pores; few

reddish brown wormcasts; about 1 percent rounded ironstone pebbles, mainly less than 1/2 inch in diameter; slightly acid; clear smooth boundary.

Bt—10 to 16 inches; very dark grayish brown (10YR 3/2) clay loam, dark brown (10YR 2/2) moist; moderate medium subangular blocky structure parting to moderate very fine subangular blocky; hard, friable; common very fine and fine roots; common fine and few medium pores; few pressure faces; less than 1 percent rounded ironstone pebbles about 1/4 to 1/2 inch in diameter; common fine and medium distinct dark yellowish brown (10YR 4/6) masses of iron accumulation with sharp boundaries; slightly acid; clear smooth boundary.

Btss1—16 to 30 inches; reddish brown (5YR 4/4) clay, reddish brown (5YR 4/3) moist; moderate medium angular blocky structure; very hard, very firm; few fine roots; few fine and medium pores; common pressure faces and slickensides; distinct discontinuous clay films on faces of peds and in some pores; less than 1 percent rounded ironstone pebbles about 1/4 to 1/2 inch in diameter; many fine distinct light olive brown (2.5Y 5/4) and pale yellow (2.5Y 7/3) masses of iron accumulation with sharp boundaries; slightly acid; gradual wavy boundary.

Btss2—30 to 44 inches; light yellowish brown (2.5Y 6/4) clay, light olive brown (2.5Y 5/4) moist; moderate medium angular blocky structure; very hard, very firm; few fine roots; few fine and medium pores; common slickensides; distinct discontinuous clay films on faces of peds and in pores; less than 1 percent rounded ironstone pebbles about 1/4 to 1/2 inch in diameter; many medium and coarse prominent red (2.5YR 4/8) masses of iron accumulation with sharp boundaries; slightly acid; gradual wavy boundary.

Btss3—44 to 54 inches; light yellowish brown (2.5Y 6/4) clay, light olive brown (2.5Y 5/4) moist; moderate medium angular blocky structure; very hard, very firm; few fine roots; few fine and medium pores; common slickensides; distinct discontinuous clay films on faces of peds and in pores; few fine iron-manganese concretions; less than 1 percent rounded ironstone and siliceous pebbles about 1/4 to 1/2 inch in diameter; common medium prominent red (2.5YR 4/8) masses of iron accumulation with sharp boundaries; slightly acid; gradual wavy boundary.

BCt—54 to 70 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; weak medium subangular blocky structure; very hard, firm; few fine roots; few fine and medium pores; distinct discontinuous clay films on faces of peds and in some pores; few small slickensides; common iron-manganese concretions; about 5 percent rounded ironstone and siliceous pebbles, mainly less than 1/2 inch in diameter; common fine and medium faint pale yellow (2.5Y 7/4) masses of iron accumulation with sharp boundaries; neutral; gradual smooth boundary.

Ck—70 to 80 inches; light yellowish brown (2.5Y 6/4) shale that has clay texture, light olive brown (2.5Y 5/6) moist; angular rocklike structure; very hard, very firm; few fine roots, mainly along fractures; common fine and medium concretions and soft masses of calcium carbonate; few fine iron-manganese concretions; less than 1 percent ironstone pebbles about 1/4 to 1/2 inch in diameter; common medium faint pale yellow (2.5Y 7/4) masses of iron accumulation with sharp boundaries; slightly alkaline.

The thickness of the solum ranges from 60 to more than 80 inches. Masses of iron accumulation are considered to be relict redoximorphic features.

The A or Ap horizon is very dark grayish brown, dark grayish brown, or dark brown. Reaction ranges from moderately acid to neutral.

The Bt horizon is very dark grayish brown, dark grayish brown, dark brown, or dark grayish brown. Reaction is moderately acid or slightly acid. The texture is clay loam or clay. Masses of iron accumulation in shades of red and yellow are common.

The Btss horizons are reddish brown and light yellowish brown and have common or many brown and red masses of iron accumulation. Reaction ranges from slightly acid to moderately alkaline.

Some pedons have BC and Ck horizons. These horizons are yellowish brown and have dark reddish brown and yellowish brown masses of iron accumulation. Reaction ranges from slightly acid to slightly alkaline.

The C horizon, if it occurs, is stratified shale that has clayey texture. It is shades of brown, yellow, gray, and olive.

Boonville Series

The Boonville series consists of very deep, somewhat poorly drained, very slowly permeable soils on uplands. These soils formed in weathered colluvium and alluvium derived from the Yegua Formation. Slopes range from 0 to 3 percent.

Typical pedon of Boonville fine sandy loam, 1 to 3

percent slopes (fig. 12); from the intersection of Texas Highway 21 and Farm Road 2038 near Kurten, southeast 2.5 miles on Farm Road 2038, southwest 1.3 miles on Old Reliance Road, 1,000 feet southeast on oil field road, 500 feet southwest of oil well, in an improved pasture:

Ap—0 to 4 inches; pale brown (10YR 6/3) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; hard, friable; many fine and medium roots; few fine pores; about 1 percent siliceous pebbles, mainly less than 3/4 inch in diameter; few fine distinct brownish yellow (10YR 6/6) masses of iron accumulation with clear to diffuse boundaries; few fine brown (7.5YR 4/4) masses of iron accumulation lining pores and root channels; slightly acid; abrupt smooth boundary.

A—4 to 10 inches; brown (10YR 5/3) fine sandy loam, dark grayish brown (10YR 4/2) moist; about 3 percent yellowish brown (10YR 5/4) krotovinas; weak medium subangular blocky structure; hard, friable; many fine and medium roots; few fine and medium pores; about 1 percent siliceous pebbles, mainly less than 3/4 inch in diameter; few fine distinct brown (7.5YR 4/4) masses of iron accumulation with clear to diffuse boundaries; few fine brown (7.5YR 4/4) masses of iron accumulation lining pores and root channels; moderately acid; clear wavy boundary.

Eg—10 to 17 inches; very pale brown (10YR 7/3) fine sandy loam, grayish brown (10YR 5/2) moist; weak medium subangular blocky structure; hard, friable; common fine and few medium roots; few very fine pores; few fine iron-manganese concretions; about 1 percent siliceous and ironstone pebbles, mainly less than 3/4 inch in diameter; few medium distinct yellowish brown (10YR 5/8) masses of iron accumulation with clear to diffuse boundaries; moderately acid; abrupt wavy boundary.

Btssg1—17 to 24 inches; light brownish gray (10YR 6/2) clay, dark grayish brown (10YR 4/2) moist; weak very coarse prismatic structure parting to moderate medium angular blocky; extremely hard, very firm; common fine roots; few fine pores; common pressure faces and few small slickensides; discontinuous dark gray clay films on surfaces of prisms; few fine iron-manganese concretions; about 1 percent siliceous and ironstone pebbles, mainly less than 3/4 inch in diameter; common medium prominent red (2.5YR 4/8) and common fine distinct yellowish brown (10YR 5/6) masses of iron accumulation with clear to diffuse boundaries; slightly acid; clear wavy boundary.

Btssg2—24 to 36 inches; light brownish gray (2.5Y 6/2) clay, brownish gray (2.5Y 5/2) moist; weak coarse prismatic structure parting to weak medium angular blocky; extremely hard, very firm; few fine roots; few fine pores; few pressure faces and small slickensides; discontinuous dark grayish brown clay films on surface of prisms; few fine iron-manganese concretions; about 1 percent siliceous and ironstone pebbles, mainly less than 3/4 inch in diameter; common medium distinct light olive brown (2.5Y 5/4) masses of iron accumulation with clear to diffuse boundaries; neutral; clear wavy boundary.

Btg—36 to 41 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; weak coarse prismatic structure parting to weak fine angular blocky; extremely hard, very firm; few fine roots; few fine pores; few pressure faces; discontinuous clay films on surface of prisms; few fine iron-manganese concretions; few fine masses of gypsum; about 1 percent siliceous and ironstone pebbles, mainly less than 3/4 inch in diameter; moderately alkaline; clear wavy boundary.

Btk—41 to 56 inches; light gray (2.5Y 7/2) clay loam, light brownish gray (2.5Y 6/2) moist; weak coarse prismatic structure parting to moderate medium angular blocky; extremely hard, very firm; few fine roots; few fine pores; few discontinuous clay films on surface of prisms; few fine iron-manganese concretions and common iron stains on faces of peds and in some root channels; common fine calcium carbonate masses; few fine masses of gypsum; about 1 percent siliceous and ironstone pebbles, mainly less than 3/4 inch in diameter; slightly effervescent; moderately alkaline; clear wavy boundary.

BCt1—56 to 64 inches; pale yellow (10YR 7/4) clay loam, light yellowish brown (10YR 6/4) moist; weak coarse prismatic structure parting to moderate medium angular blocky; hard, firm; few fine roots; common fine pores; few discontinuous clay films on surface of prisms; few fine iron-manganese concretions; masses of gypsum make up 3 to 5 percent; about 5 percent shale fragments, mainly less than 2 inches in diameter; about 1 percent siliceous and ironstone pebbles, mainly less than 3/4 inch in diameter; few fine distinct reddish yellow (7.5YR 6/8) masses of iron accumulation; moderately alkaline; clear wavy boundary.

BCt2—64 to 73 inches; pale yellow (10YR 7/4) clay loam, light yellowish brown (10YR 6/4) moist; weak coarse prismatic structure parting to moderate medium angular blocky; hard, firm; few fine roots; common fine pores; few discontinuous clay films on surface of prisms; few fine iron-manganese concretions; few fine masses of gypsum; about 5 percent shale fragments, mainly less than 2 inches in diameter; about 1 percent siliceous and ironstone pebbles, mainly less than 3/4 inch in diameter; moderately alkaline; abrupt smooth boundary.

2CB—73 to 80 inches; light brownish gray (2.5Y 6/2) shale that has clay loam texture; weak very coarse prismatic structure parting to moderate medium platy; very firm, very hard; few fine and medium masses of gypsum; some plates have iron stains on horizontal surfaces; about 1 percent siliceous and ironstone pebbles, mainly less than 3/4 inch in diameter; common medium prominent yellowish brown (10YR 5/8) masses of iron accumulation; slightly alkaline.

The thickness of the solum ranges from 60 to about 80 inches. Cracks 0.4 inch or more wide and more than 12 inches deep are in the Btg horizon when the soils are dry. Few to many pressure faces and small slickensides are in the upper part of the argillic horizon. The upper boundary of the subsoil has amplitude of waviness of 3 to 30 inches between the subsoil crests and the subsoil troughs; the length of the cycle ranges from 3 to 8 feet. Troughs are commonly oriented parallel with the slope. Depressions are within the troughs. The content of siliceous and ironstone pebbles ranges from 0 to about 5 percent throughout. These soils have aquic soil conditions in most years. Masses of iron accumulation are considered to be contemporary redoximorphic features.

The A horizon is dark grayish brown, dark brown, grayish brown, pale brown, or brown. Reaction ranges from strongly acid to neutral. The boundary between the A and Bt horizons is abrupt over the subsoil crests and clear in the subsoil troughs. An E horizon is common in the subsoil troughs but is absent on most subsoil crests.

The E horizon is light gray, light brownish gray, pale brown, or very pale brown. The texture is fine sandy loam or very fine sandy loam. Reaction ranges from strongly acid to slightly acid.

The Btssg horizon is light brownish gray, dark gray, gray, dark grayish brown, or grayish brown. It has few or common masses of iron accumulation in shades of brown and yellow. Typically, the subsoil crests have more high-chroma colors than the subsoil troughs. This horizon is clay or clay loam and has a clay content of 35 to 55 percent. Reaction ranges from strongly acid to neutral.

The Btg horizon ranges from slightly acid to moderately alkaline.

Some pedons have a Btk horizon in shades of brown or gray with or without redoximorphic features. This horizon has few or common carbonates. Reaction is slightly alkaline or moderately alkaline.

The BCt horizon has matrix colors in shades of brown or gray. It has few to many redoximorphic features in shades of red or yellow. The texture is loam, sandy clay loam, or clay loam. Reaction is slightly alkaline or moderately alkaline.

The 2CB horizon has colors in shades of brown, gray, or yellow. It is loamy or shaly materials of the Yegua Formation. The texture is sandy clay loam, clay loam, or clay. Reaction ranges from moderately acid to moderately alkaline.

Burleson Series

The Burleson series consists of very deep, moderately well drained, very slowly permeable, clayey soils that formed in alluvial sediments. These soils are on stream terraces of the Brazos River. Slopes range from 0 to 5 percent.

Typical pedon of Burleson clay, 0 to 1 percent slopes; from the intersection of Texas High 21 and Farm Road 2818 in Bryan, west 2.7 miles on Texas Highway 21, southwest 0.6 mile on Westward Ho Road, west 0.8 mile on Goodson Bend Road, 0.2 mile north of road, in a pasture:

Ap—0 to 8 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; few fine pressure faces; moderate medium angular blocky structure; very hard, very firm; many fine roots; neutral; gradual wavy boundary.

Bss1—8 to 40 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; moderate medium angular blocky structure; very hard, very firm; common fine roots; common medium intersecting slickensides; slightly alkaline; gradual wavy boundary.

Bss2—40 to 55 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; weak medium angular blocky structure; very hard, very firm; few fine roots; common medium and large intersecting slickensides; common fine iron-manganese concretions; few fine and medium calcium carbonate concretions; common medium distinct grayish brown (10YR 5/2) iron depletions with sharp boundaries; moderately alkaline; gradual wavy boundary.

Bss3—55 to 65 inches; light brownish gray (10YR 6/2) clay, grayish brown (10YR 5/2) moist; weak medium angular blocky structure; very hard, very firm; few fine roots; common large slickensides; common medium distinct yellowish brown (10YR 5/4) masses of iron accumulation with sharp boundaries; moderately alkaline; gradual wavy boundary.

2CBss—65 to 80 inches; reddish yellow (7.5YR 6/6) silty clay, strong brown (7.5YR 5/6) moist; weak coarse angular blocky structure; very hard, very firm; few fine roots; common medium distinct grayish brown (10YR 5/2) iron depletions with sharp boundaries; few large slickensides; few calcium carbonate concretions; slightly effervescent; moderately alkaline.

The solum is 60 to 80 inches thick. The depth to slickensides ranges from 8 to 24 inches. When the soils are dry, cracks form at the surface. The cracks are as much as 2 inches wide and extend to a depth of 40 inches or more. Cycles of microdepressions and microhighs are repeated at intervals of 8 to 12 feet. In undisturbed areas, the microhighs are 3 to 10 inches higher than the microdepressions. Masses of iron accumulation and iron depletions are considered to be relict redoximorphic features.

The A horizon is very dark gray or dark gray. Reaction is neutral or slightly alkaline.

The Bss horizon is gray, dark gray, very dark gray, grayish brown, or light brownish gray. Some pedons contain yellowish brown and dark yellowish brown masses of iron accumulation and light brownish gray and grayish brown iron depletions. Reaction is slightly alkaline or moderately alkaline.

The 2CBss horizon, if it occurs, is light yellowish brown, reddish yellow, or yellowish red. The texture is clay loam or clay. Reaction is slightly alkaline or moderately alkaline.

Burlewash Series

The Burlewash series consists of moderately deep, well drained, very slowly permeable, loamy soils that formed in weakly cemented tuffaceous sandstone and siltstone. These soils are on uplands. Slopes range from 1 to 8 percent.

Typical pedon of Burlewash fine sandy loam, 1 to 5 percent slopes (fig. 13); from the intersection of Texas Highway 6 and Greens Prairie Road (which is approximately 3 miles south of College Station), 0.2 mile northeast on Greens Prairie Road; site is 50 feet south of the road:

A—0 to 8 inches; light brownish gray (10YR 6/2) fine sandy loam, grayish brown (10YR 5/2) moist; weak fine subangular blocky structure; friable, hard; many fine roots; moderately acid; abrupt smooth boundary.

Bt1—8 to 24 inches; light reddish brown (5YR 6/4) clay, reddish brown (5YR 5/4) moist; moderate medium blocky structure; very firm, very hard; many fine roots; common clay films; very strongly acid; clear smooth boundary.

Bt2—24 to 35 inches; light reddish brown (5YR 6/4) clay, reddish brown (5YR 5/4) moist; moderate medium blocky structure; very firm, very hard; few fine roots; common clay films; common medium distinct reddish brown (10YR 5/3) masses of iron accumulation with sharp boundaries; very strongly acid; clear smooth boundary.

Cr—35 to 40 inches; light brownish gray (2.5Y 6/2), slightly cemented siltstone; very strongly acid.

The thickness of the solum ranges from 20 to 40 inches. The content of siliceous pebbles ranges from 0 to about 10 percent throughout the profile. Masses of iron accumulation are considered to be relict redoximorphic features.

The A horizon is light brownish gray or light gray. Reaction is moderately acid or strongly acid.

The Bt horizons are light reddish brown, yellowish red, or brown and have brown and yellowish red masses of iron accumulation. The texture ranges from clay loam to clay. Reaction ranges from moderately acid to very strongly acid.

The Cr horizon consists of slightly cemented tuffaceous siltstone or sandstone in shades of gray, brown, and yellow.

Chazos Series

The Chazos series consists of very deep, moderately well drained, slowly permeable, sandy soils that formed in alkaline loamy and clayey alluvium. These soils are on stream terraces. Slopes range from 1 to 8 percent.

Typical pedon of Chazos loamy fine sand, 1 to 5 percent slopes; from the intersection of Farm Road 60 and Farm Road 2818 in College Station, 3.1 miles west on Farm Road 60, 0.1 mile north on county road, 100 feet east of road, in an area of rangeland:

A—0 to 4 inches; light brownish gray (10YR 6/2) loamy fine sand, grayish brown (10YR 5/2) moist; weak fine subangular blocky structure; slightly hard, friable; many fine roots; few fine siliceous pebbles; slightly acid; clear smooth boundary.

E—4 to 14 inches; very pale brown (10YR 7/3) loamy fine sand, pale brown (10YR 6/3) moist; weak fine

subangular blocky structure; slightly hard, friable; many fine roots; few fine siliceous pebbles; slightly acid; abrupt wavy boundary.

Bt1—14 to 26 inches; reddish brown (5YR 5/4) clay, reddish brown (5YR 4/4) moist; moderate medium subangular blocky structure; very hard, very firm; common thin discontinuous clay films; few fine roots; few fine siliceous pebbles; common medium distinct light brownish gray (10YR 6/2) iron depletions with clear to diffuse boundaries; moderately acid; gradual wavy boundary.

Bt2—26 to 38 inches; brownish yellow (10YR 6/6) sandy clay, yellowish brown (10YR 5/6) moist; moderate medium subangular blocky structure; very hard, very firm; few fine siliceous pebbles; few discontinuous clay films; few fine roots; common medium distinct light brownish gray (10YR 6/2) iron depletions with clear to diffuse boundaries; light yellowish brown (10YR 6/4) and few fine prominent reddish brown (5YR 5/4) masses of iron accumulation with sharp boundaries; moderately acid; gradual wavy boundary.

Bt3—38 to 52 inches; yellowish brown (10YR 5/4) clay loam, dark yellowish brown (10YR 4/4) moist; moderate medium subangular blocky structure; very hard, very firm; few fine siliceous pebbles; few discontinuous clay films; few fine roots; common medium distinct grayish brown (10YR 5/2) iron depletions with sharp boundaries; slightly alkaline; gradual wavy boundary.

BCt1—52 to 65 inches; reddish brown (5YR 5/4) sandy clay loam, dark yellowish brown (10YR 4/4) moist; weak medium subangular blocky structure; very hard, firm; few discontinuous clay films; few fine roots; common medium distinct yellowish brown (10YR 5/4) masses of iron accumulation with sharp boundaries; slightly alkaline; gradual wavy boundary.

BCt2—65 to 80 inches; light reddish brown (5YR 6/4) sandy clay loam, reddish brown (5YR 5/4) moist; weak fine and medium subangular blocky structure; very hard, friable; few discontinuous clay films; few thin strata of fine sandy loam and loamy fine sand; slightly alkaline.

The thickness of the solum is more than 80 inches. The content of siliceous pebbles ranges from 0 to 5 percent in the surface layer. These soils do not remain saturated long enough to develop aquic conditions, except in years that are much wetter than normal. Masses of iron accumulation and iron depletions are considered to be relict redoximorphic features.

The A horizon is brown, grayish brown, light brownish gray, pale brown, light gray, or very pale brown. Reaction is slightly acid or moderately acid.

The E horizon is pale brown, very pale brown, light brownish gray, or light gray. Reaction is slightly acid or moderately acid.

The Bt horizon is reddish brown, yellowish brown, light yellowish brown, or brownish yellow. Masses of iron accumulation are shades of red, brown, and yellow. Iron depletions are shades of gray. This horizon is clay or sandy clay and has a clay content of 35 to 50 percent. Reaction ranges from moderately acid to slightly alkaline.

The BCt horizon is light gray, reddish brown, light reddish brown, light yellowish brown, or light brown. Masses of iron accumulation are shades of red, brown, and yellow. Iron depletions are shades of gray. The texture is clay loam or sandy clay loam. Reaction ranges from slightly acid to moderately alkaline.

Coarsewood Series

The Coarsewood series consists of very deep, well drained, moderately rapidly permeable soils that formed in recent loamy calcareous alluvial sediments. These soils are on channel levees of flood plains. Slopes are 0 to 1 percent.

Typical pedon of Coarsewood silt loam, 0 to 1 percent slopes, rarely flooded (fig. 14), in western Brazos County; from the intersection of Texas Highway 21 and Farm Road 50 about 8 miles west of Bryan, 0.25 mile west on Texas Highway 21, 200 feet north of highway:

Ap—0 to 7 inches; light brown (7.5YR 6/4) silt loam, brown (7.5YR 5/4) moist; weak medium subangular blocky structure; slightly hard, very friable; common fine and medium roots; few fine pores; few shell fragments less than 1/4 inch in diameter; violently effervescent; moderately alkaline; abrupt smooth boundary.

Bw1—7 to 25 inches; pink (7.5YR 7/4) silt loam, brown (7.5YR 5/4) moist; weak coarse prismatic structure parting to weak fine subangular blocky; slightly hard, very friable; common fine roots; few fine pores; many very fine and fine faint strata of light brown (7.5YR 6/4) silt loam; few shell fragments less than 1/4 inch in diameter; violently effervescent; moderately alkaline; abrupt smooth boundary.

Bw2—25 to 48 inches; light brown (7.5YR 6/4) silt loam, brown (7.5YR 5/4) moist; weak coarse prismatic structure parting to weak fine subangular blocky; very friable; few fine roots; few

fine pores; common fine distinct strata of dark reddish brown (5YR 3/2) silt loam; few shell fragments less than 1/4 inch in diameter; violently effervescent; moderately alkaline; abrupt smooth boundary.

C1—48 to 65 inches; pink (7.5YR 7/4) silt loam, light brown (7.5YR 6/4) moist; massive; very friable; few fine roots; common fine and medium distinct strata of dark reddish brown (5YR 3/2) silt loam; violently effervescent; moderately alkaline; abrupt smooth boundary.

C2—65 to 80 inches; pink (7.5YR 7/4) loam, light brown (7.5YR 6/4) moist; massive; very friable; common fine distinct strata of dark reddish brown (5YR 3/2) silt loam; violently effervescent; moderately alkaline.

The thickness of the solum ranges from 40 to about 60 inches. The clay content of the control section ranges from 8 to 18 percent. Less than 15 percent of the sand fraction is coarser than very fine sand. Reaction is slightly alkaline or moderately alkaline, and effervescence ranges from slight to violent. The content of snail-shell fragments less than 1/2 inch in diameter ranges from 0 to 2 percent by volume.

The A horizon is dark brown, light brown, or reddish yellow. The darker horizons are less than 10 inches thick.

The Bw horizon is pink, light brown, reddish brown, yellowish red, or brown. It has few to many strata as much as 1/2 inch thick in shades of light brown or brown. This horizon is very fine sandy loam, loam, or silt loam.

The C horizon is light brown, brown, dark brown, or yellowish brown. The texture is very fine sandy loam, fine sandy loam, or silt loam.

Crockett Series

The Crockett series consists of moderately well drained, very slowly permeable soils that are deep to weathered shale. These soils formed in clayey marine sediments. They are on uplands. Slopes range from 1 to 5 percent.

Typical pedon of Crockett loam, 1 to 3 percent slopes; from the intersection of Farm Road 974 and Farm Road 2223 north of Bryan, 2.7 miles north on Farm Road 2223, 300 feet east of farm gate, in a pasture:

A—0 to 8 inches; brown (7.5YR 4/3) loam, dark brown (7.5YR 3/3) moist; weak fine subangular blocky structure; very hard, firm; many fine roots; few fine ironstone fragments; neutral; abrupt wavy boundary.

Bt—8 to 21 inches; yellowish brown (10YR 5/4) clay; moderate medium angular blocky structure; extremely hard, very firm, very sticky and very plastic; common fine roots; few fine pressure faces and slickensides; few ironstone fragments; few thin clay films; common medium distinct red (2.5YR 4/6) masses of iron accumulation with sharp boundaries and few fine distinct dark grayish brown (10YR 4/2) iron depletions with sharp boundaries; slightly acid; gradual wavy boundary.

Btss—21 to 34 inches; dark reddish brown (2.5YR 3/3) clay; moderate medium angular blocky structure; extremely hard, very firm, very sticky and very plastic; few fine roots; common slickensides and pressure faces; common thin clay films on faces of peds; many medium distinct dark gray (10YR 4/1) iron depletions with sharp boundaries; slightly acid; gradual wavy boundary.

Btssy—34 to 45 inches; brown (10YR 5/3) clay; moderate medium angular blocky structure; extremely hard, very firm, very sticky and very plastic; about 5 percent gypsum crystals; common black stains; few thin clay films; few fine roots; common slickensides and pressure faces; common medium distinct red (2.5YR 4/6) masses of iron accumulation; neutral; gradual wavy boundary.

C—45 to 80 inches; dark brown (10YR 4/3) shale that has clay texture; rock structure; extremely hard, very firm, very sticky and very plastic; common gypsum crystals; slightly acid.

The thickness of the solum ranges from 40 to 60 inches. The content of clay in the upper 20 inches of the argillic horizon ranges from 40 to 60 percent. Masses of iron accumulation and iron depletions are considered to be relict redoximorphic features.

The A horizon typically is less than 10 inches thick but is as much as 15 inches thick in subsoil troughs. It is very dark grayish brown, dark grayish brown, dark brown, grayish brown, or brown. Reaction ranges from moderately acid to neutral.

The Bt horizon is clay or sandy clay. The content of clay is 40 to 50 percent in the upper 20 inches. This horizon is brown, reddish brown, or yellowish brown. Masses of iron accumulation are shades of yellow, brown, and red. Iron depletions are shades of gray. Reaction ranges from moderately acid to slightly alkaline.

The Btss horizon is dark reddish brown, reddish brown, brown, brownish yellow, or yellowish brown. Masses of iron accumulation are shades of yellow, brown, and red. Iron depletions are shades of gray. Reaction ranges from neutral to moderately alkaline.

The Btssy horizon is mainly shades of olive, yellow,

and brown. The texture is clay loam or clay. This horizon has few to many concretions of calcium carbonate and gypsum. Reaction ranges from moderately acid to moderately alkaline.

The C horizon is shale that has clay loam or clay texture. This horizon is shades of brown, yellow, and gray. Reaction ranges from neutral to moderately alkaline.

Derly Series

The Derly series consists of very deep, poorly drained, very slowly permeable soils that formed in loamy and clayey alluvium. These soils are on Pleistocene terraces of the Navasota River and major local streams. Slopes are 0 to 1 percent.

Typical pedon of Derly loam, in an area of Derly-Rader complex, 0 to 1 percent slopes, in northeastern Brazos County; from the intersection of Farm Road 2038 and Texas Highway 21 near Kurten, 3.8 miles east on Farm Road 2038, 1.0 mile north on county road to ranch gate, 0.3 mile east on private road and 1,000 feet north, in a pasture:

A—0 to 6 inches; light brownish gray (10YR 6/2) loam; weak medium angular blocky structure; extremely hard, very firm; many fine roots; common medium distinct dark yellowish brown (10YR 4/6) masses of iron accumulation; moderately acid; clear wavy boundary.

Btg/E—6 to 16 inches; grayish brown (10YR 5/2) clay loam; about 25 percent tongues and streaks of light yellowish brown (10YR 6/4) albic material (E); weak medium subangular blocky structure; extremely hard, extremely firm; few fine roots; common thick clay films; few medium distinct brownish yellow (10YR 6/6) masses of iron accumulation with clear to diffuse boundaries; moderately acid; gradual wavy boundary.

Btg1—16 to 29 inches; grayish brown (10YR 5/2) clay loam; moderate medium subangular blocky structure; extremely hard, extremely firm; few fine roots; few sand coats along ped faces; common thick clay films; moderately acid; gradual wavy boundary.

Btg2—29 to 44 inches; grayish brown (10YR 5/2) clay loam; weak medium blocky structure; extremely hard, extremely firm; few fine roots; common thin clay films; slightly acid; gradual wavy boundary.

BCtg—44 to 80 inches; light brownish gray (2.5Y 6/2) clay loam; weak medium subangular blocky structure; extremely hard, very firm; few fine roots; few thin clay films; slightly alkaline.

The thickness of the solum is more than 80 inches. During most years these soils have aquic conditions. Masses of iron accumulation are considered to be contemporary redoximorphic features.

The A horizon is light brownish gray or grayish brown. Reaction ranges from strongly acid to slightly acid.

The Btg/E horizon is grayish brown, light gray, or light brownish gray. The texture is clay loam or silty clay loam. Tongues and streaks of albic material make up 15 to 30 percent of this horizon. Reaction is strongly acid or moderately acid.

The Btg horizon is grayish brown or light brownish gray. The texture is clay loam or clay. Reaction ranges from strongly acid to neutral.

The BCtg horizon is light brownish gray or grayish brown. The texture is loam, clay loam, or silty clay loam. Reaction ranges from strongly acid to slightly alkaline.

Desan Series

The Desan series consists of very deep, somewhat excessively drained, moderately permeable soils that formed in ancient sandy alluvium. These soils are on terraces along breaks into the Navasota River and major local streams. Slopes range from 3 to 8 percent.

Typical pedon of Desan loamy fine sand, 3 to 8 percent slopes; from the intersection of Farm Road 158 and Texas Highway 30, 1.1 miles east on Texas Highway 30, 2.0 miles east on Hardy Weedon road, 1.8 miles south and east on Weedon Loop to corner in road, 1,500 feet southwest along fenceline, in an area of rangeland:

A—0 to 8 inches; light brown (7.5YR 6/3) loamy fine sand, brown (7.5YR 5/3) moist; single grained; loose, very friable; many fine roots; neutral; clear smooth boundary.

E—8 to 52 inches; very pale brown (10YR 7/3) loamy fine sand, pale brown (10YR 6/3) moist; single grained; loose, very friable; common fine roots; moderately acid; clear smooth boundary.

Bt1—52 to 62 inches; red (2.5YR 4/6) sandy clay loam; moderate medium subangular blocky structure; very hard, firm; few fine roots; common thin clay films; common medium distinct strong brown (7.5YR 5/6) masses of iron accumulation with sharp boundaries; moderately acid; clear smooth boundary.

Bt2—62 to 80 inches; red (2.5YR 4/6) sandy clay loam; moderate medium subangular blocky structure; very hard, firm; few fine roots; few

discontinuous clay films; common fine distinct strong brown (7.5YR 5/6) masses of iron accumulation with sharp boundaries; moderately acid.

The thickness of the solum ranges from 65 to more than 80 inches. Masses of iron accumulation are considered to be both relict and contemporary redoximorphic features.

The A horizon is brown, light brown, or pale brown. Reaction is slightly acid or neutral.

The E horizon is pale brown or very pale brown. Reaction ranges from moderately acid to neutral.

The Bt horizon is reddish brown, red, or yellowish red. Reaction is moderately acid or slightly acid.

The C horizon, if it occurs, is red, yellow, or brown. The texture is fine sandy loam or loamy fine sand. Reaction is strongly acid or moderately acid.

Dimebox Series

The Dimebox series consists of very deep, moderately well drained, very slowly permeable, clayey soils that formed in clayey marine sediments. These soils are on uplands. Slopes are 0 to 1 percent.

Typical pedon of Dimebox clay, 0 to 1 percent slopes; from the intersection of Farm Road 46 and Old San Antonio Road (OSR), 1.0 mile northeast on OSR, 100 feet east, in a pasture:

A—0 to 11 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; moderate medium subangular blocky structure; very hard, very firm; common fine roots; few fine ironstone pebbles; moderately acid; gradual wavy boundary.

Bss—11 to 37 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; weak coarse angular blocky structure; very hard, very firm; few fine roots; common intersecting slickensides; few fine distinct yellowish brown (10YR 5/8) masses of iron accumulation with sharp boundaries; few fine ironstone pebbles; slightly alkaline; gradual wavy boundary.

Bkss—37 to 49 inches; light olive brown (2.5Y 5/4) clay, olive brown (2.5Y 4/4) moist; weak coarse angular blocky structure; very hard, very firm; few fine roots; common intersecting slickensides; common fine and medium calcium carbonate concretions; many fine distinct yellowish brown (10YR 5/6) masses of iron accumulation with sharp boundaries; few fine ironstone pebbles; moderately alkaline; gradual wavy boundary.

BCssy—49 to 61 inches; mixed olive brown (2.5Y 4/4), gray (10YR 5/1), and yellowish brown (10YR 5/6) clay; weak coarse angular blocky structure; very hard, very firm; few fine roots; partially weathered shale fragments making up 30 percent of the mass; common intersecting slickensides; few fine gypsum crystals; few organic stains; moderately alkaline; abrupt wavy boundary.

C—61 to 80 inches; mixed olive brown (2.5Y 4/4), gray (10YR 5/1), and yellowish brown (10YR 5/6) shale that has clay texture; common ironstone strata; moderately alkaline.

The thickness of the solum ranges from 60 to 80 inches. When the soils are dry, cracks 1 to 2 inches wide extend to a depth of 40 inches or more. Gilgai microrelief is evident in undisturbed areas. Few fine ironstone and siliceous pebbles are in most pedons. Masses of iron accumulation are considered to be both relict and contemporary redoximorphic features.

The A horizon is dark gray, very dark gray, or black. Reaction ranges from moderately acid to neutral.

The B horizon is dark gray, very dark gray, light olive brown, or olive brown and has yellowish brown masses of iron accumulation. Reaction is slightly alkaline or moderately alkaline. In some pedons the horizon has calcium carbonate concretions and gypsum crystals in the lower part.

The C horizon is light olive brown, olive brown, or yellowish brown. Reaction is slightly alkaline or moderately alkaline. Calcium carbonate concretions and gypsum crystals are in some pedons.

Dutek Series

The Dutek series consists of very deep, well drained, moderately permeable, sandy soils that formed in loamy and sandy alluvial sediments. These soils are on stream terraces. Slopes range from 3 to 8 percent.

Typical pedon of Dutek loamy fine sand, 3 to 8 percent slopes, in western Brazos County; from the intersection of Farm Road 60 and Farm Road 2818 on the west edge of College Station, 3.0 miles west on Farm Road 60, 0.4 mile northwest on Old Jones Road, 200 feet north of road, near edge of sand pit:

A—0 to 6 inches; light brown (7.5YR 6/4) loamy fine sand, brown (7.5YR 5/4) moist; single grained; loose; many fine and medium roots; neutral; clear wavy boundary.

E—6 to 35 inches; pink (7.5YR 7/4) loamy fine sand, light brown (7.5YR 6/4) moist; single grained; loose; few fine roots; slightly acid; clear wavy boundary.

Bt—35 to 55 inches; red (2.5YR 5/6) sandy clay loam, red (2.5YR 5/6) moist; moderate medium subangular blocky structure; hard, firm; few fine

roots; clay films on faces of peds; slightly acid; gradual wavy boundary.

BCt1—55 to 75 inches; light red (2.5YR 6/6) fine sandy loam, light red (2.5YR 6/6) moist; weak medium blocky structure; hard, firm; few fine roots; few discontinuous clay films on faces of peds; neutral; gradual smooth boundary.

BCt2—75 to 85 inches; reddish yellow (5YR 7/6) fine sandy loam, reddish yellow (5YR 6/6) moist; weak medium subangular blocky structure; slightly hard; friable; few fine roots; neutral.

The thickness of the solum ranges from 60 to more than 80 inches.

The combined thickness of the A and E horizons ranges from 20 to 40 inches. Colors include pale brown, very pale brown, light brown, pink, dark yellowish brown, and light yellowish brown. Reaction is slightly acid or neutral.

The Bt horizon is reddish brown, reddish yellow, yellowish red, light red, or red. It is clay loam, sandy clay loam, or loam. Reaction ranges from strongly acid to slightly acid.

The BCt horizon is light red, light reddish brown, or reddish yellow. The texture is fine sandy loam or loam. Reaction ranges from strongly acid to neutral.

Some pedons have a 2C horizon. This horizon is strong brown, reddish yellow, or yellowish red. The texture is loamy fine sand or fine sandy loam. Reaction ranges from strongly acid to neutral.

Eufaula Series

The Eufaula series consists of very deep, somewhat excessively drained, rapidly permeable soils that formed in sandy alluvial sediments. These soils are on stream terraces. Slopes range from 1 to 3 percent.

Typical pedon of Eufaula loamy fine sand, 1 to 3 percent slopes; from the intersection of Farm Road 158 and Texas Highway 30 east of College Station, 1.0 mile east on Texas Highway 30, 2.0 miles northeast on Hardy Weedon Road, 3.0 miles southeast on Weedon Loop, 1.5 miles north and east on Hensarling Lane, 50 feet south of the road:

A—0 to 15 inches; pale brown (10YR 6/3) loamy fine sand, brown (10YR 5/3) moist; single grained; loose; many fine roots; moderately acid; clear smooth boundary.

E1—15 to 42 inches; very pale brown (10YR 7/4) loamy fine sand, light yellowish brown (10YR 6/4) moist; single grained; few fine roots; moderately acid; clear smooth boundary.

E2—42 to 62 inches; very pale brown (10YR 8/4) loamy fine sand; single grained; loose; few coarse roots; few lamellae of red (2.5YR 5/6) sandy clay loam about 1/8 inch thick; moderately acid; clear smooth boundary.

E&Bt—62 to 82 inches; very pale brown (10YR 7/4) loamy fine sand; common lamellae of strong brown (7.5YR 5/6) fine sandy loam about 1/4 to 1 inch thick and 2 to 4 inches apart (Bt); clay bridging between sand grains in the lamellae; few fine roots; strongly acid.

The thickness of the solum ranges from about 80 to 100 inches. The combined thickness of the A and E horizons ranges from 34 to 75 inches.

The A horizon is yellowish brown, dark yellowish brown, brown, or pale brown. Reaction ranges from moderately acid to neutral.

The E horizon is yellowish brown, light yellowish brown, pale brown, or very pale brown loamy sand or loamy fine sand. Reaction ranges from moderately acid to neutral.

The E&Bt horizon consists of lamellae or pockets of Bt material in a horizon dominated by E material. The E part is yellowish brown, brownish yellow, light gray, light brownish gray, or very pale brown loamy sand or loamy fine sand. The Bt material is yellowish red, reddish yellow, strong brown, or red fine sandy loam or loamy fine sand. Reaction ranges from strongly acid to slightly acid.

Falba Series

The Falba series consists of moderately deep, moderately well drained, very slowly permeable, loamy soils on uplands. These soils formed in weakly cemented tuffaceous sandstone of marine origin. Slopes range from 1 to 3 percent.

Typical pedon of Falba fine sandy loam, 1 to 3 percent slopes; from the intersection of Texas Highway 6 and Farm Road 159 about 8.0 miles south of College Station, 3.0 miles southeast on Texas Highway 6, 0.6 mile south and east in subdivision, 50 feet south, in a pasture:

Ap—0 to 7 inches; light brownish gray (10YR 6/2) fine sandy loam, grayish brown (10YR 5/2) moist; weak medium subangular blocky structure; hard, friable; common fine roots; few fine distinct dark yellowish brown masses of iron accumulation with sharp boundaries; moderately acid; abrupt wavy boundary.

Bt1—7 to 13 inches; grayish brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; weak medium angular blocky structure; extremely hard, extremely firm; few fine roots; few thin clay films;

few fine distinct yellowish brown (10YR 5/6) masses of iron accumulation with sharp boundaries; strongly acid; gradual wavy boundary.
Bt2—13 to 36 inches; gray (10YR 5/1) clay, dark gray (10YR 4/1) moist; weak medium angular blocky structure; extremely hard, extremely firm; few fine roots; few thin clay films; few fine distinct yellowish brown (10YR 5/6) masses of iron accumulation with sharp boundaries; slightly acid; gradual wavy boundary.
Cr—36 to 50 inches; very pale brown (10YR 7/3), tuffaceous sandstone.

The thickness of the solum ranges from 20 to 40 inches. When the soils are dry, small cracks may form at the surface.

The A horizon is less than 10 inches thick. It is light brownish gray, grayish brown, or brown. Reaction is moderately acid or slightly acid.

The Bt horizon is dark grayish brown, grayish brown, or dark gray. It has few or common masses of iron accumulation in shades of brown and yellow. The texture is clay or clay loam. Reaction ranges from extremely acid to slightly acid.

The Cr horizon is white, very pale brown, or light gray, tuffaceous sandstone.

Gladewater Series

The Gladewater series consists of very deep, somewhat poorly drained, very slowly permeable, clayey soils on flood plains along the Navasota River and its major tributaries. These soils formed in slightly acid, clayey alluvium. Slopes are 0 to 1 percent.

Typical pedon of Gladewater clay, frequently flooded (fig. 15); from the intersection of Texas Highway 21 and Farm Road 2038 about 10 miles east of Bryan, 3.8 miles east on Farm Road 2038, 2.2 miles north on Clear Lake Road to a gate, 4,200 feet east, in an area of woodland:

A—0 to 8 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; moderate medium subangular blocky structure; extremely hard, very firm; many fine roots; few fine faint yellowish brown masses of iron accumulation with clear to diffuse boundaries; strongly acid; clear wavy boundary.
Bssg1—8 to 53 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; weak coarse angular blocky structure; extremely hard; very firm; many fine roots; common slickensides; few fine faint yellowish brown masses of iron accumulation with clear to diffuse boundaries; strongly acid; gradual wavy boundary.
Bssg2—53 to 80 inches; dark grayish brown (10YR 4/2) clay, grayish brown (10YR 5/2) moist; weak coarse angular blocky structure; few fine roots; common slickensides; few medium faint yellowish brown masses of iron accumulation with clear to diffuse boundaries; moderately acid.

The thickness of the solum is more than 80 inches. When the soils are dry, cracks form at the surface. The cracks are 1/2 inch to 2 inches wide and 15 to 35 inches deep. These soils have aquic conditions during most years. Masses of iron accumulation are considered to be contemporary redoximorphic features.

The A horizon is dark gray, gray, or dark brown. It has few or common, faint to distinct, dark yellowish brown, brown, or dark grayish brown masses of iron accumulation. Reaction is moderately acid or strongly acid.

The Bssg horizon is dark grayish brown, grayish brown, or dark gray. It has brown or yellowish brown masses of iron accumulation. Reaction ranges from very strongly acid to slightly acid.

Gredge Series

The Gredge series consists of very deep, well drained, very slowly permeable soils on dissected Pleistocene terraces and terrace scarps. These soils formed in slightly acid or moderately alkaline clayey and loamy sediments. Slopes range from 1 to 8 percent.

Typical pedon of Gredge fine sandy loam, 1 to 5 percent slopes; from the Navasota River on Texas Highway 30, 2.4 miles west on Texas Highway 30 and 1,000 feet north, in a pasture:

A—0 to 7 inches; very pale brown (10YR 7/3) fine sandy loam, brown (10YR 5/3) moist; weak coarse subangular blocky structure; very hard, firm; many fine, medium, and coarse roots; common fine pores; very strongly acid; abrupt wavy boundary.
Bt1—7 to 13 inches; dark red (2.5YR 3/6) clay, dark red (2.5YR 3/6) moist; moderate fine angular blocky structure; very hard, very firm; many fine, medium, and coarse roots; continuous clay films on faces of peds; very strongly acid; clear smooth boundary.
Bt2—13 to 21 inches; reddish brown (5YR 5/4) clay, reddish brown (5YR 5/4) moist; moderate medium angular blocky structure; very hard, very firm; common fine and medium roots and few coarse roots; continuous clay films on faces of peds; common medium distinct light brownish gray (10YR 6/2) iron depletions; very strongly acid; clear smooth boundary.

Bt3—21 to 27 inches; light brownish gray (10YR 6/2) clay loam, grayish brown (10YR 5/2) moist; moderate coarse angular blocky structure parting to moderate fine angular blocky; very hard, very firm; few fine and medium roots; continuous clay films on faces of peds; common medium distinct strong brown (7.5YR 5/8) and common fine prominent red (2.5YR 4/8) masses of iron accumulation inside peds; strongly acid; gradual smooth boundary.

Bt4—27 to 40 inches; light brownish gray (10YR 6/2) clay loam, grayish brown (10YR 5/2) moist; moderate coarse angular blocky structure; very hard, very firm; few fine roots; discontinuous clay films on faces of peds; few white salt crystals (barite); few fine distinct strong brown (7.5YR 5/8) masses of iron accumulation; strongly acid; gradual smooth boundary.

BCt1—40 to 57 inches; mixed brownish yellow (10YR 6/8), gray (10YR 6/1), and light gray (2.5Y 7/2) clay loam; moderate and weak coarse angular blocky structure; hard, firm; few fine roots; few discontinuous clay films on faces of peds; few sand coats or fillings between peds; slightly acid; gradual wavy boundary.

BCt2—57 to 68 inches; mixed yellowish brown (10YR 5/4), very pale brown (10YR 7/3), and gray (10YR 6/1) sandy clay loam; weak medium and coarse subangular blocky structure; hard, firm; few fine roots; few discontinuous clay films on faces of peds; moderately alkaline.

The thickness of the solum ranges from 60 to about 80 inches. The boundary between the A and Bt horizons is abrupt or clear and is somewhat wavy. These soils do not remain saturated long enough in most years to develop aquic conditions; however, in years that are much wetter than normal, aquic conditions may develop in the area of contact between the A and Bt horizons. Masses of iron accumulation and iron depletions are considered to be relict redoximorphic features. The clay content decreases by 20 percent or more within a depth of 20 to 35 inches. Calcium carbonate concretions are in some pedons below a depth of 28 inches.

The A horizon averages less than 10 inches thick but may be as much as 15 inches thick in some pedons. This horizon is dark grayish brown, very pale brown, brown, pale brown, or light brownish gray. The content of siliceous pebbles ranges from 0 to 5 percent by volume. Reaction ranges from very strongly acid to slightly acid.

Some pedons have a thin E horizon.

The Bt1 horizon is red, dark red, or reddish brown. Reaction ranges from very strongly acid to moderately acid.

The Bt2 horizon is red, dark red, reddish brown, brown, yellowish brown, light yellowish brown, or dark brown and has light brownish gray iron depletions. The texture is clay, clay loam, or sandy clay loam. Reaction ranges from very strongly acid to slightly acid.

The Bt3 and Bt4 horizons are yellowish brown, brown, grayish brown, gray, or light gray. Redoximorphic features are shades of brown, red, gray, and yellow. The texture ranges from clay loam to sandy clay loam. Reaction ranges from strongly acid to moderately alkaline. The horizons are noncalcareous.

The BCt horizon has mixed redoximorphic features in shades of brown, yellow, red, and gray. Some pedons have a matrix color of grayish brown, light gray, and reddish yellow with or without redoximorphic features. The BCt horizon is sandy clay loam or clay loam. Reaction ranges from moderately acid to moderately alkaline. The horizon is noncalcareous.

Some pedons have a 2C horizon. This horizon is shale, mudstone, or stratified soil materials and occurs below a depth of 60 inches. The texture is mainly loam, clay loam, or clay. Reaction ranges from slightly acid to moderately alkaline. Some strata are calcareous.

Greenvine Series

The Greenvine series consists of moderately deep, well drained, very slowly permeable, clayey soils that formed in tuffaceous clay and siltstone. These soils are on uplands. Slopes range from 2 to 5 percent.

Typical pedon of Greenvine clay, 2 to 5 percent slopes; from the intersection of Texas Highway 6 and Farm Road 159 about 2.6 miles northeast of Millican, 2.5 miles south on Texas Highway 6, 1.5 miles west, north, and then east on a county road, 200 feet south of road, in an area of rangeland:

A—0 to 7 inches; very dark gray (10YR 3/1) clay, very dark gray (10YR 3/1) moist; moderate medium subangular blocky structure; extremely hard, very firm, very sticky and very plastic; common fine roots; slightly effervescent; moderately alkaline; clear wavy boundary.

Bss1—7 to 24 inches; very dark gray (10YR 3/1) clay, very dark gray (10YR 3/1) moist; moderate medium angular blocky structure; extremely hard, very firm, very sticky and very plastic; common fine roots; few intersecting slickensides; slightly effervescent; moderately alkaline; clear wavy boundary.

Bss2—24 to 35 inches; very dark gray (10YR 3/1) clay; moderate medium angular blocky structure; extremely hard, very firm, very sticky and very plastic; few fine roots; common intersecting slickensides; common medium distinct light gray (10YR 7/2), light brownish gray (10YR 6/2), and grayish brown (10YR 5/2) iron depletions with sharp boundaries; slightly effervescent; moderately alkaline; clear wavy boundary.
Cr—35 to 60 inches; light gray (10YR 7/2), interbedded tuffaceous siltstone and shale; extremely hard; extremely firm; slightly effervescent; moderately alkaline.

The thickness of the solum ranges from 30 to 40 inches. When the soils are dry, cracks extend from the surface to the Cr horizon. Some pedons have carbonates below a depth of 6 inches. Intersecting slickensides begin at a depth of about 15 inches. Iron depletions are considered to be relict redoximorphic features.

The A horizon ranges from 3 to 26 inches in thickness. It is black, dark gray, or very dark gray. Reaction ranges from neutral to moderately alkaline.

The Bss horizon is gray or dark gray. In some pedons it has grayish brown, light brownish gray, light gray, very pale brown, or white redoximorphic features. Reaction is slightly alkaline or moderately alkaline.

The Cr horizon ranges from clayey tuffaceous siltstone or shale to fine grained sandstone. Reaction is slightly alkaline or moderately alkaline.

Highbank Series

The Highbank series consists of very deep, well drained, slowly permeable soils on natural levees adjacent to the Brazos River. These soils formed in loamy and clayey alluvium. Slopes are 0 to 1 percent.

Typical pedon of Highbank silty clay loam, 0 to 1 percent slopes, rarely flooded (fig. 16), in western Brazos County; from the intersection of Texas Highway 21 and Farm Road 50 about 10 miles west of Bryan, 2.1 miles north on Farm Road 50, 0.1 mile west on Sims Road, 0.2 mile south on county road, 2.0 miles west on private road, 100 feet south of road, in an area of rangeland:

A1—0 to 8 inches; reddish brown (5YR 5/4) silty clay loam, reddish brown (5YR 4/4) moist; weak medium subangular blocky structure; hard, firm, slightly sticky; common fine roots; strongly effervescent; moderately alkaline; abrupt smooth boundary.
A2—8 to 15 inches; reddish brown (5YR 5/4) silty clay loam, reddish brown (5YR 4/4) moist; weak medium subangular blocky structure; common fine pressure faces; hard, firm, slightly sticky; common fine roots; strongly effervescent; moderately alkaline; abrupt smooth boundary.
Bss—15 to 19 inches; reddish brown (5YR 5/3) silty clay, reddish brown (5YR 4/3) moist; moderate medium subangular blocky structure; hard, firm, sticky; common intersecting slickensides; few fine roots; few thin strata of light reddish brown silt loam; few bedding planes; strongly effervescent; moderately alkaline; abrupt smooth boundary.
Abss—19 to 80 inches; reddish brown (5YR 4/3) clay, dark reddish brown (5YR 3/3) moist; weak medium blocky structure; very hard, very firm, very sticky and very plastic; few fine roots; few fine pores; few shiny pressure faces; few intersecting slickensides; strongly effervescent; moderately alkaline.

The A horizon is reddish brown or yellowish red.

The Bss horizon is reddish brown, light reddish brown, or yellowish red. The texture is clay, silty clay, or silty clay loam. Faint stratification may occur in this horizon.

The buried horizon below a depth of 25 inches is reddish brown, dark reddish brown, reddish gray, or light reddish brown. It is clay, silty clay loam, or silt loam or is stratified with these textures.

Kaufman Series

The Kaufman series consists of very deep, moderately well drained, very slowly permeable, clayey soils on flood plains along the Navasota River and major local streams. Slopes are 0 to 1 percent.

Typical pedon of Kaufman clay, frequently flooded, on the flood plain along Wickson Creek in eastern Brazos County; from the intersection of Texas Highway 30 and Farm Road 158, 1.1 miles south on Texas Highway 30, 2.8 miles east on Hardy Weedon Road to Wickson Creek, 700 feet south on private road, in an area of open rangeland:

A—0 to 10 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; moderate medium subangular blocky structure; extremely hard, extremely firm; many fine roots; strongly acid; clear wavy boundary.
Bss1—10 to 48 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; moderate medium subangular blocky structure; extremely hard, extremely firm; common fine roots; common medium intersecting slickensides; few fine

yellowish brown masses of iron accumulation with sharp boundaries; moderately acid; gradual smooth boundary.

Bss2—48 to 80 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; weak coarse subangular blocky structure; extremely hard, extremely firm; few fine roots; common intersecting slickensides; few fine yellowish brown masses of iron accumulation with sharp boundaries; moderately alkaline.

The thickness of the solum is more than 80 inches. Cracks 1 to 2 inches wide and up to 30 inches deep form during the dry seasons. Masses of iron accumulation are considered to be relict redoximorphic features.

The A horizon is dark gray or very dark gray. Reaction is slightly acid or neutral.

The Bss horizon is very dark gray, dark gray, or gray. Few yellowish brown masses of iron accumulation are in the lower part. In some pedons the lower part is clay loam. Reaction ranges from slightly acid to moderately alkaline.

Koether Series

The Koether series consists of shallow, somewhat excessively drained, rapidly permeable soils that formed in strongly cemented sandstone. These soils are on uplands. Slopes range from 3 to 12 percent.

Typical pedon of Koether loamy fine sand, in an area of Koether-Rock outcrop complex, 3 to 12 percent slopes; from the intersection of Texas Highway 6 and Texas Business 6, 1.9 miles south on Texas Highway 6 to Greens Prairie Road, 0.3 mile on Greens Prairie Road, 500 feet northwest, in an area of rangeland:

A1—0 to 8 inches; brown (10YR 5/3) loamy fine sand, brown (10YR 4/3) moist; weak fine subangular blocky structure; soft, very friable; many fine roots; about 35 percent, by volume, sandstone fragments 2 inches wide and 5 inches long; moderately acid; gradual wavy boundary.

A2—8 to 12 inches; pale brown (10YR 6/3) loamy fine sand, brown (10YR 5/3) moist; weak fine subangular blocky structure; soft, very friable; common fine roots; about 40 percent, by volume, sandstone fragments 2 inches wide and 5 inches long; few siliceous pebbles; moderately acid.

R—12 to 20 inches; indurated sandstone.

The depth to hard sandstone bedrock ranges from 7 to 20 inches. The content of coarse angular sandstone fragments ranges from 35 to 50 percent in the surface horizon.

The A horizon is brown or pale brown. Reaction ranges from moderately acid to very strongly acid.

Kurten Series

The Kurten series consists of well drained, very slowly permeable, loamy soils that are deep to shale. These soils formed in mostly acid deltaic shales and clays. They are on uplands. Slopes range from 2 to 8 percent.

Typical pedon of Kurten fine sandy loam, 2 to 5 percent slopes; from the intersection of Old San Antonio Road (OSR) and Texas Highway 6 about 5 miles north of Bryan, 15.1 miles east on OSR, 1.1 miles southeast on private road (Pecan Valley Ranch), 0.1 mile east, in a pasture:

Ap—0 to 4 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 4/3) moist; weak fine subangular blocky structure; hard, very friable; many fine and medium roots; few fine siliceous pebbles; slightly acid; abrupt smooth boundary.

Bt—4 to 11 inches; red (2.5YR 5/6) clay, red (2.5YR 4/6) moist; moderate coarse prismatic structure parting to weak coarse subangular blocky; very hard, very firm; many fine and medium roots along faces of peds; few pressure faces; few siliceous pebbles; very strongly acid; gradual wavy boundary.

Btss1—11 to 20 inches; red (2.5YR 4/6) clay; moderate coarse prismatic structure parting to moderate medium angular blocky; very hard, very firm; common fine and medium roots; common pressure faces; few prominent intersecting slickensides; grayish brown (10YR 5/2) coats along root channels; common fine and medium prominent light brownish gray (2.5Y 6/2) iron depletions with sharp boundaries; few siliceous pebbles; very strongly acid; gradual wavy boundary.

Btss2—20 to 33 inches; red (2.5YR 4/6) clay; moderate coarse prismatic structure parting to moderate medium angular blocky; very hard, very firm; common fine and medium roots; few prominent intersecting slickensides; grayish brown (10YR 5/2) coats along root channels; moderate medium and coarse prominent pale red (2.5YR 6/2) iron depletions with sharp boundaries; very strongly acid; gradual wavy boundary.

BCtss—33 to 45 inches; grayish brown (10YR 5/2) clay; weak coarse prismatic structure parting to

weak thick platy; very hard, very firm; common fine roots; few prominent large slickensides; many medium prominent red (2.5YR 5/6) and yellowish brown (10YR 5/8) masses of iron accumulation; very strongly acid; gradual wavy boundary.

C1—45 to 58 inches; grayish brown (10YR 5/2) shale that has clay texture; massive; hard, firm; few fine and medium roots; stratified rock fragments from the C2 horizon; thin strata of reddish yellow (7.5YR 6/6) material; thin loamy strata of strong brown (7.5YR 4/6) and yellow (2.5Y 7/6); clay films on horizontal surfaces; few large masses of gypsum crystals; very strongly acid; gradual wavy boundary.

C2—58 to 80 inches; grayish brown (10YR 5/2) shale that has clay texture; massive; hard, firm; few fine roots; approximately 20 percent strong brown (7.5YR 4/6), yellow (2.5Y 7/6), and light gray (10YR 7/2) loamy strata 1/4 to 1/2 inch thick; few faint yellowish brown (10YR 5/4) masses of iron accumulation; very strongly acid.

The thickness of the solum ranges from 40 to 60 inches. The boundary between the A and Bt horizons is abrupt over the subsoil crests and clear over the subsoil troughs. The content of ironstone pebbles ranges from 0 to 10 percent by volume. A few ironstone fragments up to 20 inches in diameter are on the surface of some pedons. The content of clay in the particle-size control section ranges from 40 to 60 percent. The coefficient of linear extensibility ranges from 0.07 to 0.10 in the upper 20 inches of the Bt horizon, and the potential linear extensibility is more than 2.5 inches in the upper 50 inches of the soil. Masses of iron accumulation and iron depletions are considered to be relict redoximorphic features.

The A horizon averages less than 10 inches thick in more than 50 percent of the pedon, but it is as much as 12 inches thick over some subsoil troughs. The A horizon is brown, dark grayish brown, grayish brown, or light grayish brown. Some pedons have masses of iron accumulation in shades of yellow and brown.

The E horizon, if it occurs, is light grayish brown, grayish brown, or pale brown. Reaction ranges from strongly acid to neutral.

The Bt horizon is red, dark reddish brown, reddish brown, or yellowish red. Redoximorphic features in shades of red, brown, gray, or yellow are in some pedons. The texture is clay or silty clay. Reaction ranges from very strongly acid to moderately acid. Base saturation is 35 to 75 percent.

The Btss horizon is red, dark reddish brown, reddish brown, or yellowish red. The texture is clay or silty clay. Reaction ranges from very strongly acid to neutral. Few or common gypsum crystals are in some pedons.

The BCtss horizon is red, dark reddish brown, or brown. The texture is mainly clay, silty clay, or clay loam and is less commonly sandy clay loam. Reaction ranges from very strongly acid to slightly alkaline. Few or common gypsum crystals and few calcium carbonate concretions are in some pedons.

The C horizon is shades of red, brown, yellow, or gray. It is mostly soft shale but is stratified with silt loam, clay loam, loam, or very fine sandy loam in some pedons. Reaction ranges from very strongly acid to slightly alkaline. Few or common gypsum crystals and few calcium carbonate concretions are in some pedons.

Lufkin Series

The Lufkin series consists of very deep, moderately well drained, very slowly permeable soils on Pleistocene terraces or remnants of terraces in the uplands. These soils formed in slightly acid to alkaline clayey sediments. Slopes are 0 to 1 percent.

Typical pedon of Lufkin fine sandy loam, 0 to 1 percent slopes (fig. 17); from the intersection of Texas Highway 21 and Farm Road 2038 in Kurten, 0.2 mile east on Texas Highway 21, 2.6 miles northeast on Democrat Road, 1.1 miles east on Plagen Road, 600 feet north of the road:

Ap—0 to 6 inches; grayish brown (10YR 5/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak coarse subangular blocky structure; friable, nonsticky; many fine roots; many fine distinct brown (7.5YR 4/4) masses of iron accumulation with sharp boundaries; few fine siliceous pebbles; moderately acid; clear smooth boundary.

Eg—6 to 9 inches; light gray (10YR 7/2) loam, dark grayish brown (10YR 6/2) moist; weak medium subangular blocky structure; friable, nonsticky; many fine roots; many medium distinct brown masses of iron accumulation and common medium distinct grayish brown iron depletions with clear to sharp boundaries; few fine siliceous pebbles; moderately acid; abrupt wavy boundary.

Btg—9 to 18 inches; grayish brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; moderate medium angular blocky structure; very firm, plastic; common fine roots; few pressure faces; few discontinuous clay films; common medium distinct gray (10YR 5/1) iron depletions and few

fine prominent red (2.5YR 4/6) masses of iron accumulation; few fine siliceous pebbles; strongly acid; clear smooth boundary.

Btssg1—18 to 25 inches; light brownish gray (10YR 6/2) clay, grayish brown (10YR 5/2) moist; moderate medium angular blocky structure; very firm, plastic; common fine roots; dark grayish brown clay films on faces of peds and on small slickensides; common fine pressure faces; many coarse distinct yellowish brown (10YR 5/8) masses of iron accumulation with sharp boundaries; few fine siliceous pebbles; strongly acid; clear smooth boundary.

Btssg2—25 to 32 inches; gray (10YR 6/1) clay loam, gray (10YR 5/1) moist; moderate coarse angular blocky structure; very firm, plastic; few fine roots; few pressure faces and small slickensides; gray clay films on faces of peds; few fine black iron-manganese concretions; few fine distinct yellowish brown (10YR 5/8) masses of iron accumulation with sharp to diffuse boundaries; moderately acid; clear wavy boundary.

Btgk1—32 to 40 inches; gray (10YR 6/1) clay loam, gray (10YR 5/1) moist; moderate coarse angular blocky structure; very firm, plastic; few fine roots; few pressure faces; gray clay films on faces of peds; few fine calcium carbonate concretions; few fine iron-manganese concretions; few fine distinct yellowish brown (10YR 5/8) masses of iron accumulation with sharp to clear boundaries; neutral; clear wavy boundary.

Btgk2—40 to 80 inches; light gray (10YR 6/1) clay loam, gray (10YR 5/1) moist; moderate medium angular blocky structure; firm, plastic; few fine roots; few pressure faces; gray clay films; few fine iron-manganese concretions; few coarse distinct gray (10YR 5/1) iron depletions with sharp to clear boundaries; few fine siliceous pebbles; neutral.

The thickness of the solum is more than 80 inches. Cracks form during dry periods. During most years these soils do not have aquic conditions, but they are saturated for short periods and may develop some aquic features. Masses of iron accumulation and iron depletions are considered to be both relict and contemporary redoximorphic features.

The A horizon is hard and massive when dry. It is dark gray, gray, light gray, dark grayish brown, grayish brown, or light brownish gray. Reaction ranges from strongly acid to slightly acid.

The E horizon is gray, light gray, light brownish gray, or white. Some pedons in cultivated areas do not have an E horizon.

The Bt horizon typically is gray, light gray, grayish brown, or light brownish gray. Less than 20 percent of the volume of the Bt horizon has masses of iron accumulation in shades of brown, olive, or yellow. The texture is clay or clay loam, and the content of clay ranges from 35 to 45 percent. Reaction ranges from strongly acid to slightly alkaline.

Luling Series

The Luling series consists of very deep, well drained, very slowly permeable soils on uplands. These soils formed in marine clays. Slopes range from 1 to 8 percent.

Typical pedon of Luling clay, 1 to 3 percent slopes (fig. 18); from the intersection of Old San Antonio Road (OSR) and Farm Road 1687 about 5 miles west of Bryan, 600 feet west on Farm Road 1687, 100 feet north, in a pasture:

A—0 to 5 inches; dark grayish brown (2.5Y 4/2) clay, very dark grayish brown (2.5Y 3/2) moist; moderate medium subangular blocky structure; hard, firm; common fine roots; few fine calcium carbonate concretions; moderately alkaline; gradual wavy boundary.

Bss—5 to 17 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate medium angular blocky structure; very hard, very firm; common fine roots; few fine pressure faces; few fine slickensides in the lower part; few fine calcium carbonate concretions; few fine and medium ironstone pebbles; moderately alkaline; gradual wavy boundary.

Bssk1—17 to 31 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; few fine very dark grayish brown (2.5Y 3/2) masses in old cracks; weak coarse angular blocky structure; extremely hard, extremely firm; few fine roots; common fine intersecting slickensides; common fine and medium calcium carbonate concretions; few fine iron-manganese concretions; moderately alkaline; gradual wavy boundary.

Bssk2—31 to 44 inches; grayish brown (2.5Y 5/2) clay; common fine distinct light olive brown (2.5Y 5/6) masses of iron accumulation; common fine intersecting slickensides; weak coarse angular blocky structure; extremely hard, extremely firm; few fine roots; common fine and medium calcium carbonate concretions; few fine black iron-manganese concretions; moderately alkaline; gradual smooth boundary.

BCky—44 to 62 inches; mixed grayish brown (2.5Y 5/2), light olive brown (2.5Y 5/6), and gray (10YR 6/1) clay; weak coarse angular blocky structure; very hard, very firm; few fine roots; few fine

pressure faces; few fine gypsum and calcium carbonate concretions; moderately alkaline; gradual smooth boundary.

Cky—62 to 75 inches; mixed light brownish gray (10YR 6/2), pale brown (10YR 6/3), and light olive brown (2.5Y 5/6) clay; massive; few fine calcium carbonate concretions; 10 to 15 percent gypsum crystals; moderately alkaline.

The thickness of the solum ranges from 60 to 80 inches. Slickensides extend to a depth of 12 inches. When the soils are dry, cracks form at the surface. The cracks are as much as 2 inches wide and extend to a depth of about 40 inches. Undisturbed areas have gilgai microrelief. Microknolls are 3 to 10 inches higher than microdepressions. Reaction ranges from neutral to moderately alkaline throughout the profile. The content of gypsum crystals ranges from 0 to 20 percent.

The A horizon is grayish brown, dark grayish brown, or very dark grayish brown.

The B horizon is mostly grayish brown, dark grayish brown, or gray. It is light olive brown or yellowish brown in some pedons.

The C horizon is light olive brown, light brownish gray, pale brown, or grayish brown.

Mabank Series

The Mabank series consists of very deep, moderately well drained, very slowly permeable soils that formed in alkaline clays. These soils are on stream terraces and valley fills. Slopes are 0 to 1 percent.

Typical pedon of Mabank loam, 0 to 1 percent slopes; from the intersection of Texas Highway 6 (Business 6) and Texas Highway 6 (Bypass) north of Bryan, 500 feet east, in an old cropland field:

A—0 to 8 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; moderate fine subangular blocky structure; hard, firm; common fine roots; common fine faint dark yellowish brown (10YR 4/6) masses of iron accumulation with sharp boundaries; moderately acid; clear smooth boundary.

BE—8 to 10 inches; dark gray (10YR 4/1) clay loam, very dark gray (10YR 3/1) moist; moderate medium subangular blocky structure; hard, firm; few fine roots; slightly acid; clear smooth boundary.

Btss1—10 to 24 inches; black (10YR 2/1) clay, black (10YR 2/1) moist; weak coarse blocky structure; extremely hard, very firm; few fine roots; few slickensides; common pressure faces; common discontinuous clay films; few fine ironstone pebbles; neutral; clear smooth boundary.

Btss2—24 to 31 inches; very dark gray (10YR 3/1) clay; weak medium angular blocky structure; hard, very firm; few fine roots; few slickensides; common pressure faces; common discontinuous clay films; common medium prominent weak red (2.5YR 4/2) and common fine distinct dark brown (7.5YR 3/2) iron depletions with sharp to clear boundaries; few fine ironstone pebbles; neutral; clear smooth boundary.

Btyg1—31 to 45 inches; dark grayish brown (10YR 4/2) clay loam; weak medium angular blocky structure; extremely hard, extremely firm; common discontinuous clay films; few fine roots; 15 percent gypsum crystals; common fine faint dark yellowish brown (10YR 3/4) masses of iron accumulation with sharp to clear boundaries; neutral; gradual smooth boundary.

Btyg2—45 to 65 inches; dark grayish brown (10YR 4/2) clay loam; weak medium subangular blocky structure; very hard, very firm; few fine roots; common discontinuous clay films; many fine distinct strong brown (7.5YR 4/6) and few fine prominent yellowish red (5YR 4/6) masses of iron accumulation with sharp to clear boundaries; 15 percent gypsum crystals; neutral; gradual smooth boundary.

2CBy—65 to 70 inches; dark grayish brown (10YR 4/2) clay loam; weak medium subangular blocky structure; very hard, very firm; common medium dark brown (10YR 3/3) masses of iron accumulation; 15 percent gypsum crystals; neutral; gradual smooth boundary.

2C—70 to 80 inches; mixed dark brown (7.5YR 4/3), yellow (10YR 7/6), and red (2.5YR 4/6) clay loam; bedding planes; 20 percent gypsum crystals; neutral.

The thickness of the solum ranges from 60 to more than 80 inches. The depth to gypsum crystals ranges from 35 to 45 inches. When the soils are dry, cracks 1/2 inch wide extend from the top of the argillic horizon to a depth of 20 inches or more. During most years these soils do not have aquic conditions, but they are saturated for short periods and may develop some aquic features. Masses of iron accumulation and iron depletions are considered to be both relict and contemporary redoximorphic features.

The thickness of the A and E horizons averages less than 10 inches, but the thickness ranges to 15 inches in subsoil troughs. The A and E horizons are light brownish gray, dark grayish brown, grayish brown, or gray. Reaction ranges from moderately acid to neutral.

Figure 12.—A profile of Boonville fine sandy loam, 1 to 3 percent slopes. The subsoil is dense, gray clay that has a high shrink-swell potential. The subsoil has a very wavy upper boundary.

Figure 13.—A profile of Burlewash fine sandy loam, 1 to 5 percent slopes. The subsoil is reddish brown clay. Weakly cemented sandstone is at a depth of about 35 inches.

Figure 14.—A profile of Coarsewood silt loam, 0 to 1 percent slopes, rarely flooded. Strata of silt loam begin directly beneath a thin surface layer.

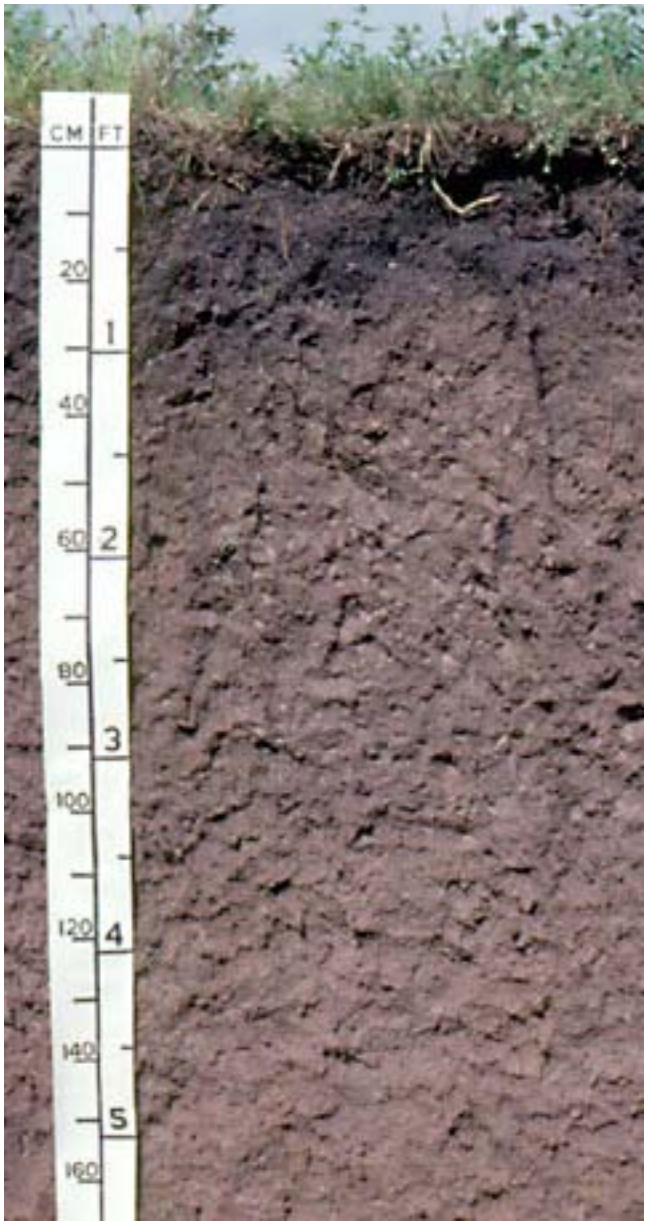

Figure 15.—A profile of Gladewater clay, frequently flooded. This soil is dark grayish brown clay throughout and has common slickensides.

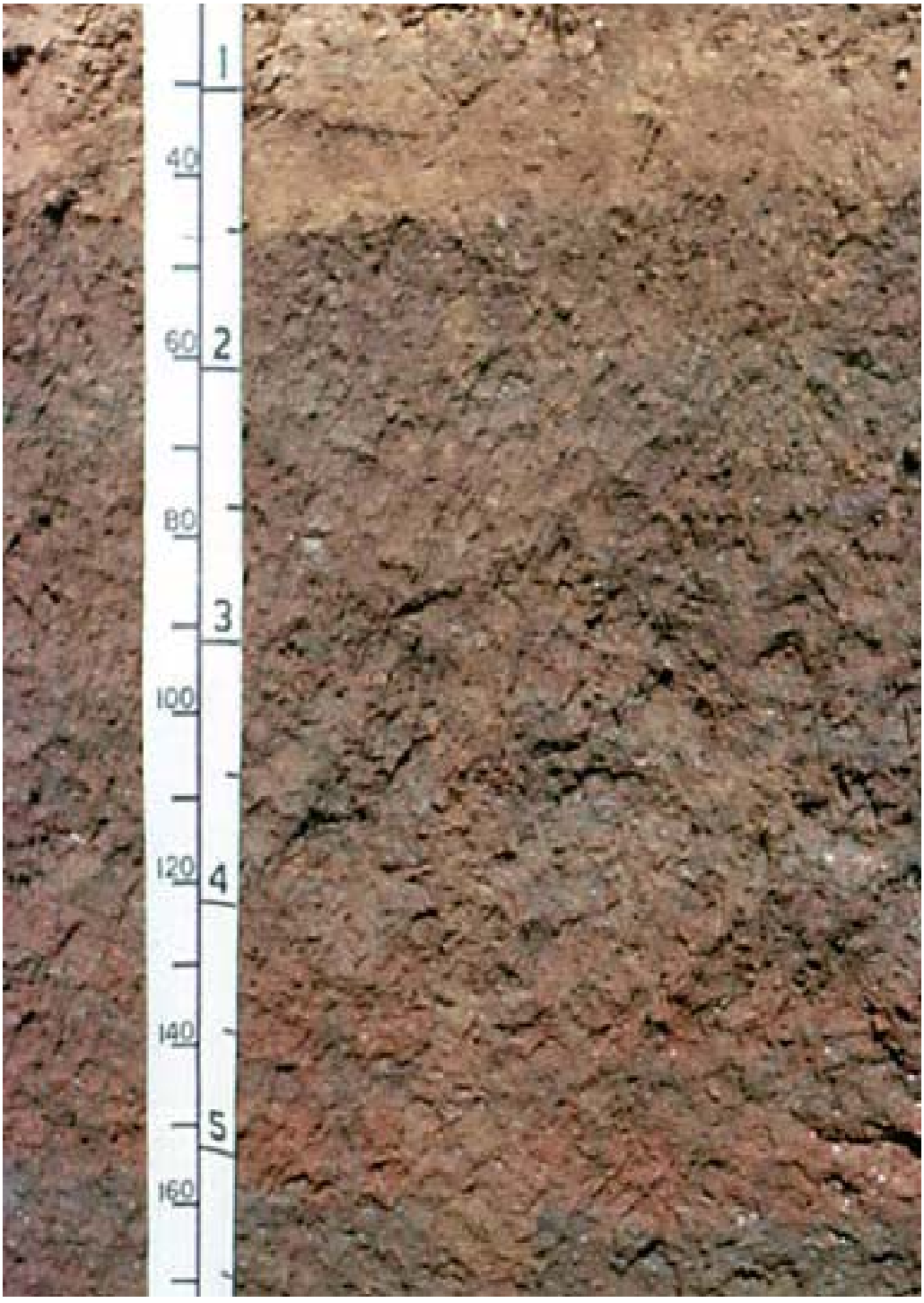

Figure 16.—A profile of Highbank silty clay loam, 0 to 1 percent slopes, rarely flooded. Reddish brown silty clay loam is above a layer of dense clay that has common slickensides.

Figure 17.—A utility excavation showing the extremely wavy contact between the surface layer and the subsoil in an area of Lufkin fine sandy loam, 0 to 1 percent slopes.

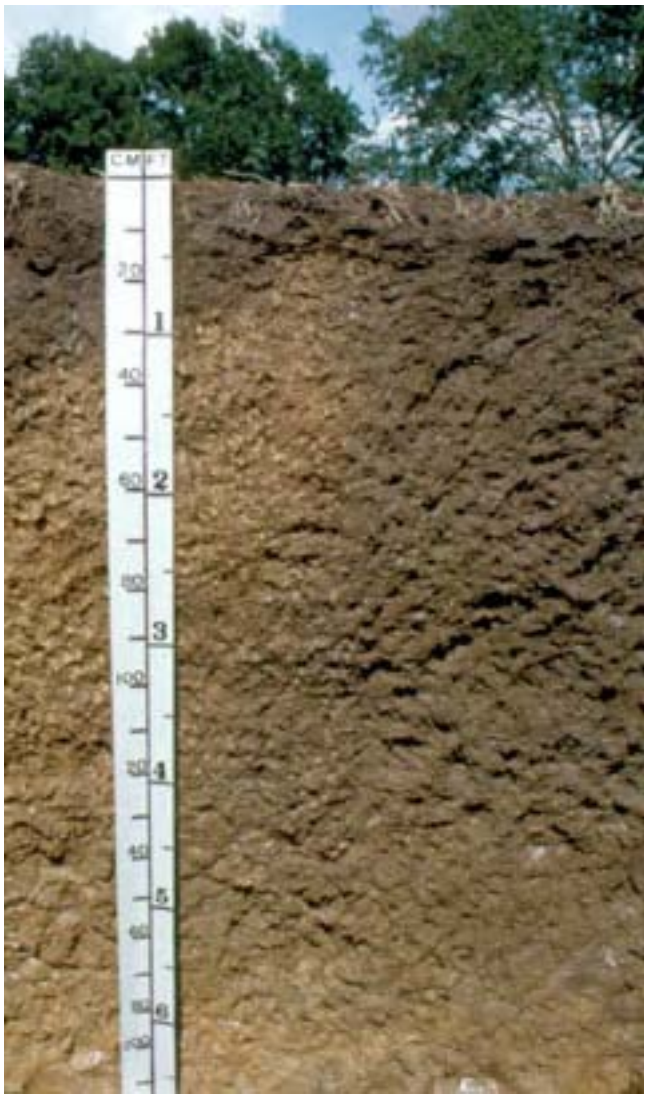

Figure 18.—A profile of Luling clay, 1 to 3 percent slopes. The high shrink-swell potential is evidenced by the slickensides and by the difference in colors between microhighs and microlows.

Figure 19.—A profile of Roetex clay, frequently flooded. This soil is clay throughout. It has wetness features and slickensides below a thin surface layer.

Figure 20.—A profile of Sandow loam, frequently flooded. Strata of brown loam and fine sandy loam begin directly beneath a thin surface layer.

Figure 21.—A profile of Ships clay, 0 to 1 percent slopes, rarely flooded. This soil is brown clay throughout and has common slickensides.

Figure 22.—A profile of Silawa fine sandy loam, 2 to 5 percent slopes. The subsoil is reddish brown sandy clay loam that grades to loamy sand at a depth of about 50 inches.

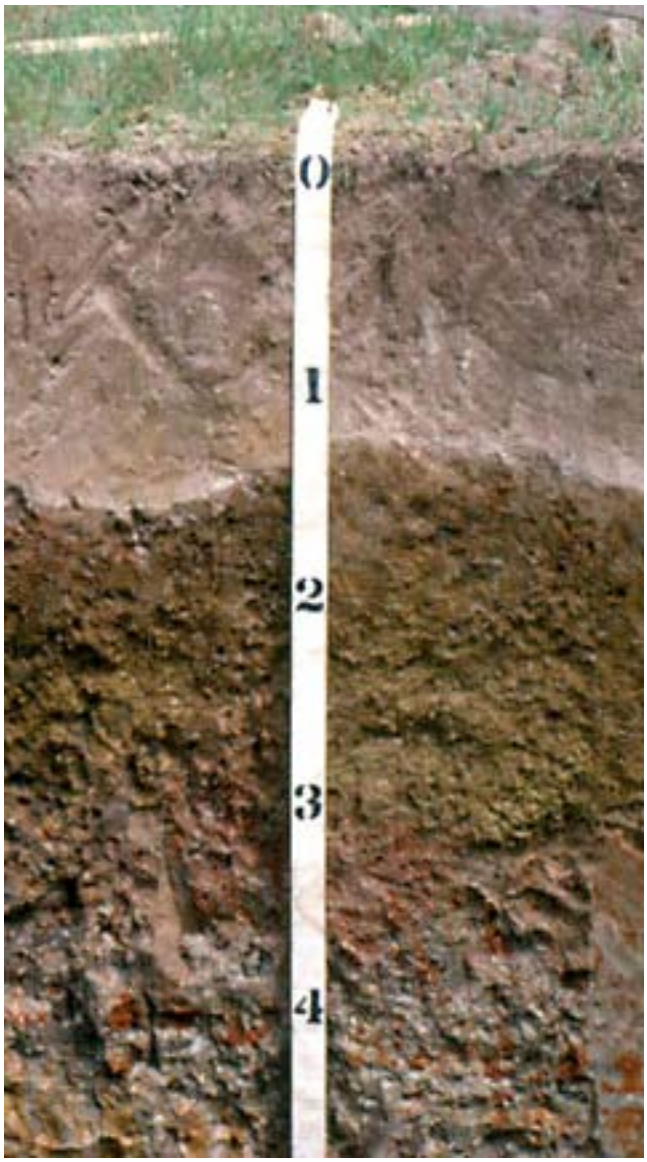

Figure 23.—A profile of Tabor fine sandy loam, 0 to 2 percent slopes. The subsoil is mottled, dense clay and has a very wavy upper boundary. Depth is marked in feet.

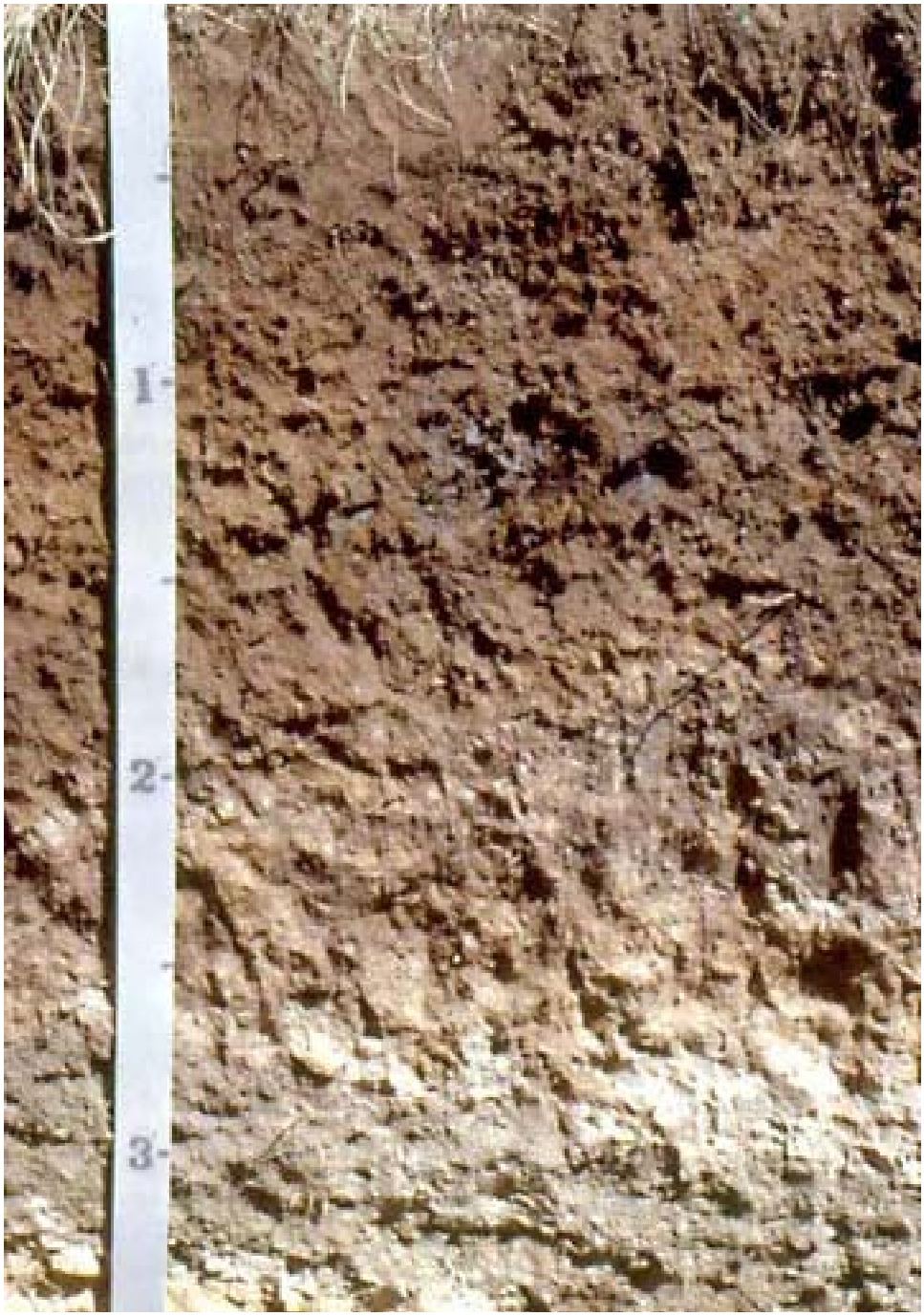

Figure 24.—A profile of Zack very fine sandy loam, 1 to 5 percent slopes. The subsoil is mottled clay that grades to weakly bedded material at a depth of about 36 inches.

The BE horizon is light brownish gray, dark gray, or grayish brown. Reaction ranges from moderately acid to neutral.

The Btss1 horizon is black or very dark gray. In some pedons it has few masses of iron accumulation in shades of yellow and brown. The texture is clay or clay loam. Reaction ranges from moderately acid to moderately alkaline.

The Btss2 horizon and lower horizons are very dark gray or very dark grayish brown. In some pedons they have few or common weak red and strong brown masses of iron accumulation. The texture is clay or clay loam. Reaction ranges from moderately acid to slightly alkaline.

The Bty horizon has 5 to 20 percent gypsum crystals 3 to 5 mm in size. This horizon is dark grayish brown or grayish brown and has dark yellowish brown, strong brown, or yellowish red masses of iron accumulation. The texture is clay or clay loam. Reaction ranges from neutral to moderately alkaline.

The 2CBy horizon is dark grayish brown or dark gray.

Navasan Series

The Navasan series consists of very deep, moderately well drained, moderately slowly permeable soils that formed in sandy alluvial sediments. These soils are on first-level stream terraces. Slopes range from 0 to 3 percent.

Typical pedon of Navasan loamy fine sand, 0 to 3 percent slopes; from the intersection of Texas Highway 21 and Farm Road 2038 in Kurten, 0.2 mile east on Texas Highway 21, 2.6 miles northeast on Democrat Road to intersection with Plagen Road, 0.3 mile northeast on Democrat Road, 1.75 miles east on semiprivate road, 2,500 feet east along powerline right-of-way, 200 feet north, in a pasture:

A—0 to 4 inches; brown (10YR 5/3) loamy fine sand, dark brown (10YR 4/3) moist; weak fine and medium subangular blocky structure; loose, very friable; common fine and medium roots; strongly acid; clear smooth boundary.

E1—4 to 15 inches; very pale brown (10YR 7/3) loamy fine sand, pale brown (10YR 6/3) moist; weak medium subangular blocky structure; soft, very friable; common fine and medium roots; few fine distinct yellowish brown (10YR 5/6) masses of iron accumulation with clear to diffuse boundaries; strongly acid; clear wavy boundary.

E2—15 to 31 inches; very pale brown (10YR 7/3) loamy fine sand, pale brown (10YR 6/3) moist; weak medium subangular blocky structure; soft, very friable; few fine and medium roots; few medium distinct yellowish brown (10YR 5/8) masses of iron accumulation with clear to diffuse boundaries; some masses of iron accumulation have a strong brown (7.5YR 5/6) center; moderately acid; clear wavy boundary.

E3—31 to 51 inches; very pale brown (10YR 8/3) loamy fine sand, very pale brown (10YR 7/3) moist; weak medium subangular blocky structure; soft, very friable; few medium roots; common medium yellowish brown (10YR 5/6) masses of iron accumulation with clear to diffuse boundaries and a strong brown (7.5YR 5/6) center; moderately acid; clear smooth boundary.

B/E—51 to 61 inches; brownish yellow (10YR 6/6) fine sandy loam, yellowish brown (10YR 5/6) moist (B); moderate fine subangular blocky structure; slightly hard, friable; some small areas are slightly brittle when moist; few fine roots; about 30 percent, by volume, very pale brown (10YR 7/3) loamy fine sand in pockets and tongues 2 to 4 inches in diameter at intervals of 8 to 12 inches (E); few iron-manganese concretions and nodules 1/4 to 1/2 inch in diameter; strongly acid; abrupt smooth boundary.

Bt—61 to 66 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 4/3) moist; weak coarse blocky structure; slightly hard, friable; few fine roots; few thin discontinuous clay films on faces of peds; few fine distinct yellowish brown (10YR 5/6) masses of iron accumulation with a strong brown center and with clear to diffuse boundaries; strongly acid; clear smooth boundary.

Btg1—66 to 74 inches; light gray (10YR 7/2) sandy clay loam, light brownish gray (10YR 6/2) moist; weak coarse blocky structure; hard, firm; few fine roots; few small masses of E material; few thin discontinuous clay films on faces of peds; common medium prominent strong brown (7.5YR 5/6) and few fine prominent brownish yellow (10YR 6/6) masses of iron accumulation with clear to diffuse boundaries; strongly acid; clear wavy boundary.

Btg2—74 to 90 inches; light gray (10YR 7/1) sandy clay loam, gray (10YR 6/1) moist; weak coarse blocky structure; hard, firm; few fine roots; common continuous clay films on faces of peds; few fine prominent strong brown (7.5YR 5/6) and brownish yellow (10YR 6/6) masses of iron accumulation with clear to diffuse boundaries; strongly acid.

The thickness of the solum is more than 80 inches. A perched water table is at a depth of about 48 to 60 inches during most of the year. The combined

thickness of the A and E horizons ranges from 40 to 60 inches. Redoximorphic features are considered to be contemporary.

The A or Ap horizon is brown or grayish brown. It has yellowish brown or brownish yellow masses of iron accumulation in some pedons. Reaction ranges from strongly acid to neutral.

The E horizon is very pale brown, pale brown, or light yellowish brown. In most pedons the lower part of this horizon has few or common brownish and yellowish masses of iron accumulation. Reaction in the E horizon ranges from strongly acid to neutral. The texture is loamy fine sand or loamy sand.

The E/B or B/E horizon consists of masses, interfingers, and tongues of material that are continuous and contain isolated masses of B material. The E part of the horizon is very pale brown or pale brown. The B material is yellowish brown or brownish yellow. The texture in the B part is fine sandy loam, sandy clay loam, or loam. Reaction ranges from very strongly acid to moderately acid. In most pedons the lower part of the E/B horizon contains few or common fine or medium pebbles.

The Bt horizon is yellowish brown, brown, or brownish yellow. It has few or common masses of iron accumulation in shades of brown and yellow. Iron depletions in shades of gray are in some pedons. The texture is sandy loam or fine sandy loam. Reaction ranges from very strongly acid to moderately acid.

The Btg horizon has grayish matrix colors and few to many masses of iron accumulation in shades of brown and yellow. Some pedons have iron depletions in shades of gray. Some pedons have a mixed matrix with these colors. The texture is sandy clay loam or clay loam. Reaction is strongly acid or moderately acid.

Padina Series

The Padina series consists of very deep, well drained, moderately permeable soils that formed in thick sandy beds. These soils are on uplands and Pleistocene terraces. Slopes range from 1 to 5 percent.

Typical pedon of Padina loamy fine sand, 1 to 5 percent slopes, in northeastern Brazos County; from the intersection of Texas Highway 21 and Farm Road 2038 at Kurten, 5.5 miles southeast on Farm Road 2038, 0.3 mile southwest on Cobb Road, 0.2 mile east on private road, 200 feet north of road, in a pasture:

A—0 to 8 inches; light yellowish brown (10YR 6/4) loamy fine sand, yellowish brown (10YR 5/4) moist; single grained; loose; common fine and medium roots; moderately acid; clear smooth boundary.

E—8 to 62 inches; very pale brown (10YR 7/4) loamy fine sand, light yellowish brown (10YR 6/4) moist; single grained; loose; few fine roots; moderately acid; gradual smooth boundary.

B/E—62 to 71 inches; yellowish brown (10YR 5/6) fine sandy loam; about 40 percent light yellowish brown (10YR 6/4) loamy fine sand (E); weak medium subangular blocky structure; slightly hard, firm; few fine roots; few discontinuous clay films; common medium distinct yellowish red (5YR 5/6) masses of iron accumulation with clear to diffuse boundaries; strongly acid; gradual smooth boundary.

Bt—71 to 82 inches; mixed light gray (10YR 7/2), yellowish red (5YR 4/6), and red (2.5YR 4/6) sandy clay loam; moderate medium subangular blocky structure; hard, firm; few fine roots; common discontinuous clay films; strongly acid.

The thickness of the solum is more than 80 inches. These soils may become saturated in the lower part of the profile for short periods after heavy rains and may develop aquic conditions in years that are much wetter than normal. The combined thickness of the A and E horizons ranges from 40 to 65 inches.

The A horizon is dark grayish brown, dark brown, brown, pale brown, dark yellowish brown, light yellowish brown, yellowish brown, very pale brown, grayish brown, or light brownish gray. Reaction ranges from moderately acid to neutral.

The E horizon is light yellowish brown, pale brown, very pale brown, or brown. Reaction ranges from moderately acid to neutral. The boundary between the A and Bt1 horizons is wavy or irregular.

The Bt horizon is light gray, brownish yellow, yellowish brown, or yellowish red. It has few or common masses of iron accumulation in shades of brown and yellow. Iron depletions in shades of gray are in some pedons. The texture is fine sandy loam or sandy clay loam, and the content of clay ranges from 18 to 35 percent. Reaction ranges from strongly acid to slightly acid.

The BC horizon, if it occurs, is mixed yellowish red, red, light gray, and brownish yellow. The texture is sandy clay loam or fine sandy loam. Reaction ranges from slightly acid to strongly acid.

Rader Series

The Rader series consists of very deep, moderately well drained, very slowly permeable soils that formed in loamy and sandy alluvial sediments. These soils are on terraces and on upland valley fills. Slopes range from 0 to 3 percent.

Typical pedon of Rader fine sandy loam, 0 to 2 percent slopes, in eastern Brazos County; from the intersection of Farm Road 2038 and Texas Highway 21 at Kurten, 3.8 miles east on Farm Road 2038, 0.5 mile north, 0.6 mile east, and 0.1 mile north on county road, 200 feet west of road; in a pasture:

A—0 to 11 inches; brown (10YR 5/3) fine sandy loam, brown (10YR 4/3) moist; weak fine subangular blocky structure; slightly hard, friable; many fine and medium roots; common fine faint dark grayish brown and dark yellowish brown masses of iron accumulation with clear to diffuse boundaries; slightly acid; clear wavy boundary.

E—11 to 17 inches; very pale brown (10YR 7/4) fine sandy loam, light yellowish brown (10YR 6/4) moist; weak fine subangular blocky structure; slightly hard, friable; many fine roots; few fine yellowish brown masses of iron accumulation with clear to diffuse boundaries; moderately acid; gradual wavy boundary.

Bt/E—17 to 28 inches; yellowish brown (10YR 5/6) sandy clay loam; 10 to 20 percent very pale brown (10YR 7/4) albic materials (E); weak fine subangular blocky structure; hard, firm; few fine roots; few discontinuous clay films on faces of peds; common medium distinct light yellowish brown (10YR 6/4) and few fine distinct red (2.5YR 4/8) masses of iron accumulation with clear to diffuse boundaries; strongly acid; gradual wavy boundary.

Bt1—28 to 35 inches; yellowish brown (10YR 5/6) clay; moderate medium subangular blocky structure; very hard, very firm, sticky and plastic; few fine roots; few discontinuous clay films on faces of peds; many fine distinct grayish brown (10YR 5/2) iron depletions and common medium distinct red (2.5YR 4/8) masses of iron accumulation with clear to diffuse boundaries; strongly acid; gradual wavy boundary.

Bt2—35 to 48 inches; yellowish brown (10YR 5/6) clay loam; weak medium subangular blocky structure; very hard, very firm, sticky and plastic; few fine roots; few discontinuous clay films; many medium distinct light gray (10YR 6/1) iron depletions and few medium distinct red (2.5YR 4/6) masses of iron accumulation with clear to diffuse boundaries; slightly acid; gradual wavy boundary.

BCt—48 to 65 inches; gray (10YR 6/1) clay loam; weak medium subangular blocky structure; hard, firm; few discontinuous clay films; few sand coats along faces of peds; common medium distinct yellowish brown (10YR 5/6) and red (2.5YR 4/6) masses of iron accumulation; slightly alkaline.

The thickness of the solum is more than 80 inches. The content of clay in the control section ranges from 28 to 35 percent. These soils have aquic conditions during most years. Masses of iron accumulation and iron depletions are considered to be contemporary redoximorphic features.

The A horizon is dark grayish brown, dark brown, dark yellowish brown, brown, grayish brown, or yellowish brown. Reaction is moderately acid or slightly acid.

The E horizon is light brownish gray, pale brown, light yellowish brown, very pale brown, or light gray. Reaction is moderately acid or slightly acid.

The Bt/E horizon is yellowish brown or light yellowish brown and has red or yellowish red masses of iron accumulation. The E material ranges from 5 to about 20 percent. The texture is loam, sandy clay loam, or clay loam. Reaction is strongly acid or moderately acid.

The Bt horizon is yellowish brown or light yellowish brown and has masses of iron accumulation in shades of yellow, brown, or red and iron depletions in shades of gray. The texture is clay, clay loam, or sandy clay loam. Reaction ranges from very strongly acid to slightly alkaline.

The BCt horizon is shades of gray or brown. Masses of iron accumulation are shades of yellow, brown, or red. The texture is clay, clay loam, or sandy clay loam. Reaction ranges from strongly acid to slightly alkaline. In some pedons the lower part has a few masses or concretions of calcium carbonate.

Rehburg Series

The Rehburg series consists of deep, moderately well drained, very slowly permeable soils that formed in stratified, compact tuffaceous materials and sandstone. These soils are on uplands. Slopes range from 1 to 5 percent.

Typical pedon of Rehburg loamy fine sand, 1 to 5 percent slopes, in southeastern Brazos County; from the intersection of Texas Highway 6 and Texas Business 6 south of College Station, 1.9 miles south on Texas Highway 6 to Greens Prairie Road, 1.7 miles northeast on Greens Prairie Road, 2.9 miles east on Rock Prairie Road, 300 feet east of road, in a pasture:

A—0 to 12 inches; brown (7.5YR 5/2) loamy fine sand, dark brown (7.5YR 4/2) moist; single grained; loose, very friable; common fine and medium roots; few fine siliceous pebbles; moderately acid; clear wavy boundary.

E—12 to 24 inches; pinkish gray (7.5YR 6/2) loamy

fine sand, brown (7.5YR 5/2) moist; single grained; loose, very friable; common fine and medium roots; few siliceous pebbles; moderately acid; abrupt smooth boundary.

Bt—24 to 35 inches; grayish brown (10YR 5/2) clay loam; moderate medium subangular blocky structure; hard, very firm, very sticky and very plastic; few fine roots; common discontinuous clay films; common medium distinct gray (10YR 5/1) iron depletions with clear to diffuse boundaries; few siliceous pebbles; strongly acid; gradual wavy boundary.

BCt—35 to 46 inches; light brownish gray (10YR 6/2) sandy clay loam; weak medium blocky structure; very hard, extremely firm; few fine roots; few discontinuous clay films; common medium distinct light brownish gray iron depletions and brownish yellow masses of iron accumulation with clear to diffuse boundaries; few fine siliceous pebbles; strongly acid; gradual wavy boundary.

Cr—46 to 60 inches; very pale brown (10YR 7/3) and yellow (10YR 7/6), thinly bedded tuffaceous clay loam and sandstone; extremely hard, firm; strongly acid.

The thickness of the solum and the depth to paralithic contact range from 40 to 60 inches. The combined thickness of the A and E horizons ranges from 20 to 36 inches. These soils have aquic conditions during most years. Masses of iron accumulation and iron depletions are considered to be contemporary redoximorphic features.

The A and E horizons are brown, light gray, pinkish gray, or gray. Reaction ranges from strongly acid to neutral.

The Bt horizon is light brownish gray or grayish brown. It has few to many masses of iron accumulation in shades of yellow, brown, and red. The texture is clay loam or sandy clay. The content of clay in the particle-size control section ranges from 25 to 35 percent. Reaction ranges from strongly acid to slightly acid.

The BCt horizon has redoximorphic features in shades of red and brown. The texture is sandy clay loam or clay loam. Reaction ranges from strongly acid to slightly acid.

The Cr horizon is weakly to strongly cemented sandstone or compact tuffaceous clays that are massive.

Robco Series

The Robco series consists of very deep, moderately well drained, slowly permeable, sandy soils that formed in loamy sediments. These soils are on uplands and Pleistocene terraces. Slopes range from 1 to 3 percent.

Typical pedon of Robco loamy fine sand, 1 to 3 percent slopes, in northern Brazos County; from the intersection of Texas Highway 21 and Farm Road 2038 at Kurten, 0.9 mile north on Farm Road 2038, 0.3 mile west on Kurten Cemetery Road, 0.1 mile south to cemetery entrance, 0.1 mile south on private road along the east side of the cemetery, 200 feet southwest of the southeast corner of cemetery, in a pasture:

A—0 to 15 inches; brown (10YR 5/3) loamy fine sand, brown (10YR 4/3) moist; single grained; loose, very friable; many fine grass roots; slightly acid; clear smooth boundary.

E—15 to 28 inches; pale brown (10YR 6/3) loamy fine sand, brown (10YR 5/3) moist; single grained; loose, very friable; many fine grass roots; moderately acid; gradual wavy boundary.

Bt/E—28 to 33 inches; brownish yellow (10YR 6/6) sandy clay loam, yellowish brown (10YR 5/6) moist (Bt); 40 percent tongues of light gray (10YR 7/2) loamy fine sand (E); moderate medium subangular blocky structure; slightly hard, friable; common fine roots; few fine pores; few discontinuous clay films; few fine distinct light gray (10YR 7/2) iron depletions with clear to diffuse boundaries; moderately acid; gradual wavy boundary.

Btg1—33 to 47 inches; light gray (10YR 7/2) sandy clay loam; moderate medium subangular blocky structure; hard, firm; few fine roots; few fine pores; few discontinuous clay films; common coarse red (2.5YR 4/6) and yellowish brown (10YR 5/6) masses of iron accumulation; strongly acid; gradual wavy boundary.

Btg2—47 to 65 inches; light gray (10YR 7/2) clay loam, light brownish gray (10YR 6/2) moist; weak medium subangular blocky structure; very hard, very firm; few fine roots; many medium prominent red (10R 4/6) masses of iron accumulation with clear to diffuse boundaries; strongly acid; gradual wavy boundary.

BCt—65 to 82 inches; red (2.5YR 4/6) sandy clay loam; weak medium subangular blocky structure (some of the red material is structureless); hard, friable; few discontinuous clay films; many medium prominent light gray (10YR 7/2) iron depletions with clear to diffuse boundaries; strongly acid.

The thickness of the solum ranges from 60 to more than 80 inches. The average clay content in the upper 20 inches of the argillic horizon is 25 to 35 percent. These soils have aquic conditions during most years.

Masses of iron accumulation and iron depletions are considered to be contemporary redoximorphic features.

The A horizon is brown, dark yellowish brown, or pale brown. It ranges from 20 to 40 inches in thickness. Reaction ranges from strongly acid to slightly acid.

The E horizon is pale brown, brown, or light brownish gray. In some pedons it has few or common redoximorphic features in shades of gray or yellow. Reaction ranges from very strongly acid to moderately acid.

The Bt/E horizon is 60 to 90 percent Bt material by volume. The Bt part is brownish yellow, yellowish brown, or light yellowish brown. The texture is sandy clay loam, loam, or clay loam. The E material consists of tongues, interfingers, and pockets of light gray, light grayish brown, or pale brown. The horizon has few redoximorphic features in shades of gray, yellow, and red or has a matrix with a mixture of these colors. Reaction ranges from very strongly acid to moderately acid.

The Bt horizon is light gray, light brownish gray, or grayish brown. The horizon has few to many redoximorphic features in shades of gray, red, yellow, and brown or has a matrix with mixed shades of red, gray, and yellow. The texture is mostly clay loam or sandy clay loam, but the range includes sandy clay. Reaction ranges from very strongly acid to moderately acid.

The BCt horizon is shades of red, gray, yellow, or brown and has few to many redoximorphic features. The texture ranges from sandy clay loam to clay. Reaction ranges from very strongly acid to neutral. In some pedons the horizon has few or common pockets of gypsum and other salts.

Roetex Series

The Roetex series consists of very deep, somewhat poorly drained, very slowly permeable, clayey soils that formed in clayey alluvium. These soils are in depressions on the flood plain along the Brazos River. Slopes are 0 to 1 percent.

Typical pedon of Roetex clay, frequently flooded (fig. 19); from the intersection of Farm Road 2154 and Texas Highway 6 about 4 miles southeast of Millican, 1.3 miles northwest on Farm Road 2154, 0.9 mile southwest on county road, 800 feet east, in a depression in a field:

A—0 to 15 inches; dark brown (7.5YR 3/2) clay, dark brown (7.5YR 3/2) moist; weak medium subangular blocky structure; extremely hard, extremely firm; few fine roots; slightly effervescent; moderately alkaline; gradual wavy boundary.

Bss1—15 to 23 inches; dark brown (7.5YR 3/2) clay, dark brown (7.5YR 3/2) moist; streaks of reddish brown (5YR 4/4); weak medium angular blocky structure; extremely hard, extremely firm; common fine roots; common medium intersecting slickensides; slightly effervescent; moderately alkaline; gradual wavy boundary.

Bss2—23 to 56 inches; reddish brown (5YR 4/4) clay, reddish brown (5YR 4/4) moist; few fine streaks of brown (7.5YR 3/2); moderate medium angular blocky structure; extremely hard, extremely firm; common fine roots; common medium intersecting slickensides; few fine distinct dark gray (10YR 4/1) iron depletions with clear to diffuse boundaries; slightly effervescent; moderately alkaline; gradual wavy boundary.

Bss3—56 to 75 inches; reddish brown (5YR 4/3) clay, reddish brown (5YR 4/3) moist; brown material in filled cracks; extremely firm; few fine roots; common medium intersecting slickensides; slightly effervescent; moderately alkaline.

The thickness of the solum ranges from 60 to more than 80 inches. The soils are slightly effervescent and moderately alkaline throughout. Slickensides that intersect are common below a depth of about 15 inches. The soils crack when dry, but the cracks remain open for less than 90 cumulative days in most years. These soils have aquic conditions during most years. Iron depletions are considered to be contemporary redoximorphic features.

The A horizon is 10 to 17 inches thick. It is dark brown, dark reddish brown, or reddish brown.

The Bss horizon is dark brown, dark reddish brown, or reddish brown. It has dark gray and brown redoximorphic features.

Some pedons have a C horizon within a depth of 60 to 80 inches. This horizon is shades of red, brown, or yellow. The texture is clay or silty clay with thin strata of loamy materials, or the horizon is stratified with loamy and clayey materials.

Rosanky Series

The Rosanky series consists of very deep, well drained, very slowly permeable soils that formed in stratified loamy and clayey sediments. These soils are on uplands. Slopes range from 1 to 8 percent.

Typical pedon of Rosanky fine sandy loam, 2 to 5 percent slopes, in northeastern Brazos County; from the intersection of Farm Road 974 and Farm Road 2776 about 1.0 mile northeast of Tabor, 1.0 mile south

on Farm Road 2776, 2.0 miles east on county road, 300 feet north of gate, in a wooded pasture:

A—0 to 8 inches; brown (7.5YR 5/4) fine sandy loam, dark brown (7.5YR 4/4) moist; weak fine subangular blocky structure; slightly hard, very friable; common fine roots; moderately acid; clear smooth boundary.

Bt1—8 to 25 inches; red (2.5YR 4/6) clay, dark red (2.5YR 3/6) moist; strong fine subangular blocky structure; very hard, firm; common fine roots; thin clay films on faces of peds; few fine ironstone fragments; moderately acid; gradual smooth boundary.

Bt2—25 to 35 inches; red (2.5YR 4/6) clay, red (2.5YR 3/6) moist; moderate medium subangular blocky structure; very hard, firm; few fine roots; thin clay films on faces of peds; common medium distinct strong brown (7.5YR 5/6) masses of iron accumulation with sharp boundaries; few fine ironstone nodules; strongly acid; gradual smooth boundary.

Bt3—35 to 41 inches; red (2.5YR 5/6) clay, dark red (2.5YR 3/6) moist; moderate medium subangular blocky structure; very hard, firm; few fine roots; few discontinuous clay films on faces of peds; common medium distinct pale brown (10YR 6/3) masses of iron accumulation with sharp boundaries; very strongly acid; gradual smooth boundary.

BCt—41 to 48 inches; red (2.5YR 5/6) sandy clay loam, red (2.5YR 4/6) moist; moderate medium subangular blocky structure; hard, friable; few fine roots; few discontinuous clay films on faces of peds; common medium distinct very pale brown (10YR 7/4) masses of iron accumulation with sharp boundaries; very strongly acid; abrupt wavy boundary.

C—48 to 65 inches; dark reddish brown (2.5YR 3/4) clay loam stratified with light gray and reddish yellow; rocklike structure with finely divided fractures; very strongly acid; clear wavy boundary.

Cr—65 to 80 inches; stratified dark reddish brown, light gray, and reddish yellow, weakly cemented sandstone interbedded with gray clay; very strongly acid.

The thickness of the solum ranges from 40 to 60 inches. Some pedons contain as much as 5 percent ironstone fragments. Masses of iron accumulation are considered to be relict redoximorphic features.

The A horizon averages less than 10 inches in thickness but ranges from 3 to 12 inches. This horizon is dark brown, dark yellowish brown, very dark grayish brown, brown, or yellowish brown. Reaction ranges from strongly acid to neutral.

The Bt horizon is dark red, dark reddish brown, red, light red, yellowish red, or reddish brown. The texture is clay or clay loam, and the content of clay ranges from 35 to 50 percent. Reaction ranges from very strongly acid to moderately acid.

The BCt horizon is brown, light yellowish brown, light gray, grayish brown, yellowish brown, light brownish gray, yellowish red, or red. Reaction ranges from very strongly acid to neutral.

The C horizon is dark reddish brown, light gray, or reddish yellow. The texture is clay, sandy clay loam, or fine sandy loam, but the horizon may be stratified with ironstone or shale. Reaction is very strongly acid or strongly acid.

The Cr horizon is at a depth of 60 to 70 inches in most pedons.

Sandow Series

The Sandow series consists of very deep, moderately well drained, moderately slowly permeable soils that formed in loamy sediments. These soils are on natural levees on flood plains. Slopes are 0 to 1 percent.

Typical pedon of Sandow loam, frequently flooded (fig. 20); from the intersection of Texas Highway 21 and Farm Road 2818 on the west edge of Bryan, 1.8 miles west on Texas Highway 21, 0.2 mile south on ranch road, 200 feet northwest of road, in a pasture:

A1—0 to 6 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure parting to weak very fine subangular blocky; extremely hard, very firm; few fine pores; common fine and medium roots; slightly acid; clear smooth boundary.

A2—6 to 15 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure parting to weak very fine subangular blocky; hard, firm; common fine and medium roots; common fine and medium pores; few fine faint yellowish brown (10YR 5/4) masses of iron accumulation with clear to diffuse boundaries; slightly acid; abrupt smooth boundary.

Bw—15 to 20 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 5/3) moist; weak fine and medium subangular blocky structure; hard, firm; few fine and medium roots; few fine and medium pores; few fine faint yellowish brown

(10YR 5/4) masses of iron accumulation with clear to diffuse boundaries; slightly acid; abrupt smooth boundary.

Ab—20 to 28 inches; brown (10YR 4/3) sandy clay loam, brown (10YR 4/3) moist; weak very coarse prismatic structure; very hard, very firm; few fine and medium roots; few fine and medium pores; few fine faint yellowish brown (10YR 5/4) masses of iron accumulation with clear to diffuse boundaries; slightly acid; gradual smooth boundary.

Bwb1—28 to 34 inches; grayish brown (10YR 5/2) sandy clay loam, dark grayish brown (10YR 4/2) moist; moderate coarse angular blocky structure; very hard, very firm; few fine and medium roots; few fine and medium pores; few faint white (10YR 8/2) clean sand coats on vertical faces of peds; few fine faint yellowish brown (10YR 5/4) masses of iron accumulation with clear to diffuse boundaries; moderately acid; gradual smooth boundary.

Bwb2—34 to 41 inches; pale brown (10YR 6/3) sandy clay loam, brown (10YR 5/3) moist; moderate coarse prismatic structure parting to weak coarse angular blocky; very hard, very firm; few fine and medium roots; few fine and medium pores; many prominent white (10YR 8/2) sand coats on most vertical faces of prisms; few fine faint yellowish brown (10YR 5/4) masses of iron accumulation with clear to diffuse boundaries; slightly acid; gradual smooth boundary.

BCb—41 to 46 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 5/3) moist; weak coarse prismatic structure parting to weak coarse angular blocky; very hard, firm; few fine and medium roots; few fine and medium pores; few fine black iron-manganese stains along root channels; few fine faint yellowish brown (10YR 5/4) masses of iron accumulation with clear to diffuse boundaries; slightly acid; clear smooth boundary.

A´b—46 to 54 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 5/3) moist; weak medium and coarse subangular blocky structure; slightly hard, friable; few fine and medium roots; few fine and medium pores; few fine iron-manganese stains along root channels; few fine distinct light olive brown (2.5Y 5/6) masses of iron accumulation with clear to diffuse boundaries; moderately acid; clear smooth boundary.

Btgb—54 to 80 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 5/3) moist; weak coarse prismatic structure parting to weak coarse angular blocky; slightly hard, friable; few fine and medium roots; few fine and medium pores; many thin continuous dark gray (10YR 4/1) clay films on vertical faces of peds; few fine black concretions; few medium barite segregations on faces of peds; slightly acid.

The thickness of the solum is more than 80 inches. The content of clay in the particle-size control section ranges from 18 to 35 percent. These soils do not remain saturated long enough to develop aquic conditions above a depth of 40 inches, except in years that are much wetter than normal. Masses of iron accumulation are considered to be both relict and contemporary redoximorphic features.

The A1 horizon is less than 10 inches thick. It is grayish brown, dark grayish brown, or dark brown. Reaction ranges from moderately acid to neutral.

The A2 horizon is loam or fine sandy loam. Reaction ranges from moderately acid to neutral.

The Bw horizon is brown, grayish brown, light brownish gray, or pale brown. The texture is loam or fine sandy loam. Reaction ranges from moderately acid to neutral.

The Ab horizon, if it occurs, is brown, dark grayish brown, or very dark grayish brown.

The buried B horizon, if it occurs, is grayish brown, light brownish gray, brown, or dark brown. In some pedons it has few or common masses of iron accumulation in shades of brown or thin silty strata of brown and pale brown. The horizon is fine sandy loam, sandy clay loam, or clay loam. Reaction ranges from moderately acid to neutral.

Shalba Series

The Shalba series consists of shallow, moderately well drained, very slowly permeable soils that formed in weakly cemented, tuffaceous, fine grained sandstone. These soils are on uplands. Slopes range from 2 to 6 percent.

Typical pedon of Shalba fine sandy loam, in an area of Shalba-Rock outcrop complex, 2 to 6 percent slopes, in southern Brazos County; from the intersection of Texas Highway 6 and Farm Road 159 about 3 miles east of Millican, 2.7 miles south on Texas Highway 6, 0.6 mile west on Westward Ho Road, 0.8 mile west and north on Chisolm Trail Road, 0.2 mile east on county road, 300 feet north, in an area of rangeland:

A—0 to 4 inches; light brownish gray (10YR 6/2) fine sandy loam, grayish brown (10YR 5/2) moist; massive; hard, firm; common fine roots; moderately acid; abrupt wavy boundary.

Bt1—4 to 12 inches; grayish brown (10YR 5/2) clay,

dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure; very hard, extremely firm; common fine roots; few discontinuous clay films; strongly acid; gradual wavy boundary.

Bt2—12 to 18 inches; dark grayish brown (10YR 4/2) clay; weak medium subangular blocky structure; very hard, extremely firm; few fine roots; few discontinuous clay films; common medium distinct light gray iron depletions with sharp boundaries; moderately acid; clear wavy boundary.

Cr—18 to 30 inches; white (10YR 8/2) siltstone, light gray (10YR 7/2) moist; rock structure; extremely hard, extremely firm.

The thickness of the solum and the depth to paralithic contact range from 14 to 20 inches. Matrix colors with low chroma are inherited from the parent material. Iron depletions are considered to be relict redoximorphic features.

The A horizon is light gray, gray, or light brownish gray. Reaction ranges from very strongly acid to moderately acid.

The Bt horizon is grayish brown, dark grayish brown, or dark gray. It has few or common ped coats of very dark gray, dark gray, and very dark grayish brown. Reaction ranges from very strongly acid to moderately acid. The lower boundary of the Bt horizon is wavy or irregular.

The Cr horizon is clayey tuff, tuffaceous sandstone, siltstone, or tuffaceous clay. The texture is fine sandy loam or clay loam.

Ships Series

The Ships series consists of very deep, moderately well drained, very slowly permeable soils that formed in thick, clayey alluvial sediments. These soils are on the flood plain along the Brazos River. Slopes range from 0 to 5 percent.

Typical pedon of Ships clay, 0 to 1 percent slopes, rarely flooded (fig. 21), in western Brazos County; from the intersection of Old San Antonio Road (OSR) and Farm Road 1687 about 5 miles west of Bryan, 1.8 miles west on Farm Road 1687, 1.0 mile south on Sims Cutoff Road, 1.0 mile west on Sims Road, 0.1 mile north on private road, then 200 feet east, in a cultivated field:

Ap—0 to 8 inches; reddish brown (5YR 4/3) clay, dark reddish brown (5YR 3/3) moist; moderate medium granular structure; very hard, extremely firm, very sticky and very plastic; few fine roots; strongly effervescent; moderately alkaline; abrupt smooth boundary.

A—8 to 15 inches; reddish brown (5YR 5/4) clay, reddish brown (5YR 4/4) moist; moderate medium angular blocky structure; common fine pressure faces; very hard, very firm, very sticky and very plastic; few fine roots; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bss1—15 to 32 inches; reddish brown (5YR 5/4) clay, reddish brown (5YR 5/4) moist; weak medium angular blocky structure; very hard, very firm, very sticky and very plastic; few fine roots; common intersecting slickensides; few vertical cracks filled with darker soil material from the horizon above; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bss2—32 to 47 inches; brown (7.5YR 4/4) clay, brown (7.5YR 4/4) moist; many coarse distinct streaks or crack fillings of reddish brown (5YR 5/4); weak medium angular blocky structure; very hard, very firm, very sticky and very plastic; few fine roots; few calcium carbonate concretions; common intersecting slickensides; few vertical cracks filled with darker soil material from the horizons above; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bss3—47 to 80 inches; reddish brown (2.5YR 4/4) clay, reddish brown (2.5YR 4/4) moist; common medium distinct streaks of reddish brown (5YR 5/4) and dark reddish brown (5YR 3/3); weak medium angular blocky structure; few fine roots; few calcium carbonate concretions; common intersecting slickensides; strongly effervescent; moderately alkaline.

The thickness of the solum is more than 80 inches. When the soils are dry, cracks form at the surface. The cracks are more than 1 cm wide and extend to a depth of 40 inches or more. The soils are moderately alkaline and strongly effervescent throughout.

The combined thickness of the A horizons ranges from 15 to 40 inches. These horizons are reddish brown, dark reddish brown, dark reddish gray, or dark brown.

The Bss horizon is reddish brown, dark reddish brown, or brown. The texture is clay or silty clay.

Shiro Series

The Shiro series consists of moderately deep, well drained, slowly permeable soils on uplands. These soils formed in tuffaceous sandstone and siltstone. Slopes range from 1 to 3 percent.

Typical pedon of Shiro loamy fine sand, 1 to 3 percent slopes, in southern Brazos County; from the intersection of Texas Highway 6 and Texas Business 6

in College Station, 1.9 miles south on Texas Highway 6, 0.9 mile east on Greens Prairie Road, 1,200 feet south, in an area of rangeland:

A—0 to 6 inches; pinkish gray (7.5YR 6/2) loamy fine sand, brown (7.5YR 5/2) moist; weak fine subangular blocky structure; loose, very friable; common fine roots; about 5 percent siliceous pebbles; moderately acid; clear wavy boundary.

E—6 to 15 inches; pinkish gray (7.5YR 7/2) loamy fine sand, pinkish gray (7.5YR 6/2) moist; weak fine subangular blocky structure; loose, very friable; common fine roots; about 5 percent siliceous pebbles; moderately acid; abrupt wavy boundary.

Bt1—15 to 24 inches; reddish brown (2.5YR 5/4) clay, reddish brown (2.5YR 4/4) moist; moderate medium blocky structure; extremely hard, extremely firm; common fine and medium roots; few siliceous pebbles; clay films on faces of peds; common medium prominent light brownish gray (10YR 6/2) iron depletions with sharp boundaries; moderately acid; gradual wavy boundary.

Bt2—24 to 34 inches; light brownish gray (10YR 6/2) clay, grayish brown (10YR 5/2) moist; weak medium blocky structure; extremely hard, extremely firm; few fine roots; clay films on faces of peds; common medium prominent reddish brown masses of iron accumulation with sharp boundaries; moderately acid; gradual wavy boundary.

Cr—34 to 50 inches; light gray (10YR 7/2) siltstone; common medium distinct yellowish brown, reddish brown, and red masses of iron accumulation; interbedded tuffaceous sandstone; extremely hard; moderately acid.

The thickness of the solum and the depth to the Cr horizon range from 20 to 40 inches. The combined thickness of the A and E horizons ranges from 10 to 18 inches. Masses of iron accumulation and iron depletions are considered to be relict redoximorphic features.

The A horizon is brown, pinkish gray, light brownish gray, grayish brown, or pale brown. Reaction ranges from strongly acid to slightly acid.

The E horizon is pinkish gray, pinkish white, light brownish gray, light gray, or pale brown. Reaction ranges from strongly acid to slightly acid.

The upper part of the Bt horizon is reddish brown, yellowish red, or red and has common light brownish gray iron depletions. The lower part of the horizon is light brownish gray, light gray, or grayish brown and has redoximorphic features in shades of red, yellow, and gray. The Bt horizon is clay, sandy clay, or clay loam. Reaction ranges from very strongly acid to neutral.

The Cr horizon is weakly to strongly cemented, tuffaceous sandstone or siltstone that is interbedded with shale in some pedons.

Silawa Series

The Silawa 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 2 to 8 percent.

Typical pedon of Silawa fine sandy loam (fig. 22), 5 to 8 percent slopes, in southwestern Brazos County; from the intersection of Farm Road 2154 and Koppe Bridge Road in Wellborn, 4.4 miles on Koppe Bridge Road, 1,000 feet southeast of road, in an area of rangeland:

A—0 to 15 inches; brown (7.5YR 5/4) fine sandy loam, brown (7.5YR 4/4) moist; weak fine subangular blocky structure; slightly hard, very friable; common fine roots; few siliceous pebbles; slightly acid; abrupt smooth boundary.

Bt1—15 to 24 inches; reddish brown (5YR 5/4) sandy clay loam, reddish brown (5YR 4/4) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, firm; common fine roots; few siliceous pebbles; clay films on faces of peds; moderately acid; gradual wavy boundary.

Bt2—24 to 40 inches; red (2.5YR 5/6) sandy clay loam, red (2.5YR 4/6) moist; moderate medium prismatic structure parting to weak medium subangular blocky; very hard, very firm; few fine roots; few discontinuous clay films on faces of peds; moderately acid; gradual wavy boundary.

Bt3—40 to 50 inches; red (2.5YR 5/8) sandy clay loam, red (2.5YR 4/8) moist; weak medium prismatic structure breaking to weak medium subangular blocky; hard, firm; few fine roots; few discontinuous clay films on faces of peds; few fine siliceous pebbles; moderately acid; gradual wavy boundary.

BCt—50 to 60 inches; red (2.5YR 5/6) fine sandy loam, red (2.5YR 5/6) moist; single grained; slightly hard, friable; moderately acid.

The thickness of the solum ranges from 40 to 60 inches. The clay content decreases from the maximum by more than 20 percent within a depth of 60 inches. Reaction ranges from strongly acid to slightly acid throughout the profile.

The A horizon is pinkish gray, grayish brown, light brownish gray, brown, or dark grayish brown. Some pedons have an E horizon. This horizon has color values 1 or 2 units higher than those in the A horizon.

The Bt horizon is reddish yellow, yellowish red, reddish brown, light red, or red. The texture is clay loam or sandy clay loam.

The BCt horizon is strong brown, red, reddish yellow, or yellowish red. The texture is sandy clay loam or fine sandy loam.

The C horizon, if it occurs, has colors of reddish yellow, strong brown, yellowish red, yellow, brown, or very pale brown. The texture is fine sandy loam or loamy fine sand. Strata of sand or gravel are in many pedons.

Singleton Series

The Singleton series consists of moderately deep, moderately well drained, very slowly permeable soils on uplands. These soils formed in tuffaceous siltstone and sandstone. Slopes range from 1 to 3 percent.

Typical pedon of Singleton fine sandy loam, 1 to 3 percent slopes; from the intersection of Texas Highway 6 and Texas Business 6 south of College Station, 1.0 mile south on Texas Highway 6, 0.2 mile west into subdivision, 200 feet south along a drainage ditch:

A—0 to 9 inches; light brownish gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; hard, friable; many fine roots; slightly acid; abrupt wavy boundary.

Bt1—9 to 17 inches; pale brown (10YR 6/3) clay, brown (10YR 5/3) moist; moderate medium angular blocky structure; extremely hard, extremely firm; common fine roots; dark grayish brown (10YR 3/2) clay films on faces of peds; common medium distinct yellowish brown (10YR 5/6) masses of iron accumulation with sharp boundaries; very strongly acid; gradual wavy boundary.

Bt2—17 to 28 inches; very pale brown (10YR 7/3) clay, pale brown (10YR 6/3) moist; moderate coarse angular blocky structure; extremely hard, very firm; grayish brown (10YR 5/2) clay films on faces of peds; few fine roots; few fine faint brownish yellow (10YR 6/6) masses of iron accumulation with sharp boundaries; strongly acid; clear wavy boundary.

Cr—28 to 60 inches; stratified white (10YR 8/1), yellowish brown (10YR 5/6), and brown (10YR 5/3) siltstone.

The thickness of the solum ranges from 20 to 40 inches. The content of clay in the upper 20 inches of the Bt horizon ranges from 35 to 45 percent. When the soils are dry, small cracks form at the surface. Gray colors are inherited from the parent material. Masses of iron accumulation are considered to be relict redoximorphic features.

The combined thickness of the A and E horizons ranges from 5 to 12 inches. The A horizon is light gray, light brownish gray, grayish brown, brown, or pale brown. The E horizon is light gray or very pale brown. Reaction in these horizons ranges from strongly acid to slightly acid.

The Bt horizon is grayish brown, light brownish gray, brown, or dark grayish brown on ped exteriors and pale brown, brown, dark brown, or light brown on ped interiors. The horizon is clay or clay loam and has a clay content of 35 to 50 percent. Reaction ranges from very strongly acid to moderately acid.

The Cr horizon is weakly cemented, tuffaceous sandstone or siltstone. In some pedons it is interbedded with clay loam or sandy clay loam.

Spiller Series

The Spiller series consists of very deep, moderately well drained, slowly permeable soils on erosional uplands. These soils formed in thinly stratified, loamy and clayey Tertiary sediments. Slopes range from 1 to 5 percent.

Typical pedon of Spiller loamy fine sand, 1 to 3 percent slopes, in northern Brazos County; from the intersection of Texas Highway 6 and Farm Road 974 in Bryan, 0.9 mile northeast on Farm Road 974, 5.4 miles northwest on Farm Road 2223 past Broach Road, 1,000 feet northeast on oil field road, 600 feet northwest on oil field road, 100 feet southwest, in a pasture:

Ap—0 to 15 inches; brown (10YR 5/3) loamy fine sand, brown (10YR 4/3) moist; weak fine and medium subangular blocky structure; loose, very friable; common fine and medium roots; slightly acid; clear smooth boundary.

E—15 to 18 inches; light yellowish brown (10YR 6/4) loamy fine sand, yellowish brown (10YR 5/4) moist; weak fine and medium subangular blocky structure; loose, very friable; common fine and medium roots; slightly acid; clear smooth boundary.

Bt1—18 to 24 inches; brownish yellow (10YR 6/6) sandy clay, yellowish brown (10YR 5/6) moist; strong fine subangular blocky structure; hard, friable, sticky and plastic; common fine roots; many thick continuous dark yellowish brown

(10YR 4/4) clay films on vertical and horizontal faces of peds; few fine prominent red (2.5YR 5/6) masses of iron accumulation with sharp boundaries; slightly acid; clear smooth boundary.

Bt2—24 to 33 inches; light yellowish brown (10YR 6/4) sandy clay, yellowish brown (10YR 5/4) moist; strong fine and medium subangular blocky structure; hard, friable, sticky and plastic; common fine roots; many thick continuous light brownish yellow (10YR 6/4) clay films on vertical and horizontal faces of peds; many medium distinct brownish yellow (10YR 6/8) and common medium prominent red (2.5YR 5/8) masses of iron accumulation with sharp boundaries; moderately acid; clear smooth boundary.

Bt3—33 to 43 inches; pale brown (10YR 6/3) sandy clay, brown (10YR 5/3) moist; common distinct light brownish gray (2.5Y 6/2) mottles; moderate fine and medium subangular blocky structure; very hard, firm, sticky and plastic; common fine roots along faces of peds; many thick continuous pale brown (10YR 6/3) clay films on vertical and horizontal faces of peds; many medium distinct brownish yellow (10YR 6/6) masses of iron accumulation with sharp boundaries and with a fine and medium red (2.5YR 5/8) center; moderately acid; clear smooth boundary.

BCt—43 to 54 inches; brownish yellow (10YR 6/8) sandy clay loam, yellowish brown (10YR 5/8) moist; weak fine and medium angular blocky structure; very hard, very firm, sticky and plastic; few fine roots and root traces on faces of peds; common distinct light brownish gray (2.5Y 6/2) shale fragments; common thin clay films on faces of peds; many coarse prominent red (2.5YR 5/8) masses of iron accumulation with sharp boundaries; moderately acid; abrupt smooth boundary.

C—54 to 85 inches; weakly consolidated brownish yellow (10YR 6/8) loamy material with strata of light brownish gray (2.5Y 6/2} shale 1 to 2 inches thick; moderately alkaline.

The thickness of the solum ranges from 40 to about 60 inches. The content of clay in the particle-size control section ranges from 35 to 45 percent. Base saturation throughout the argillic horizon ranges from 35 to 75 percent. Some pedons contain as much as 15 percent, by volume, ironstone pebbles less than 15 mm in size.

The combined thickness of the A and E horizons ranges from 10 to about 20 inches. These horizons are dark brown, brown, pale brown, or light yellowish brown. Reaction ranges from moderately acid to neutral.

The upper part of the Bt horizon is light yellowish brown, yellowish brown, brownish yellow, or brown. It is clay or sandy clay. Reaction ranges from strongly acid to slightly acid.

The lower part of the Bt horizon is brown, pale brown, light yellowish brown, or yellowish brown. It has few to many masses of iron accumulation in shades of red, yellow, and brown. Some pedons have mottles in shades of gray that are inherited from the parent material. The texture is clay, clay loam, or sandy clay. Reaction ranges from strongly acid to slightly acid.

The BCt horizon is shades of red, brown, yellow, or gray. The texture is sandy clay, clay loam, sandy clay loam, or loam. Reaction ranges from strongly acid to slightly acid.

The C horizon is shades of red, brown, or yellow. The texture is fine sandy loam, loam, or sandy clay loam that has strata of gray shale 1 to 5 inches thick. Reaction ranges from strongly acid to moderately alkaline.

Styx Series

The Styx series consists of very deep, well drained, moderately permeable soils on high stream terraces. These soils formed in sandy and loamy alluvial sediments. Slopes range from 1 to 3 percent.

Typical pedon of Styx loamy fine sand, 1 to 3 percent slopes, in eastern Brazos County; from the intersection of Texas Highway 21 and Farm Road 2038 in Kurten, 5.5 miles southeast on Farm Road 2038, 0.3 mile southwest on Cobb Road, 0.2 mile east on private road, 1,000 feet east, in a pasture:

A—0 to 8 inches; yellowish brown (10YR 5/4) loamy fine sand, dark yellowish brown (10YR 4/4) moist; single grained; loose; common fine roots; neutral; gradual smooth boundary.

E—8 to 24 inches; very pale brown (10YR 7/4) loamy fine sand, light yellowish brown (10YR 6/4) moist; single grained; few fine roots; neutral; clear smooth boundary.

Bt1—24 to 30 inches; brownish yellow (10YR 6/6) sandy clay loam, yellowish brown (10YR 5/4) moist; moderate medium subangular blocky structure; hard, firm; few fine roots; clay films on faces of peds; slightly acid; gradual smooth boundary.

Bt2—30 to 44 inches; red (2.5YR 5/8) sandy clay loam, red (2.5YR 4/8) moist; moderate medium subangular blocky structure; hard, firm; few fine roots; discontinuous clay films on faces of peds; common medium distinct light yellowish brown (10YR 6/4) masses of iron accumulation with

sharp boundaries; few fine distinct light brownish gray (10YR 6/2) iron depletions with sharp boundaries; moderately acid; gradual wavy boundary.

Bt3—44 to 68 inches; red (2.5YR 5/8) sandy clay loam, red (2.5YR 4/8) moist; weak medium angular blocky structure; hard, firm; few fine roots; common medium distinct brownish yellow (10YR 6/6) masses of iron accumulation with sharp boundaries; common medium distinct light brownish gray (10YR 6/2) iron depletions with sharp boundaries; moderately acid.

The thickness of the solum ranges from 60 to more than 80 inches. The combined thickness of the A and E horizons is 20 to 40 inches. Masses of iron accumulation and iron depletions are considered to be both relict and contemporary redoximorphic features.

The A horizon is yellowish brown, pale brown, brown, grayish brown, or light gray. The E horizon is light yellowish brown, very pale brown, light brownish gray, light gray, or white. Reaction in the A and E horizons ranges from strongly acid to neutral.

The upper part of the Bt horizon is sandy clay loam or clay loam. The average clay content in the upper 20 inches ranges from 20 to 35 percent. The horizon is light yellowish brown, brownish yellow, yellowish brown, strong brown, or reddish yellow. Reaction ranges from strongly acid to slightly acid.

The lower part of the Bt horizon has matrix colors in shades of brown, yellow, red, or gray or is mixed with these colors. Reaction ranges from strongly acid to slightly acid.

The C horizon, if it occurs, is stratified fine sandy loam and sandy clay loam. It is shades of brown or yellow and has masses of iron accumulation in shades of red. Reaction ranges from strongly acid to neutral.

Tabor Series

The Tabor series consists of very deep, moderately well drained, very slowly permeable soils that formed in clayey and loamy alluvial sediments. These soils are on stream terraces and terrace remnants in the uplands. Slopes range from 0 to 3 percent.

Typical pedon of Tabor fine sandy loam, 0 to 2 percent slopes (fig. 23); from the intersection of Texas Highway 21 and Texas Highway 6 (east bypass) in Bryan, 8.5 miles northeast on Texas Highway 21, 2.9 miles east and north on Democrat Road, 0.7 mile east on semiprivate road, 200 feet south, in a pasture:

Ap—0 to 6 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 4/3) moist; moderate medium and fine subangular blocky structure; hard, friable; many fine roots; common medium prominent strong brown (7.5YR 4/6) masses of iron accumulation with clear to diffuse boundaries; 5 percent siliceous pebbles; strongly acid; clear smooth boundary.

E—6 to 14 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 5/3) moist; moderate medium and fine subangular blocky structure; hard, friable; many fine roots; common fine distinct dark yellowish brown (10YR 3/4) masses of iron accumulation with clear to diffuse boundaries; 6 percent siliceous pebbles; strongly acid; clear wavy boundary.

Btss1—14 to 23 inches; brown (10YR 5/3) clay, brown (10YR 4/3) moist; moderate medium angular blocky structure; very hard, very firm; common fine roots; few fine pores; common distinct pressure faces; few distinct slickensides; common pale brown (10YR 6/3) clay films on faces of peds; common medium prominent dark red (2.5YR 3/6) and common coarse prominent yellowish brown (10YR 5/6) masses of iron accumulation with clear to diffuse boundaries; few siliceous pebbles; strongly acid; gradual wavy boundary.

Btss2—23 to 42 inches; light brownish gray (10YR 6/2) clay, grayish brown (10YR 5/2) moist; weak coarse angular blocky structure; very hard, very firm; few fine roots; common distinct slickensides; many distinct pressure faces; few dark grayish brown (10YR 4/2) clay films on vertical faces of peds; many coarse prominent yellowish brown (10YR 5/6) and few fine prominent dark red (2.5YR 3/6) masses of iron accumulation with clear to diffuse boundaries; 2 percent siliceous pebbles; moderately acid; clear smooth boundary.

Btss3—42 to 57 inches; brownish yellow (10YR 6/6) clay loam, yellowish brown (10YR 5/6) moist; weak coarse prismatic structure parting to moderate medium angular blocky; very hard, very firm; few fine roots; few fine pores; many continuous very dark grayish brown (10YR 3/2) clay films on faces of peds and in pores; few distinct slickensides; common distinct pressure faces; common medium distinct strong brown (7.5YR 4/6) masses of iron accumulation with clear to diffuse boundaries and few fine grayish brown (10YR 5/2) iron depletions with clear to diffuse boundaries; few siliceous pebbles; neutral; gradual smooth boundary.

Btg—57 to 67 inches; light gray (10YR 7/2) sandy clay loam, light brownish gray (10YR 6/2) moist; weak coarse prismatic structure parting to weak medium angular blocky; very hard, very firm; few

fine roots; few fine pores; common continuous very dark grayish brown (10YR 3/2) clay films on vertical faces of peds; few calcium carbonate concretions; many medium prominent yellowish brown (10YR 5/6) and common medium distinct red (2.5YR 4/6)) masses of iron accumulation with clear to diffuse boundaries; 2 percent siliceous pebbles; neutral; gradual smooth boundary.

BCtg1—67 to 72 inches; white (10YR 8/2) sandy clay loam, light gray (10YR 7/2) moist; weak coarse angular blocky structure; hard, firm; few fine roots; few fine pores; few discontinuous very dark grayish brown (10YR 3/2) clay films and few distinct grayish brown (10YR 5/2) clay films on vertical faces of peds; few distinct brown (10YR 4/3) sand coats along faces of peds; common coarse prominent red (10R 4/6) and common medium prominent brownish yellow (10YR 6/6) masses of iron accumulation with clear to diffuse boundaries; 8 percent siliceous pebbles; neutral; gradual smooth boundary.

BCtg2—72 to 80 inches; white (10YR 8/1) sandy clay loam, light gray (10YR 7/1) moist; weak coarse angular blocky structure; hard, friable; few fine roots; few fine pores; few discontinuous dark grayish brown (10YR 4/2) clay films on vertical faces of peds; thick continuous prominent (10YR 6/4) sand coats on vertical faces of peds; many coarse prominent yellowish red (5YR 5/8) and common medium prominent red (10R 4/6) masses of iron accumulation with clear to diffuse boundaries; few siliceous pebbles; neutral.

The thickness of the solum ranges from 60 to more than 80 inches. The combined thickness of the A and E horizons typically ranges from 10 to 18 inches; however, in more than 50 percent of the pedons, it is less than 15 inches. In some pedons it is as much as 22 inches in subsoil troughs and is less than 6 inches on subsoil crests. The average content of clay in the particle-size control section is about 48 percent, but it ranges from 45 to 55 percent. The coefficient of linear extensibility ranges from 0.07 to 0.12 in the upper 20 inches of the argillic horizon. Base saturation is 75 to 90 percent in some part of the Bt horizon. These soils do not remain saturated long enough to develop aquic conditions, except in years that are much wetter than normal. Masses of iron accumulation and iron depletions are considered to be both relict and contemporary redoximorphic features.

The A horizon is brown, grayish brown, light brownish gray, or pale brown. The E horizon is gray, light brownish gray, or grayish brown. The A and E horizons are fine sandy loam or very gravelly fine sandy loam. Reaction ranges from strongly acid to slightly acid.

Most pedons have a BE horizon. This horizon is typically less than 3 inches thick but may be as much as 7 inches thick. It is thickest in subsoil troughs and is thinnest on subsoil crests. The texture is fine sandy loam or sandy clay loam.

The Bt horizon is brown, grayish brown, yellowish brown, light brownish gray, pale brown, light yellowish brown, or brownish yellow and has redoximorphic features in shades of red, gray, brown, or yellow. The texture is clay or clay loam. Reaction ranges from very strongly acid to neutral.

The BCtg horizon is shades of gray or grayish brown. It has masses of iron accumulation in shades of gray, yellow, or brown. The texture is sandy clay loam, loam, or clay loam. Reaction ranges from moderately acid to slightly alkaline.

The C horizon, if it occurs, is clay, sandy clay loam, or clay loam. It typically contains thin strata of shale or weakly consolidated sandstone. Reaction ranges from moderately acid to moderately alkaline.

Uhland Series

The Uhland series consists of very deep, moderately well drained, moderately slowly permeable soils on natural levees of flood plains. These soils formed in sandy alluvium. Slopes are 0 to 1 percent.

Typical pedon of Uhland loam, frequently flooded; from the intersection of Texas Highway 30 and Farm Road 158, 1.9 miles east on Elmo Weedon Road, 0.5 mile northwest on Steep Hollow Road, 1.5 miles north on Cargill Lane, 500 feet northeast, across Wickson Creek:

Ap—0 to 7 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure; hard, friable; many fine roots; neutral; abrupt smooth boundary.

Bw1—7 to 20 inches; yellowish brown (10YR 5/4) fine sandy loam, dark yellowish brown (10YR 4/4) moist; moderate medium subangular blocky structure; hard, friable; common fine roots; common fine distinct grayish brown (10YR 5/2) iron depletions with clear to diffuse boundaries; neutral; clear smooth boundary.

Bw2—20 to 65 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 5/3) moist; moderate medium subangular blocky structure; few fine

roots; common fine distinct grayish brown (10YR 5/2) iron depletions with clear to diffuse boundaries; slightly acid.

The solum is more than 80 inches thick. The content of clay in the particle-size control section ranges from 10 to 18 percent. The texture is fine sandy loam or loam throughout. Reaction is slightly acid or neutral. Iron depletions are considered to be contemporary redoximorphic features. These soils have aquic conditions during most years.

The A horizon is dark grayish brown or grayish brown. In pedons where the A horizon has moist values of 3 or less, the horizon is less than 10 inches thick.

The Bw horizon is brown, pale brown, yellowish brown, or light yellowish brown. These colors are variable in various strata.

Some pedons have a buried A horizon. This horizon is brown, grayish brown, or dark grayish brown.

Weswood Series

The Weswood series consists of very deep, well drained, moderately permeable soils on flood plains along the Brazos River. These soils formed in recent loamy alluvium. Slopes range from 0 to 5 percent.

Typical pedon of Weswood silt loam, 0 to 1 percent slopes, rarely flooded; 200 feet east of the intersection of Texas Highway 21 and Farm Road 50, in an area of cropland:

Ap—0 to 8 inches; brown (7.5YR 5/4) silt loam, dark brown (7.5YR 4/4) moist; moderate fine and medium subangular blocky structure; slightly hard, friable; few fine roots; strongly effervescent; moderately alkaline; abrupt smooth boundary.

Bw—8 to 24 inches; light brown (7.5YR 6/4) silt loam, brown (7.5YR 5/4) moist; moderate medium subangular blocky structure; slightly hard, friable; few fine roots; strongly effervescent; moderately alkaline; clear smooth boundary.

C1—24 to 30 inches; stratified light brown (7.5YR 6/4), brown (7.5YR 5/2), and yellowish brown (10YR 5/6) silt loam; platy structure; few fine roots; strongly effervescent; moderately alkaline; clear smooth boundary.

C2—30 to 34 inches; light brown (7.5YR 6/4) silt loam that has few strata of brown (7.5YR 4/4) silty clay; platy structure; few fine roots; strongly effervescent; moderately alkaline; clear smooth boundary.

C3—34 to 40 inches; stratified strong brown (7.5YR 5/6), brown (7.5YR 5/2), and light brown (7.5YR 6/4) silt loam and silty clay loam; platy structure; few fine roots; strongly effervescent; moderately alkaline; clear smooth boundary.

C4—40 to 80 inches; brown (7.5YR 5/4) silt loam; common fine distinct brown (7.5YR 5/2) iron depletions; platy structure; few fine roots; strongly effervescent; moderately alkaline.

The depth to bedding planes ranges from 20 to 30 inches. Reaction is slightly alkaline or moderately alkaline throughout.

The A horizon is light brown, brown, dark brown, light reddish brown, or reddish brown. The texture is silt loam or silty clay loam.

The Bw horizon is light brown, brown, dark brown, light reddish brown, or reddish brown. The texture is silt loam or silty clay loam.

The C horizon is light brown, brown, dark brown, strong brown, light reddish brown, or reddish brown. It is stratified with textures of silt loam, silty clay loam, clay loam, and silty clay.

Wilson Series

The Wilson series consists of very deep, moderately well drained, very slowly permeable soils that formed in alkaline clayey sediments. These soils are on terraces and valley fills. Slopes are 0 to 1 percent.

Typical pedon of Wilson loam, 0 to 1 percent slopes, in northern Brazos County; from the intersection of Old San Antonio Road (OSR) and Farm Road 46 about 12 miles north of Bryan, 0.1 mile east on OSR, 0.5 mile south on private road, 300 feet west, in a pasture:

A—0 to 8 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; massive; very hard, very firm, sticky and plastic; common fine roots; few fine ironstone fragments; moderately acid; abrupt wavy boundary.

Bt—8 to 21 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; moderate medium blocky structure; extremely hard, extremely firm, very sticky and very plastic; common fine roots; common fine slickensides; few thin clay films on faces of peds; few ironstone fragments; slightly acid; gradual wavy boundary.

Btss—21 to 34 inches; gray (10YR 5/1) clay, dark gray (10YR 4/1) moist; moderate medium blocky structure; very hard, extremely firm, very sticky and very plastic; few fine roots; common fine slickensides; few thin clay films on faces of peds; few ironstone fragments; slightly acid; gradual wavy boundary.

Btssy—34 to 61 inches; dark gray (10YR 4/1) clay;

weak medium blocky structure; very hard, extremely firm, very sticky and very plastic; few fine roots; common fine slickensides; few gypsum crystals; common medium distinct yellowish brown (10YR 5/6) masses of iron accumulation with sharp to clear boundaries; moderately acid; gradual wavy boundary.

BCy—61 to 80 inches; gray (10YR 5/1) clay; weak coarse angular blocky structure; very hard, extremely firm, very sticky and very plastic; common fine gypsum crystals; common medium distinct yellowish brown and strong brown masses of iron accumulation with clear to diffuse boundaries; slightly alkaline.

The thickness of the solum ranges from 60 to more than 80 inches. When the soils are dry, cracks form at the surface. The cracks are 1/2 to 1 inch wide and extend to a depth of 20 inches or more. During most years these soils do not have aquic conditions, but they are saturated for short periods and may develop some aquic features. Masses of iron accumulation and iron depletions are considered to be both relict and contemporary redoximorphic features.

The A horizon ranges from 4 to 12 inches in thickness. It is dark brown, dark grayish brown, grayish brown, or dark gray. Reaction ranges from moderately acid to neutral. The horizon is massive and is hard or very hard when dry.

The Bt horizon is gray, dark gray, or very dark gray. It is clay or clay loam. The horizon has few or common ironstone and chert fragments. A few gypsum crystals are in the lower part of the horizon in some pedons. The Btss subhorizons have few or common slickensides. Reaction in the Bt horizon ranges from moderately acid to slightly alkaline.

The BC horizon is gray or light brownish gray. The texture is clay or clay loam. The content of gypsum crystals ranges from 5 to 10 percent of the soil mass in some pedons. Reaction ranges from neutral to moderately alkaline.

Yahola Series

The Yahola series consists of very deep, well drained, moderately rapidly permeable soils that formed in loamy alluvium. These soils are on natural levees of the flood plain along the Brazos River. Slopes are 0 to 1 percent.

Typical pedon of Yahola fine sandy loam, 0 to 1 percent slopes, rarely flooded, in western Brazos County; from the intersection of Texas Highway 21 and Farm Road 50 about 10 miles west of Bryan, 1.1 miles south on Farm Road 50, 300 feet south, in a pasture:

A—0 to 12 inches; reddish brown (5YR 5/4) fine sandy loam, light reddish brown (5YR 6/3) moist; weak fine subangular blocky structure; slightly hard, friable; common fine roots; strongly effervescent; moderately alkaline; abrupt smooth boundary.

C1—12 to 24 inches; pink (5YR 7/3) fine sandy loam, light reddish brown (5YR 6/3) moist; weak fine subangular blocky structure; slightly hard, friable; few fine roots; few fine discontinuous pink (5YR 7/4) bedding planes; strongly effervescent; moderately alkaline; abrupt smooth boundary.

C2—24 to 42 inches; pink (5YR 7/3) fine sandy loam, pink (5YR 7/3) moist; common faint pink (5YR 7/4) bedding planes; slightly hard, friable; few fine roots; strongly effervescent; moderately alkaline; abrupt smooth boundary.

C3—42 to 48 inches; strata of light reddish brown (5YR 6/3) silty clay loam and pink (5YR 7/3) loamy fine sand; each texture makes up 50 percent of the horizon by volume; common faint pink (5YR 7/4) bedding planes; slightly hard, friable; few fine roots; strongly effervescent; moderately alkaline; abrupt smooth boundary.

C4—48 to 80 inches; pink (5YR 7/3) silt loam, light reddish brown (5YR 6/3) moist; common bedding planes; slightly hard, friable; few fine roots; strongly effervescent; moderately alkaline.

The content of clay in the particle-size control section ranges from 10 to 18 percent. Effervescence ranges from slight to strong throughout the profile.

The A horizon is reddish brown, light reddish brown, or reddish gray.

The C horizon is reddish brown, light reddish brown, reddish gray, pink, or pinkish gray. The horizon is fine sandy loam or loam above a depth of 40 inches and is stratified with various sandy and loamy textures in the lower part.

Zack Series

The Zack series consists of soils that are moderately deep to thinly bedded loamy and clayey sediments. These soils are on uplands. They are moderately well drained. Permeability is very slow. Slopes are dominantly 1 to 5 percent but range from 1 to 25 percent.

Typical pedon of Zack very fine sandy loam, 1 to 5 percent slopes (fig. 24); from the intersection of Texas Highway 6 Bypass and Farm Road 158 1.0 mile east of Bryan, 3.1 miles southeast on Farm Road 158, about 1.0 mile north and east on Copperfield Drive and Canterbury Drive, 2,000 feet south, under post oak tree on ridgetop:

Ap—0 to 7 inches; dark brown (10YR 4/3) very fine sandy loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure; hard, very friable; common fine roots; few fine siliceous pebbles; strongly acid; abrupt smooth boundary.

Bt1—7 to 18 inches; mixed dark grayish brown (10YR 4/2), dark reddish brown (5YR 3/3), and dark red (2.5YR 3/6) clay; moderate medium angular blocky structure; very hard, very firm; common fine roots; few cracks 1/2 inch wide; few pressure faces; continuous clay films on faces of peds; few fine siliceous pebbles; slightly acid; clear wavy boundary.

Bt2—18 to 24 inches; dark brown (7.5YR 4/4) clay, dark brown (7.5YR 3/4) moist; moderate coarse angular blocky structure; very hard, very firm; common fine roots; few cracks 1/2 inch wide; few wedge-shaped peds; continuous clay films on faces of peds; few fine siliceous pebbles; neutral; clear smooth boundary.

2BCk—24 to 36 inches; mixed light yellowish brown (10YR 6/4) and very dark grayish brown (10YR 3/2) sandy clay loam; weak medium subangular blocky structure; slightly hard, firm; few fine roots; common concretions of calcium carbonate; moderately alkaline; abrupt irregular boundary.

2Ck—36 to 60 inches; thinly bedded light brownish gray (10YR 6/2), dark reddish brown (5YR 3/3), and light red (2.5YR 6/8) loam; massive; extremely hard, extremely firm; common calcium carbonate concretions; moderately alkaline.

The thickness of the solum and the depth to stratified clayey or loamy deltaic sediments range from 25 to 40 inches. Colors with chroma of 2 or less are inherited from the parent material, or they are relict redoximorphic features.

The A horizon is dark brown, dark grayish brown, or grayish brown. Reaction ranges from strongly acid to slightly acid.

The Bt horizon is dark reddish brown, dark red, dark brown, or dark grayish brown, or it is a mixture of these colors. The texture is clay or silty clay. The content of clay ranges from 40 to 60 percent. Small slickensides or pressure faces are in some pedons. Reaction ranges from moderately acid to neutral. In some pedons the lower part of the Bt horizon is clay loam and ranges from neutral to moderately alkaline.

The 2BC horizon is shades of brown and gray and has mottles in shades of brown, gray, and yellow. The texture is silty clay loam, clay loam, or sandy clay loam. Reaction ranges from neutral to moderately alkaline.

The 2Ck or 2C horizon is light gray, light brownish gray, or grayish brown. The texture is loam, clay loam, or silty clay loam. Some pedons have alternating strata of loamy and clayey sediments. Reaction ranges from neutral to moderately alkaline.

Zulch Series

The Zulch series consists of soils that are moderately deep to weathered shale. These moderately well drained soils formed in loamy and clayey sediments. Permeability is very slow. Slopes range from 1 to 3 percent.

Typical pedon of Zulch fine sandy loam, 1 to 3 percent slopes; from the intersection of Texas Highway 21 and Texas Highway 6 Bypass, 0.8 mile southeast on Texas Highway 6 Bypass, 2.6 miles northeast on old Reliance road, 0.3 mile south on private road, 800 feet west, in a pasture:

Ap—0 to 5 inches; grayish brown (10YR 5/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; extremely hard, friable; many fine roots; moderately acid; abrupt wavy boundary.

Bt1—5 to 13 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; weak coarse subangular blocky structure; extremely hard, very firm; few fine roots; common clay films; shiny ped faces; few fine faint yellowish brown (10YR 5/4) masses of iron accumulation with sharp boundaries; few fine pebbles; slightly acid; clear smooth boundary.

Bt2—13 to 27 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; weak coarse subangular blocky structure; extremely hard, very firm; few fine roots; common clay films; few small pressure faces; neutral; clear smooth boundary.

Bt3—27 to 36 inches; gray (10YR 5/1) clay, dark gray (10YR 4/1) moist; weak coarse subangular blocky structure; extremely hard, very firm; few fine roots; few small pressure faces; few clay films; slightly alkaline; clear smooth boundary.

C—36 to 60 inches; grayish brown (10YR 5/2) clay, grayish brown (10YR 5/2) moist; interbedded with soft shale; extremely hard, very firm; common white salts and calcium carbonate concretions at the contact with the Bt3 horizon; strongly effervescent; moderately alkaline.

The thickness of the solum and the depth to underlying siltstone and shale strata range from 30 to 40 inches. The content of clay in the particle-size control section ranges from 35 to 45 percent. When the soils are dry, cracks form at the surface. The cracks are 1/2 inch to 1 1/2 inches wide and extend to a depth of 40 inches or more. Common or many salts

and carbonate concretions are at the contact with C materials. Some pedons have an exchangeable sodium percentage of 4 to 10 in the C horizon. A few siliceous pebbles are throughout the profile in some pedons. Gray colors are inherited from the parent material.

The A horizon is less than 10 inches thick in more than 50 percent of the pedon but ranges to as much as 12 inches thick in some parts of the pedon. It is dark grayish brown, dark gray, or grayish brown. Reaction ranges from moderately acid to neutral. Some pedons have a thin E horizon.

The Bt horizon is gray, dark gray, dark grayish brown, or very dark grayish brown. Few or common masses of iron accumulation in shades of brown or red are in some pedons. The Bt horizon is clay loam or clay. Reaction ranges from moderately acid to slightly alkaline.

The BC or CB horizon, if it occurs, is light brownish gray or grayish brown. The texture is clay or clay loam. Reaction ranges from neutral to moderately alkaline.

The C or 2C horizon is weakly consolidated siltstone or shale. It is grayish brown or dark grayish brown and has mottles in shades of brown, yellow, and gray. It is clay or clay loam and is thinly bedded. Reaction ranges from neutral to moderately alkaline.

Formation of the Soils

This section describes the factors of soil formation and relates them to the formation of the soils in Brazos County. It also describes the surface geology of the survey area.

Factors of Soil Formation

Soil is formed by the action of soil-forming processes on material deposited or accumulated by geological forces. The characteristics of a soil at any given point depend on the physical and mineralogical composition of the parent material; the climate under which the soil material has 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 factors are important in the genesis of each soil; some have had more influence than others on a given soil.

Parent Material

Parent material is the unconsolidated mass in which a soil forms. It determines the chemical and mineral composition of the soil. In Brazos County, the parent material consists of unconsolidated sandy, loamy, and clayey sediment deposited by water from the Eocene, Pleistocene, and Holocene epochs. The geology of the parent material is described in the section “Surface Geology and Geomorphology.”

Climate

The warm and humid climate of Brazos County promotes moderately rapid soil development. The climate is uniform throughout the survey area, but its effect is modified locally by runoff. In some areas the effect of climate also is modified by the direction of exposure. Major differences among soils in this survey area are not believed to have resulted from the effects of climate.

Plant and Animal Life

Plants, insects, earthworms, animals, micro-organisms, and other living organisms, including humans, contributed to the development of the soils. The addition of organic material and nitrogen to the soil, the addition and removal of plant nutrients, and changes in structure and porosity are caused by plants, animals, and humans.

Plants probably have affected soil formation in Brazos County more than other kinds of living organisms. Soils that formed under grasses tend to have a higher content of organic matter in the surface layer than soils that formed under trees.

Relief

Relief, or topography, influences soil formation through its effect on drainage, erosion, and plant cover.

The soils in Brazos County range from nearly level to steep, although most of the county is gently sloping. The nearly level areas consist of flood plains and the terraces associated with them. The more sloping areas are the uplands and the higher lying terraces or terrace remnants.

The degree of soil profile development typically depends on the amount of moisture in the soil. Gladewater soils are in nearly level, somewhat poorly drained areas that receive extra water; therefore, they have gleyed characteristics and the horizon development is not well defined. Gredge soils are in the more sloping, better drained areas. These soils exhibit bright colors and distinct horizons throughout. Soils on footslopes, such as Benchley soils, receive additional organic material and have a thick, dark surface layer. Soils on adjacent side slopes, such as

Crockett soils, have a thin, light-colored surface layer because the surface layer is removed by erosion as quickly as it is developed.

Time

A great length of time is required for the formation of soils that have distinct horizons. The differences in the length of time that the parent material has been in place are generally reflected in the degree of development of soil horizons. Young soils have little horizon development, and old soils have well expressed horizons.

Sandow and Uhland soils are young soils. They are on nearly level flood plains. Although they have undergone some horizon development, they closely resemble the loamy and sandy parent material in which they formed. Benchley and Crockett soils are older soils. They have developed distinct horizons that do not resemble the parent material.

Processes of Horizon Differentiation

Several processes are involved in the formation of horizons in soils. These processes include the accumulation of organic matter, the leaching of carbonates and other bases, and the formation and translocation of silicate clay minerals. In most soils more than one of these processes have been active in the development of horizons.

The accumulation of organic matter in the upper part of a profile results in the formation of a distinct, dark surface layer. The soils in Brazos County range from low to high in content of organic matter. Benchley soils have accumulated organic matter and have a dark surface layer.

Carbonates have been leached downward in most of the soils in the survey area. Much leaching has occurred in the very deep soils that have a sandy surface layer, such as Padina and Navasan soils. Carbonates still remain in the profile of the clayey Luling soils.

The translocation of clay minerals has also contributed to horizon development in many soils. Clay minerals are produced by weathering of primary minerals. The subsoil in many of the soils in Brazos County has accumulations of clay films in pores and on the faces of peds. These soils were probably leached of carbonates and bases before the translocation of silicate clay took place. A horizon that has accumulations of translocated clay is called an argillic horizon. Chazos soils, for example, have an argillic horizon.

Surface Geology and Geomorphology

Lee Nordt, assistant professor, Department of Geology, Baylor University, Waco, Texas, and Saul Aronow, professor emeritus, Department of Geology, Lamar University, Beaumont, Texas, prepared this section. The assistance of Ray B. Daniels in the interpretation of geomorphic surfaces is acknowledged.

Brazos County is in the Gulf Coastal Plain of Texas, which is part of the larger Atlantic and Gulf Coastal Province of the United States (Walker and Coleman, 1987). The county is bordered on the west by the Brazos River and on the east by the Navasota River. The confluence of these rivers forms the southern boundary. Most of the northern boundary of the county follows the Old San Antonio Road (OSR).

The geologic units that are exposed in the county can be broadly grouped into Tertiary formations and Quaternary sediments. The Tertiary formations range in age from about 45 million to 2 million years. They are exposed at the surface in coast-paralleling patterns and dip gently in the subsurface toward the Gulf. This structural configuration deflects the local southeast-flowing streams eastward when resistant beds are encountered. As a result, most tributary streams, such as Wickson Creek and Carter Creek, flow eastward into the Navasota River. This process produces several prominent northeast to southwest strike-oriented cuestas where relatively resistant sandstones underlie the ridges. Quaternary sediments typically occur as alluvium along streams and as alluvial remnants in the uplands. These sediments were deposited during the last 1.5 million years.

The general soil map of Brazos County is used to facilitate the descriptions of geological formations. Tertiary formations are described in order of outcrop from north (oldest) to south (youngest). Quaternary sediments are addressed as they relate to individual streams.

Tertiary Formations

Tertiary formations in Brazos County, including the Cook Mountain and Yegua Formations, are part of the Claiborne Group. Gulf of Mexico transgressive and regressive cycles resulted in deposition of clayey sediments in shallow marine-deltaic and fluvio-deltaic environments, whereas sands were deposited in mainly fluvial environments (Berg, 1979; Fisher and

others, 1970; LeBlanc, 1970; Stenzel, 1938; Stenzel, 1940). These deposits subsequently consolidated into shales and sandstones.

The oldest Tertiary unit, the Cook Mountain Formation, crops out in the northernmost part of the county. It originated as a shallow marine deposit of Eocene age (Aronow and Nordt, 1988). It has been subdivided into four mappable members. From oldest to youngest, these are the Wheelock Marl, Landrum Shale, Spiller Sand, and Mount Tabor Shale (Mathews, 1950). The basal Wheelock Marl Member is characterized by partly calcareous, brown, glauconitic, and fossiliferous shales and clays. Soils of the Crockett-Benchley general soil map unit occur on the Wheelock Marl Member.

The partly acidic, brown or dark brown Landrum Shale overlies the Wheelock Marl. The Landrum Shale crops out primarily on the north-facing slope of the prominent cuesta that separates the outcrops of Wheelock Marl from the Spiller Sand.

The Spiller Sand Member forms the south-facing dipslope of the cuesta. It is composed mainly of gray and brown, acidic sands with locally interbedded shales. Soils of the Spiller-Rosanky-Kurten general soil map unit occur on the Landrum Shale and Spiller Sand Members.

The Mount Tabor Shale Member is composed of gray and brown, partly acidic shales that form erosional outliers at a higher elevation than the surrounding Spiller Sand. Soils of the Crockett-Benchley general soil map unit occur on the Mount Tabor Shale.

The Yegua Formation is exposed in the middle part of the county (Barnes, 1981). It is the product of deltaic progression over the Cook Mountain Formation in response to a major marine regression (LeBlanc, 1970). The Yegua Formation is subdivided into four members (Mathews, 1950); however, only three of these significantly affect soil distribution. The basal member (oldest) is the Smetana Sandstone, which forms a narrow but prominent cuesta separating the Cook Mountain and Yegua Formations. It consists of acidic, reddish, iron-rich sandstones with locally interbedded gray and brown shales. Soils of the Spiller-Rosanky-Kurten general soil map unit occur on the Smetana Sandstone as well as on the Spiller Sand Member of the Cook Mountain Formation. This soil mapping indicates similarities in both depositional environment and lithology between the two geologic units. Soils that formed in the Smetana Sandstone, however, typically have steeper slopes than those on the Spiller Sand Member, and some of the included soils have a lower base status.

The Smetana Sandstone grades into the overlying Bryan Sandstone Member of the Yegua Formation. The Bryan Sandstone consists mainly of white, cross-bedded sands and sandstones and smaller amounts of clay and shale. The only significant surface exposure is in the northeastern part of the county. Soils of the Robco-Chazos general soil map unit occur on the Bryan Sandstone.

The Easterwood Shale is the uppermost (youngest) member of the Yegua Formation. It is the largest in surface area and consists principally of partly calcareous, white to gray shales and clays. Soils of the Zack-Boonville-Zulch general soil map unit developed on the Easterwood Shale. A few ridges in the vicinity of Easterwood Shale contain relict alluvial deposits in which Gredge, Chazos, Rader, Silawa, and Tabor soils have formed.

Five Tertiary formations are exposed at the surface in the southern part of the county. From oldest to youngest, these are the Cadell, Wellborn, Manning, Whitsett, and Catahoula Formations. These formations crop out mainly as narrow southwest-northeast-trending strata. The Cadell, Wellborn, Manning, and Whitsett Formations comprise the Jackson Group, which ranges in age from Eocene to Oligocene (Fisher and others, 1970). The Cadell, Wellborn, and Manning Formations are prodelta and marine deposits, whereas the Whitsett Formation is a fluvial deposit. The overlying Catahoula Formation is mainly fluvial in origin (Galloway, 1977). The Jackson Group and the Catahoula Formation contain more volcanic ash than the older Eocene Claiborne Group (Barnes, 1981).

The basal Cadell Formation consists of calcareous, brown clays and sands, and the overlying Wellborn and Manning Formations contain variable proportions of sandstone and brown clay. The uppermost Whitsett and Catahoula Formations are composed mainly of resistant sandstones that form discontinuous strike-trending bands related to extensive faulting near the town of Millican (Barnes, 1981). This structural activity may have been caused by a slowly rising salt dome that faulted the underlying Whitsett Formation strata up into the overlying Catahoula Formation strata (Drake, 1960). This process has created Whitsett Formation inliers within outcrops of the Catahoula Formation.

The major soils of the Burlewash-Singleton general soil map unit are mapped continually across the Jackson Group and the Catahoula Formation. Soils of lesser extent vary across the area. In some areas, the Cadell Formation weathered to form Boonville soils, which are part of the Zack-Boonville-Zulch general soil map unit. In many areas, the Whitsett and Catahoula

Formations weathered to form Falba soils. Shiro soils formed on some of the ridges. The resistant Koether-Rock outcrop and Shalba-Rock outcrop complexes are on steep, north-facing cuesta slopes.

Quaternary Sediments

Quaternary sediments cover about 60 percent of Brazos County. The chronology of Quaternary deposition on the Tertiary Gulf Coastal Plain in Texas is complex and poorly understood. It is clear, however, that modern streams and their predecessors have played an important role in creating the landscapes and depositing the sediments overlying older Tertiary formations.

Alluvial processes affecting soil distribution began with Pliocene or early Pleistocene erosion and sedimentation by the ancestral Brazos and Navasota Rivers (Byrd, 1971; Waters and Nordt, 1995). Siliceous lag gravels on major and minor interfluves are not related to the modern drainage network, indicating deposition by an ancient stream system. The paucity of gravel in Tertiary formations suggests that interfluvial gravels are probably relict fluvial deposits correlative with the Uvalde Gravel of Central Texas (Plummer, 1932) or with the Willis Formation of East Texas. Reconstruction of depositional patterns of these ancient streams is difficult because most gravels have been reworked and transported to secondary landscape positions by mass-wasting and colluviation. Gravel sources were probably chert-rich Cretaceous limestones and Ogallala Formation gravels of Miocene-Pliocene age exposed during erosion and backwearing of the Southern High Plains of Texas (Byrd, 1971). These channel lag deposits may have acted as surface armor deflecting trunk and tributary stream channels laterally to less resistant positions, retaining gravels in higher interfluvial positions (Walker, 1978). The surface horizons of most upland soils contain few to many pebbles. Locally, gravels are associated with relatively thick deposits of unconsolidated Quaternary alluvium in which Gredge, Silawa, Chazos, and Tabor soils developed.

The next major Quaternary event occurred during the middle to late Pleistocene when the Brazos and Navasota Rivers underwent at least five cycles of channel incision and flood-plain construction. Abandonment of the flood plains resulted in the formation of four terraces at elevations ranging from 10 to 80 feet above the modern flood plain. Alluvial sediments underlying these terraces and the modern flood plains generally fine upward from basal gravels to overlying silts and clays.

Brazos River Terraces and Flood Plain

The highest alluvial deposits associated with the modern Brazos River are more than 65 feet above the present flood plain. Remnants of this alluvium are typically gravelly and occur across all Tertiary formations in the county. However, individual areas covered by these deposits are generally of insufficient size to be shown on the general soil map. The very gravelly phases of Gredge and Tabor soils formed in these deposits.

Several areas of the Burleson-Wilson general soil map unit are on a succession of intermediate and low terraces of the Brazos River. These soils formed in fine grained overbank deposits that are 15 to 50 feet above flood-plain level. However, two areas of this map unit near the town of Millican are approximately 100 feet above the flood plain. They were uplifted to an unusually high landscape position presumably as a result of faulting. Sandier soils, such as Silawa, Chazos, Dutek, Padina, and Desan soils, are on the lower Brazos River terraces within the Burleson-Wilson general soil map unit. These soils formed in sediments of relict point bars and levees, in sediments of eolian origin, or both.

The flood plain along the Brazos River is underlain by 50 to 65 feet of alluvium (Cronin and Wilson, 1967). It can be subdivided into two broad stratigraphic units representing separate depositional episodes (Waters and Nordt, 1995). The lower unit is deeply buried and typically consists of cross-bedded sands and gravels. The upper unit consists mainly of fine sands, silts, and clays. Fossil evidence (Carlson and others, 1984) near the contact of the lower and upper units indicates a Pleistocene age for the lower unit and a Holocene age for the upper unit (Waters and Nordt, 1995). The lower coarse grained unit may be correlative with the late Pleistocene Deweyville Formation of East Texas.

Deposition on the upper flood plain stratigraphic unit occurred during the Holocene. Deposition was interrupted by several periods of landscape stability and soil formation during the late Holocene (Waters and Nordt, 1995). The last of these was subsequently buried by 3 to 6 feet of sediment deposited by the Brazos River when it traversed the central portion of the flood plain about 400 to 500 years ago (Waters and Nordt, 1995). The river abandoned this channel and shifted to its current position on the outer margin of the flood-plain valley approximately 400 years ago. As a result, the distribution of most soils in the flood plain follows the abandoned channel and its adjacent levee, crevasse-splay, and flood-basin deposits rather than those of the modern channel. Soils of the Weswood general soil map unit formed in very fine

sands and silts on levees and crevasse splays adjacent to the abandoned channel. Soils of the Ships general soil map unit occur in clayey flood-basin sediments deposited by flooding from the abandoned channel.

The modern Brazos River channel is entrenched and laterally confined to the outer portions of the flood plain. Fluvial deposition consists of sands and gravels along a narrow, frequently flooded zone within the modern meander belt. Yahola soils are on sparsely vegetated point bars. Weswood and Yahola soils are on ridges and swales of migrating meander scrolls. Highbank soils are mostly in modern levee positions. This modern levee is the only overbank fluvial facies related to the modern river channel. Most clayey flood-plain sediments that lie between this modern levee and the centrally located abandoned channel are alluvial deposits associated with the ancestral abandoned channel.

The broad Brazos River flood plain often flooded prior to construction of the last dams upstream during the 1960s. However, relatively high surface gradients (downstream) associated with entrenchment of the modern channel created adequate flood runoff to transport most suspended clays back into the modern low-water channel. Absence of a clay veneer across the levees and crevasse splays of the abandoned channel supports this conclusion.

Navasota River Terraces and Flood Plain

The Navasota River has a succession of four terraces. This terrace sequence is more extensive than those in the Brazos River basin and ranges from a few feet to more than 80 feet above the modern flood plain. The third and fourth terraces are the highest and oldest along the Navasota River, occurring at 50 to 80 feet above the flood plain. Soils of the Tabor-Gredge-Rader and Robco-Chazos general soil map units occur on these terraces and on dissected terrace remnants.

The well drained Gredge soils occur on dissected landscapes, and Tabor soils are in broad, nearly level areas. Many areas of the third and fourth terraces have a mound and intermound topography and are shown on the detailed soil maps as Derly-Rader complex, 0 to 1 percent slopes. Moderately sloping to steep, sandy soils, such as Padina, Desan, Dutek, and Eufaula soils, are on terrace scarps.

Soil texture and terrace morphology of many soils on the third and fourth terraces suggest an eolian sediment source. The numerous rounded and subrounded mounds, 1 to 6 feet high and 50 to 100 feet in diameter, scattered across these terraces may represent relict coppice dunes. Soils on mounds and intermounds consistently have silt and very fine sand composition ranging from 25 to 50 percent. Furthermore, many of the moderately sloping to steep terrace scarps that connect the Navasota River flood plain to these higher terraces are covered with thick sandy drapes that typically consist of coarser grained material than the underlying silt and very fine sand deposits.

There are numerous theories on the origin of mounded landscapes (Carty and others, 1988). An eolian origin is suggested for mounds on these terraces due to the textural gradation of sediments from sandy terrace scarps to silty mounds and intermounds on the terrace treads. The source area for these eolian sediments may have been late Pleistocene or Holocene point bar and levee deposits from the Navasota River flood plain or from the formerly more extensive lower second terrace.

The second terrace of the Navasota River is 23 to 30 feet above the modern flood plain. Soils of the Robco-Chazos general soil map unit occur on this terrace. Only three small remnants of this terrace have been identified within Brazos County.

The first (youngest) terrace consists of rounded to subrounded sandy knolls about 3 to 9 feet above the flood plain. These areas are typically isolated within the flood plain and are about 1 to 20 acres in size (Nordt, 1986). These sediments range from 15 to 33 feet thick and extend laterally beneath adjacent flood-basin clays. Two of the larger knolls have meander scrolls that suggest a fluvial depositional origin (Nordt, 1983). These features may be the product of a high-energy, relict fluvial regime that was partially buried by younger fine grained sediments deposited by the modern Navasota River. Sediments comprising the first terrace may also be equivalent to the buried flood-plain sands of the Brazos River and, therefore, correlative with the Deweyville Formation. The exceptionally large valley meander scars of the Navasota River valley may have also been formed during channel migration in the late Pleistocene. Climatic conditions were likely wetter during the late Pleistocene, and these conditions yielded high channel discharges and deposition of medium or coarse grained point bar sands (Bernard, 1950). The modern Navasota River is in many places underfit relative to these valley meanders, suggesting a substantial decrease in channel discharge.

Soils on the sandy knolls of the first terrace are mainly those of the Navasan series. It is unclear, however, whether sands in the upper part of these soils (A and E horizons) are pedogenically related to the subsurface clays (Bt horizons) or if they are a result of fluvial or eolian stratification. The knolls that

have meander scrolls commonly have inclusions of frequently flooded Gladewater soils in swales, indicating partial flooding and burial of the scrolls by the modern Navasota River.

Modern Navasota River alluvium consists primarily of clays and silts deposited from relatively low-energy floodwaters. These sediments are the parent materials for Gladewater soils of the Gladewater-Kaufman general soil map unit. Most of the Kaufman soils formed in areas where major, higher order tributaries deposit silty and clayey sediments as they empty into the Navasota River flood plain. Inclusions of Sandow soils generally occur in areas where minor, lower order tributaries empty into the flood plain and deposit loamy sediments in alluvial fans or as levees along local sloughs. In addition, Sandow soils occur where the width of the flood-plain valley is constricted.

Soils of the Sandow general soil map unit also occur on flood plains along major tributaries of the Navasota River. Parent sediments for these soils reflect contributions from Tertiary formations and Quaternary sediments cropping out within the drainage area. Uhland soils formed on tributary flood plains where the stream valley is narrow, or they formed adjacent to channels where coarse overbank sediments are deposited as levees. One or two terraces commonly border these tributaries but are of limited extent.

Geomorphic Surfaces and Soil Formation

Parent material lithology and landscape age together account for most of the soil variability in Brazos County. Landscape age is part of the definition of a geomorphic surface, which is defined as a two-dimensional landscape that is recognizable in space and time (Ruhe, 1975). A recognition of geomorphic surfaces can help define the beginning of soil

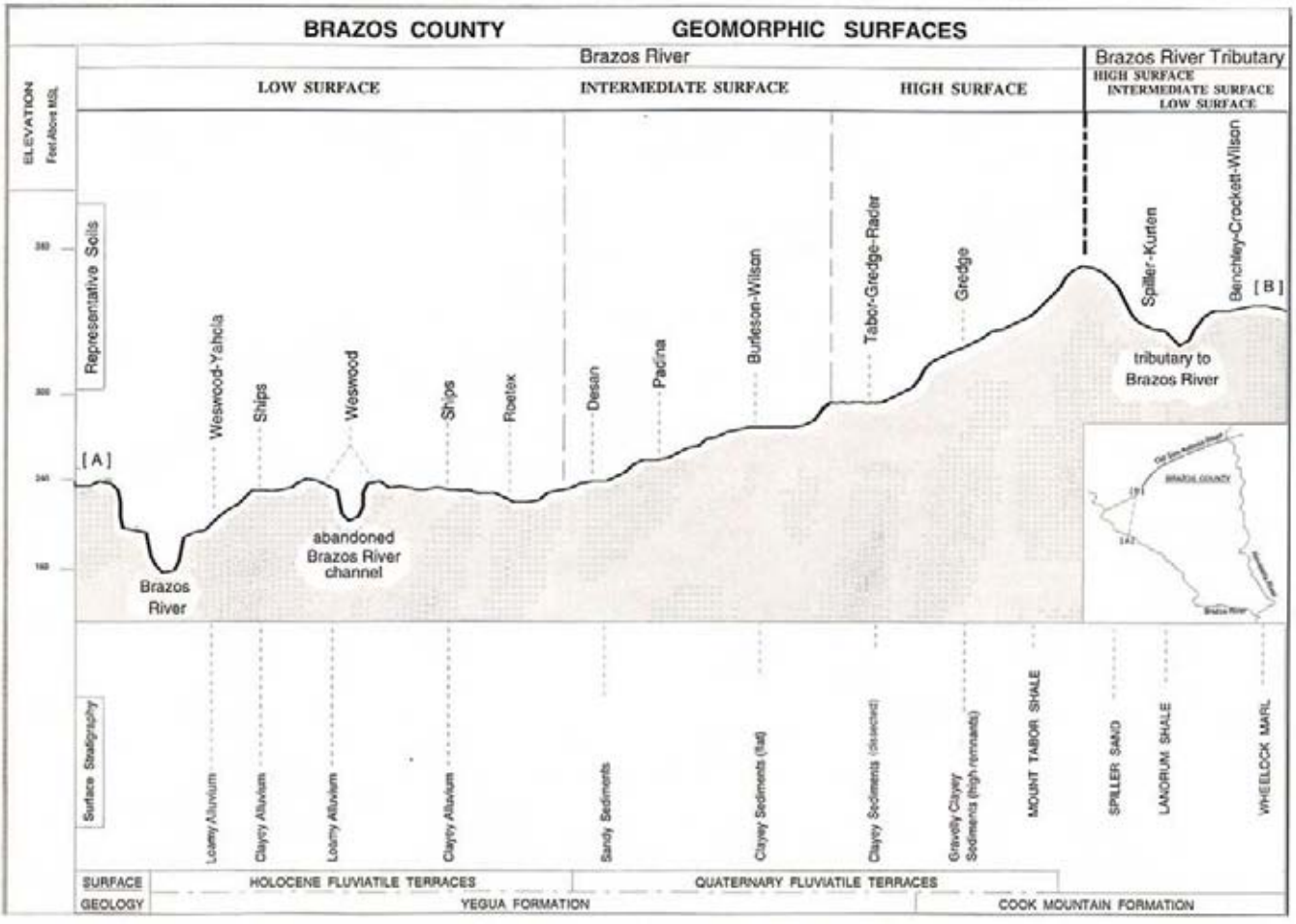

Figure 25.—An idealized cross section of geomorphic surfaces, geology, and major soils of Brazos County.

formation on any landscape, which invariably is younger than the depositional age of the sediments in which the soil formed.

Geomorphic surfaces in Brazos County have been grouped into three general categories that are useful for discussing soil distributions. The three surfaces have been informally named, from oldest to youngest, as High Surface, Intermediate Surface, and Low Surface. They are illustrated in figures 25 and 26.

The High Surface covers the broad, gently to moderately sloping interfluve separating the Brazos and Navasota Rivers. The cities of Bryan and College Station are on this surface. The Pliocene-Pleistocene Uvalde Gravel (or Willis Formation) and associated alluvial sediments on this surface are probably in secondary landscape positions having been mass-wasted from previously eroded superjacent landscapes. This limits the maximum landscape age of the High Surface to early Pleistocene. Because slopes and drainageways of the High Surface grade down to and gently merge with the uppermost terraces of the Brazos and Navasota Rivers, the High Surface (and associated hillslopes and valleys) and the highest terraces are similar in age. The uppermost terraces are believed to be middle Pleistocene in age (Nordt, 1983 and 1986). Therefore, the High Surface and associated soils can be further confined to an age of middle Pleistocene.

The drainage network associated with the High Surface is a relict system that developed in response to the uppermost terraces when they were active base-level-controlling flood plains (Nordt and Hallmark, 1986). This well integrated drainage network, with many interfluvial saddles, indicates considerable landscape stability prior to renewed entrenchment and development of younger and lower landscapes. Abrupt soil textural changes between the A and Bt horizons, coupled with well developed argillic horizons (clayey subsoils) and deep sola, suggest an advanced age for this surface. Sola in some areas,

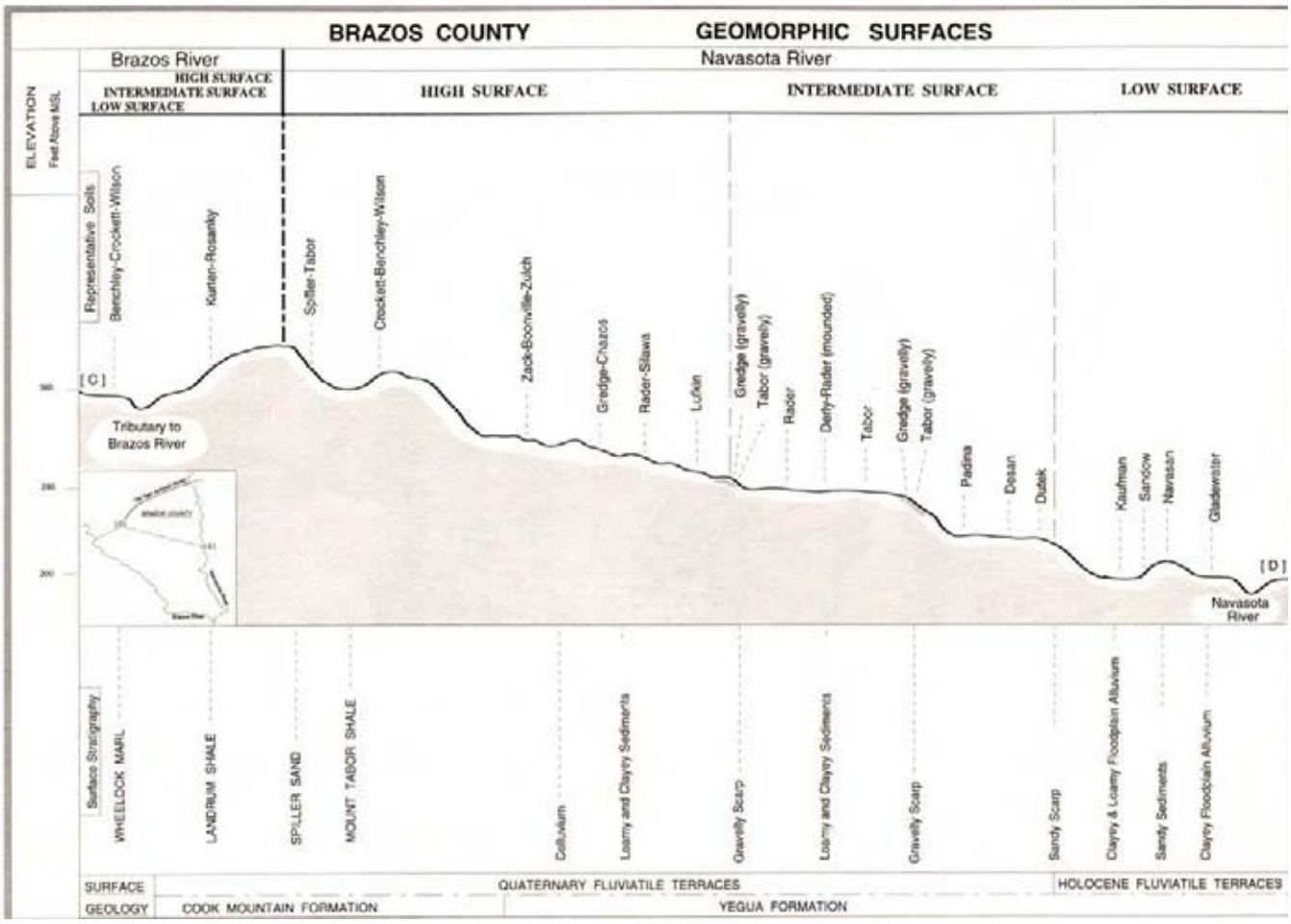

Figure 26.—An idealized cross section of geomorphic surfaces, geology, and major soils of Brazos County.

however, are surprisingly thin, probably due to the stratified and resistant nature of the underlying Tertiary parent materials. Furthermore, surface horizon erosion and subsequent eolian deposition may have produced abrupt textural changes between A and Bt horizons. In this case, textural differences between the surface and subsoil horizons are of lithogenic and not pedogenic origin. The most developed soils in Brazos County occur on terrace counterparts to the High Surface due to long-term landscape stability and nearly level slopes.

The Intermediate Surface is a slightly lower and narrower landscape that separates the broad High Surface and the lower, steeper Low Surface. Geomorphic relationships indicate that the Intermediate Surface consists of a group of inextensive surfaces that formed in response to one or more cycles of entrenchment and flood-plain development that constructed the lower two or three Brazos River and Navasota River terraces. The age of these terraces is probably late Pleistocene (Nordt, 1986), an age similar to that of the Intermediate Surface. Soils on upland and terrace counterparts of the Intermediate Surface display a similar degree of soil development to those on the High Surface. Thus, similar soils are mapped on both surfaces.

Soils on High and Intermediate Surfaces are similar mainly because of the “Steady State” principle. This principle asserts that with advancing age, many soil properties attain their maximum expression, after which there is little change (Birkeland, 1984). The Intermediate Surface has a few areas where slopes are slightly steeper than those on the High Surface. In these areas, the soil map units have a higher percentage of included soils with thinner sola.

The last major entrenchment episode of the Brazos and Navasota Rivers occurred during the late Pleistocene, possibly during deposition of Deweyville sands. This downcutting event lowered the local base level appreciably and initiated rapid upland knickpoint migration from the entrenched tributary network. This degradational episode resulted in the development of the Low Surface.

Steep slopes associated with the entrenched tributary network and gently rolling modern flood plains characterize the Low Surface. Strongly sloping phases of the Gredge, Zack, and Zulch soils are mapped in some areas on the Low Surface. It is unlikely, however, that well developed Bt horizons associated with these Low Surface soils formed during the Holocene. One explanation is the partial removal of the thick sandy A and E horizons of the Padina, Desan, and Eufaula soils by erosion during the last entrenchment episode. The Gredge and Silawa soils that have a thin surface layer could have formed in this manner. Alternatively, the alluvium was completely removed during downcutting and a veneer of colluvium was deposited. In this case, the soils would have formed in two stratigraphic units: eroded bedrock for the Bt horizons and colluvium for the A horizons. Clayey soils, such as Luling soils, developed in areas of the Low Surface where colluvial drapes do not occur and truncated shales are exposed.

Weakly developed soils on the flood plain, such as Weswood and Ships soils, are products of continued flood-plain deposition during the last 500 years (Waters and Nordt, 1995). These soils may be somewhat younger than the soils on hillslope components of the Low Surface.

Taxonomically, soils that formed in equilibrium with the High and Intermediate Surfaces are well developed Alfisols. Soil variabilities at lower taxonomic levels occur mostly as a result of differences in parent material lithologies. Terrace counterparts to the High and Intermediate Surfaces contain the most developed Alfisols in the county because of long-term landscape stability. Soils that formed in equilibrium with the Low Surface display the widest variety of properties because many formed on hillslopes that were truncated to bedrock, had a veneer of colluvium, or had partial removal of pre-existing surface horizons. Soils on the steep segments of the Low Surface are mainly Alfisols, but Vertisols have developed where complete alluvial and colluvial truncation has occurred. Soils on flood plains, which are the depositional counterpart to the Low Surface, are weakly developed Inceptisols, Mollisols, and Vertisols.

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Glossary

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.

Alluvial fan. The fanlike deposit of a stream where it issues from a gorge upon a plain or of a tributary stream near or at its junction with its main stream.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Alpha,alpha-dipyridyl. A dye that when dissolved in 1N ammonium acetate is used to detect the presence of reduced iron (Fe II) in the soil. A positive reaction indicates a type of redoximorphic feature.

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.

Aspect. The direction in which a slope faces.

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

Backslope. The position that forms the steepest and generally linear, middle portion of a hillslope. In profile, backslopes are commonly bounded by a convex shoulder above and a concave footslope below.

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.

Breaks. The steep and very steep broken land at the border of an upland summit that is dissected by ravines.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay depletions. Low-chroma zones having a low content of iron, manganese, and clay because of the chemical reduction of iron and manganese

and the removal of iron, manganese, and clay. A type of redoximorphic depletion.

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.

Colluvium. Soil material or rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

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.

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."

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.

Coppice dune. A small dune of fine grained soil material stabilized around shrubs or small trees.

Corrosion. Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

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.

Cuesta. A hill or ridge that has a gentle slope on one side and a steep slope on the other; specifically, an asymmetric, homoclinal ridge capped by resistant rock layers of slight or moderate dip.

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.

Delta. A body of alluvium having a surface that is nearly flat and fan shaped; deposited at or near the mouth of a river or stream where it enters a body of relatively quiet water, generally a sea or lake.

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.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of 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.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.
Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.
Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of 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.

Excess salt (in tables). Excess water-soluble salts in the soil that restrict the growth of most plants.

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.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

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.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Fluvial. Of or pertaining to rivers; produced by river action, as a fluvial plain.

Footslope. The position that forms the inner, gently inclined surface at the base of a hillslope. In profile, footslopes are commonly concave. A footslope is a transition zone between upslope sites of erosion and transport (shoulders and backslopes) and downslope sites of deposition (toeslopes).

Forb. Any herbaceous plant not a grass or a sedge.

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.

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.

Hard bedrock. Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Head slope. A geomorphic component of hills consisting of a laterally concave area of a hillside, especially at the head of a drainageway. The overland waterflow is converging.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

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.

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.

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.

Interfluve. An elevated area between two drainageways that sheds water to those drainageways.

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.

Iron depletions. Low-chroma zones having a low content of iron and manganese oxide because of chemical reduction and removal, but having a clay content similar to that of the adjacent matrix. A type of redoximorphic depletion.

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.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

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.

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.

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.

Mott. A grove or clump of trees in an area of prairie or open country.

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).

Muck. Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)

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.)

Nose slope. A geomorphic component of hills consisting of the projecting end (laterally convex area) of a hillside. The overland waterflow is predominantly divergent.

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.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedisediment. A thin layer of alluvial material that mantles an erosion surface and has been transported to its present position from higher lying areas of the erosion surface.

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 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.

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.

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.

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, savannahs, 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

Redoximorphic concentrations. Nodules, concretions, soft masses, pore linings, and other features resulting from the accumulation of iron or manganese oxide. An indication of chemical reduction and oxidation resulting from saturation.

Redoximorphic depletions. Low-chroma zones from which iron and manganese oxide or a combination of iron and manganese oxide and clay has been removed. These zones are indications of the chemical reduction of iron resulting from saturation.

Redoximorphic features. Redoximorphic concentrations, redoximorphic depletions, reduced matrices, a positive reaction to alpha,alpha-dipyridyl, and other features indicating the

chemical reduction and oxidation of iron and manganese compounds resulting from saturation.

Reduced matrix. A soil matrix that has low chroma in situ because of chemically reduced iron (Fe II). The chemical reduction results from nearly continuous wetness. The matrix undergoes a change in hue or chroma within 30 minutes after exposure to air as the iron is oxidized (Fe III). A type of redoximorphic feature.

Relief. The elevations or inequalities of a land surface, considered collectively.

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.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

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.

Savannah. A grassland area containing scattered trees and drought-resistant undergrowth.

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 the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shoulder. The position that forms the uppermost inclined surface near the top of a hillslope. It is a transition from backslope to summit. The surface is dominantly convex in profile and erosional in origin.

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.

Side slope. A geomorphic component of hills consisting of a laterally planar area of a hillside. The overland waterflow is predominantly parallel.

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.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. In this survey, classes for simple slopes are as follows:

Nearly level	0 to 1 percent
Very gently sloping	1 to 3 percent
Gently sloping	1 to 5 percent
Moderately sloping	5 to 8 percent
Strongly sloping	8 to 12 percent
Moderately steep	12 to 20 percent
Steep	20 to 45 percent

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.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soft bedrock. Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

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 and by the passage 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.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Summit. The topographically highest position of a hillslope. It has a nearly level (planar or only slightly convex) surface.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

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.

Toeslope. The position that forms the gently inclined surface at the base of a hillslope. Toeslopes in profile are commonly gentle and linear and are constructional surfaces forming the lower part of a hillslope continuum that grades to valley or closed-depression floors.

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.

Tuff. A compacted deposit that is 50 percent or more volcanic ash and dust.

Upland. Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial meltwater. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

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.

Windthrow. The uprooting and tipping over of trees by the wind.

Tables

Table 1.--Temperature and Precipitation

(Recorded in the period 1961-90 at College Station, Texas)

Month	Temperature						Precipitation				
				2 years in 10 will have--				2 years in 10 will have--			
	Average daily maximum	Average daily minimum	Average	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----	58.4	38.7	48.5	81	15	118	2.65	1.07	3.99	5	0.3
February---	63.0	41.9	52.5	84	21	150	2.62	1.12	3.89	4	.1
March------	71.0	49.7	60.3	88	27	342	2.58	1.16	3.79	4	.0
April------	78.3	58.0	68.2	90	36	545	3.38	1.22	5.18	4	.0
May--------	84.0	65.0	74.5	93	49	760	4.80	1.88	7.25	5	.0
June-------	90.3	71.0	80.7	99	59	920	3.68	1.01	5.82	4	.0
July-------	93.8	73.4	83.6	102	66	1,042	2.29	.53	3.67	3	.0
August-----	94.8	73.2	84.0	104	64	1,053	2.42	.77	3.76	3	.0
September--	88.4	68.7	78.6	100	51	857	4.87	2.33	7.07	5	.0
October----	80.2	58.6	69.4	93	39	602	3.81	1.48	5.76	4	.0
November---	70.1	49.4	59.8	87	28	317	3.15	1.52	4.56	4	.0
December---	61.5	41.2	51.3	81	18	149	2.79	1.30	4.07	4	.0
Yearly:											
Average---	77.8	57.4	67.6	---	---	---	---	---	---	---	---
Extreme---	---	---	---	104	13	---	---	---	---	---	---
Total-----	---	---	---	---	---	6,856	39.04	30.99	46.65	49	0.4

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50 degrees F).

Table 2.--Freeze Dates in Spring and Fall

(Recorded in the period 1961-90 at College Station, 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--	Feb. 27	Mar. 12	Mar. 24
2 years in 10 later than--	Feb. 20	Mar. 4	Mar. 18
5 years in 10 later than--	Feb. 5	Feb. 19	Mar. 5
First freezing temperature in fall:			
1 year in 10 earlier than--	Dec. 2	Nov. 20	Nov. 11
2 years in 10 earlier than--	Dec. 11	Nov. 27	Nov. 18
5 years in 10 earlier than--	Dec. 29	Dec. 12	Nov. 30

Table 3.--Growing Season

(Recorded in the period 1961-90 at College Station, 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	283	270	245
8 years in 10	293	277	253
5 years in 10	312	292	268
2 years in 10	331	306	284
1 year in 10	341	313	292

Table 4.--Acreage and Proportionate Extent of the Soils

Map symbol	Soil name	Acres	Percent
AxB	Axtell fine sandy loam, 1 to 3 percent slopes	3,554	0.9
BeA	Benchley loam, 0 to 1 percent slopes	1,172	0.3
BeB	Benchley loam, 1 to 3 percent slopes	3,209	0.8
BoA	Boonville fine sandy loam, 0 to 1 percent slopes	3,108	0.8
BoB	Boonville fine sandy loam, 1 to 3 percent slopes	13,388	3.5
BrB	Boonville-Urban land complex, 0 to 3 percent slopes	6,685	1.8
BuA	Burleson clay, 0 to 1 percent slopes	3,007	0.8
BuB	Burleson clay, 1 to 3 percent slopes	2,420	0.6
BuC	Burleson clay, 3 to 5 percent slopes	1,198	0.3
BwC	Burlewash fine sandy loam, 1 to 5 percent slopes	8,278	2.2
BwD	Burlewash fine sandy loam, 5 to 8 percent slopes	6,425	1.7
ChC	Chazos loamy fine sand, 1 to 5 percent slopes	8,334	2.2
ChD	Chazos loamy fine sand, 5 to 8 percent slopes	1,621	0.4
CoA	Coarsewood silt loam, 0 to 1 percent slopes, rarely flooded	707	0.2
CrB	Crockett loam, 1 to 3 percent slopes	11,522	3.0
CrB2	Crockett loam, 2 to 5 percent slopes, eroded	1,354	0.4
DeA	Derly-Rader complex, 0 to 1 percent slopes	8,603	2.3
DfC	Desan loamy fine sand, 3 to 8 percent slopes	1,992	0.5
DmA	Dimebox clay, 0 to 1 percent slopes	440	0.1
DuC	Dutek loamy fine sand, 3 to 8 percent slopes	2,195	0.6
EuB	Eufaula loamy fine sand, 1 to 3 percent slopes	1,717	0.5
FaB	Falba fine sandy loam, 1 to 3 percent slopes	1,849	0.5
Gd	Gladewater clay, frequently flooded	17,153	4.5
GrC	Gredge fine sandy loam, 1 to 5 percent slopes	12,200	3.2
GrC2	Gredge fine sandy loam, 2 to 5 percent slopes, eroded	1,166	0.3
GrD	Gredge fine sandy loam, 5 to 8 percent slopes	6,722	1.8
GvC	Gredge very gravelly fine sandy loam, 3 to 8 percent slopes	1,707	0.5
GyC	Greenvine clay, 2 to 5 percent slopes	213	0.1
HbA	Highbank silty clay loam, 0 to 1 percent slopes, rarely flooded	3,681	1.0
Ka	Kaufman clay, frequently flooded	5,319	1.4
KrD	Koether-Rock outcrop complex, 3 to 12 percent slopes	658	0.2
KuC	Kurten fine sandy loam, 2 to 5 percent slopes	2,741	0.7
KuD	Kurten fine sandy loam, 5 to 8 percent slopes	1,687	0.4
LfA	Lufkin fine sandy loam, 0 to 1 percent slopes	1,984	0.5
LuB	Luling clay, 1 to 3 percent slopes	1,870	0.5
LuD	Luling clay, 5 to 8 percent slopes	773	0.2
MaA	Mabank loam, 0 to 1 percent slopes	4,197	1.1
MrA	Mabank-Rader complex, 0 to 1 percent slopes	2,008	0.5
NvB	Navasan loamy fine sand, 0 to 3 percent slopes	1,818	0.5
PaC	Padina loamy fine sand, 1 to 5 percent slopes	4,644	1.2
Pt	Pits	630	0.2
RaB	Rader fine sandy loam, 0 to 2 percent slopes	11,445	3.0
RbA	Rader-Tabor complex, 1 to 3 percent slopes	2,954	0.8
ReC	Rehburg loamy fine sand, 1 to 5 percent slopes	441	0.1
RoB	Robco loamy fine sand, 1 to 3 percent slopes	11,672	3.1
Rr	Roetex clay, frequently flooded	1,320	0.3
RsC	Rosanky fine sandy loam, 2 to 5 percent slopes	2,082	0.6
RsD	Rosanky fine sandy loam, 5 to 8 percent slopes	3,441	0.9
RtC	Rosanky soils, graded, 1 to 5 percent slopes	498	0.1
RuC	Rosanky-Urban land complex, 2 to 5 percent slopes	1,191	0.3
Sa	Sandow loam, frequently flooded	24,693	6.5
Sb	Sandow-Urban land complex, frequently flooded	1,485	0.4
ScC	Shalba-Rock outcrop complex, 2 to 6 percent slopes	1,236	0.3
ShA	Ships clay, 0 to 1 percent slopes, rarely flooded	23,062	6.1
ShC	Ships clay, 1 to 5 percent slopes, rarely flooded	1,906	0.5
SkB	Shiro loamy fine sand, 1 to 3 percent slopes	3,771	1.0
SmC	Silawa fine sandy loam, 2 to 5 percent slopes	3,622	1.0
SmD	Silawa fine sandy loam, 5 to 8 percent slopes	2,664	0.7
SnB	Singleton fine sandy loam, 1 to 3 percent slopes	7,080	1.9
SpB	Spiller loamy fine sand, 1 to 3 percent slopes	9,619	2.5
SxB	Styx loamy fine sand, 1 to 3 percent slopes	1,130	0.3
TaA	Tabor fine sandy loam, 0 to 2 percent slopes	24,123	6.4
TgB	Tabor very gravelly fine sandy loam, 1 to 3 percent slopes	1,186	0.3
TuA	Tabor-Urban land complex, 0 to 2 percent slopes	1,879	0.5

Table 4.--Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Acres	Percent
Uh	Uhland loam, frequently flooded	5,328	1.4
Ur	Urban land	3,840	1.0
Us	Ustarents, clayey	956	0.3
WeA	Weswood silt loam, 0 to 1 percent slopes, rarely flooded	6,666	1.8
WeC	Weswood silt loam, 1 to 5 percent slopes, rarely flooded	2,131	0.6
WwA	Weswood silty clay loam, 0 to 1 percent slopes, rarely flooded	2,941	0.8
Wy	Weswood-Yahola complex, frequently flooded	2,202	0.6
WzA	Wilson loam, 0 to 1 percent slopes	4,843	1.3
YaA	Yahola fine sandy loam, 0 to 1 percent slopes, rarely flooded	733	0.2
ZaB	Zack very fine sandy loam, 1 to 5 percent slopes	12,380	3.3
ZaC2	Zack very fine sandy loam, 2 to 5 percent slopes, eroded	1,623	0.4
ZaD	Zack very fine sandy loam, 5 to 8 percent slopes	3,025	0.8
ZaE3	Zack very fine sandy loam, 8 to 25 percent slopes, severely eroded	374	0.1
ZcB	Zack-Urban land complex, 1 to 5 percent slopes	7,978	2.1
ZcD	Zack-Urban land complex, 5 to 8 percent slopes	917	0.2
ZuB	Zulch fine sandy loam, 1 to 3 percent slopes	11,707	3.1
	Water areas more than 40 acres in size	4,013	1.1
	Total	378,106	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. Yields in parentheses are for irrigated areas; all others are for nonirrigated areas. 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	Corn	Grain sorghum	Wheat	Small grain grazeout	Improved bermudagrass	Bahiagrass
		Lbs	Bu	Bu	Bu	AUM*	AUM*	AUM*
AxB--Axtell	3e	---	---	---	---	4.0	6.0	5.0
BeA--Benchley	2w	625	120	90	45	5.0	8.0	7.0
BeB--Benchley	2e	450	90	85	40	5.0	8.0	7.0
BoA--Boonville	3w	---	---	---	---	5.0	6.0	5.0
BoB--Boonville	3e	---	---	---	---	4.0	6.0	5.0
BrB: Boonville-Urban land.								
BuA--Burleson	2w	600	85	95	40	4.0	6.0	5.0
BuB--Burleson	2e	450	80	90	40	4.0	6.0	5.0
BuC--Burleson	3e	---	---	---	---	3.0	5.0	4.0
BwC--Burlewash	4e	---	---	---	---	2.0	2.0	2.0
BwD--Burlewash	6e	---	---	---	---	---	---	---
ChC--Chazos	3e	---	---	---	---	5.0	7.0	6.0
ChD--Chazos	4e	---	---	---	---	5.0	7.0	6.0
CoA--Coarsewood	1	900 (1,400)	115 (140)	110 (120)	---	5.0	7.0	---
CrB--Crockett	3e	300	55	55	35	4.0	6.0	5.0
CrB2--Crockett	4e	200	---	45	20	4.0	5.0	4.0
DeA:								
Derly	4w	---	---	---	---	---	---	---
Rader	2w	---	---	---	30	---	7.0	6.0

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	Corn	Grain sorghum	Wheat	Small grain grazeout	Improved bermudagrass	Bahiagrass
		Lbs	Bu	Bu	Bu	AUM*	AUM*	AUM*
DfC--Desan	3e	---	---	---	---	4.0	5.0	---
DmA--Dimebox	2w	625	120	90	50	4.0	6.0	5.0
DuC--Dutek	3e	---	---	30	---	5.0	7.0	6.0
EuB--Eufaula	4s	---	---	25	---	3.0	4.0	---
FaB--Falba	4e	---	---	---	---	3.0	4.0	3.0
Gd--Gladewater	5w	---	---	---	---	---	---	---
GrC--Gredge	4e	---	---	---	---	4.0	6.0	5.0
GrC2--Gredge	4e	---	---	---	---	3.0	4.0	3.0
GrD--Gredge	6e	---	---	---	---	---	---	---
GvC--Gredge	6s	---	---	---	---	---	---	---
GyC--Greenvine	3e	---	---	---	---	3.0	3.0	2.0
HbA--Highbank	2s	750 (1,600)	100 (120)	100 (120)	---	5.0	8.0	---
Ka--Kaufman	5w	---	---	---	---	4.0	5.0	4.0
KrD:								
Koether	7s	---	---	---	---	---	---	---
Rock outcrop	8s	---	---	---	---	---	---	---
KuC--Kurten	4e	---	---	---	---	4.0	5.0	4.0
KuD--Kurten	6e	---	---	---	---	3.0	4.0	3.0
LfA--Lufkin	3w	---	---	---	---	4.0	5.0	4.0
LuB--Luling	2e	700	110	100	50	4.0	6.0	5.0
LuD--Luling	4e	---	---	---	---	4.0	5.0	4.0

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	Corn	Grain sorghum	Wheat	Small grain grazeout	Improved bermudagrass	Bahiagrass
		Lbs	Bu	Bu	Bu	AUM*	AUM*	AUM*
MaA--Mabank	3w	330	55	55	---	4.0	5.0	4.0
MrA:								
Mabank	3w	330	55	55	---	4.0	5.0	4.0
Rader	2w	---	65	70	30	---	7.0	6.0
NvB--Navasan	3s	---	---	---	---	---	7.0	---
PaC--Padina	3e	---	---	---	---	5.0	7.0	---
Pt--Pits	8s	---	---	---	---	---	---	---
RaB--Rader	3e	200	60	70	30	5.0	7.0	6.0
RbA:								
Rader	3e	200	60	70	30	5.0	7.0	---
Tabor	3e	---	---	---	---	---	7.0	6.0
ReC--Rehburg	3e	---	---	---	---	4.0	6.0	5.0
RoB--Robco	2e	---	---	---	---	5.0	7.0	6.0
Rr--Roetex	7w	---	---	---	---	---	---	---
RsC--Rosanky	3e	---	---	---	30	5.0	7.0	6.0
RsD--Rosanky	4e	---	---	35	25	4.0	6.0	5.0
RtC--Rosanky	6s	---	---	---	---	---	---	---
RuC:								
Rosanky-Urban land.								
Sa--Sandow	5w	---	---	---	---	5.0	8.0	7.0
Sb:								
Sandow-Urban land.								

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	Corn	Grain sorghum	Wheat	Small grain grazeout	Improved bermudagrass	Bahiagrass
		Lbs	Bu	Bu	Bu	AUM*	AUM*	AUM*
ScC:								
Shalba	4s	---	---	---	---	---	---	---
Rock outcrop	8s	---	---	---	---	---	---	---
ShA	2s	750 (1,150)	115 (125)	100	---	4.0	6.0	---
Ships								
ShC	3e	400	60	45	40	4.0	6.0	---
Ships								
SkB	3e	---	---	---	---	4.0	5.0	4.0
Shiro								
SmC	3e	---	---	---	---	5.0	7.0	6.0
Silawa								
SmD	4e	---	---	---	---	4.0	6.0	5.0
Silawa								
SnB	4e	---	---	---	---	3.0	4.0	3.0
Singleton								
SpB	3e	---	---	---	---	5.0	7.0	6.0
Spiller								
SxB	3e	---	---	---	---	5.0	7.0	6.0
Styx								
TaA	3e	---	---	---	---	5.0	7.0	6.0
Tabor								
TgB	6s	---	---	---	---	---	---	---
Tabor								
TuA:								
Tabor-Urban land.								
Uh	5w	---	---	---	---	5.0	7.0	6.0
Uhland								
Ur.								
Urban land								
Us	6e	---	---	---	---	---	---	---
Ustarents								
WeA	1	1,000 (1,500)	130 (150)	100 (120)	---	5.0	8.0	---
Weswood								
WeC	3e	450	60	70	---	---	8.0	---
Weswood								
WwA	1	1,000 (1,500)	130 (150)	100 (120)	---	5.0	8.0	---
Weswood								

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	Corn	Grain sorghum	Wheat	Small grain grazeout	Improved bermudagrass	Bahiagrass
		Lbs	Bu	Bu	Bu	AUM*	AUM*	AUM*
Wy:								
Weswood	5w	---	---	---	---	5.0	8.0	---
Yahola	5w	---	---	---	---	5.0	7.0	---
WzA---Wilson	3w	350	60	55	30	4.0	6.0	5.0
YaA---Yahola	2e	700 (1,000)	90 (110)	80	45	5.0	7.0	---
ZaB---Zack	4e	---	---	---	---	3.0	4.0	3.0
ZaC2---Zack	4e	---	---	---	---	---	2.0	1.0
ZaD---Zack	6e	---	---	---	---	---	---	---
ZaE3---Zack	7e	---	---	---	---	---	---	---
ZcB: Zack-Urban land.								
ZcD: Zack-Urban land.								
ZuB---Zulch	3e	---	---	---	---	3.0	4.0	3.0

* Animal unit month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

Table 6.--Rangeland Productivity

(Only the soils that support rangeland vegetation suitable for grazing are listed)

Soil name and map symbol	Ecological site	Potential annual production for kind of growing season		
		Favorable	Normal	Unfavorable
		Lb/acre	Lb/acre	Lb/acre
AxB Axtell	Claypan Savannah	5,000	3,500	2,500
BeA, BeB Benchley	Clay Loam	6,000	5,000	3,200
BoA, BoB Boonville	Claypan Prairie	6,000	5,000	4,000
BuA, BuB, BuC Burleson	Blackland	7,000	5,500	4,000
BwC, BwD Burlewash	Claypan Savannah	4,500	3,000	2,000
ChC, ChD Chazos	Sandy Loam	5,500	4,500	3,000
CoA Coarsewood	Loamy Bottomland	8,000	6,500	5,000
CrB, CrB2 Crockett	Claypan Prairie	6,000	5,000	3,000
DeA: Derly	Claypan Savannah	5,000	3,500	2,500
Rader	Sandy Loam	6,000	4,500	3,500
DfC Desan	Deep Sand	3,000	2,000	1,000
DmA Dimebox	Blackland	7,000	6,000	4,500
DuC Dutek	Sandy	4,500	4,000	2,000
EuB Eufaula	Deep Sand	4,000	2,800	2,000
FaB Falba	Claypan Savannah	4,500	3,000	2,000
Gd Gladewater	Clayey Bottomland	7,000	6,000	4,000
GrC, GrC2, GrD Gredge	Claypan Savannah	5,000	3,500	2,500
GvC Gredge	Gravelly	5,000	3,500	2,500
GyC Greenvine	Blackland	7,000	5,000	3,000
HbA Highbank	Loamy Bottomland	8,000	6,500	5,000

Table 6.--Rangeland Productivity--Continued

Soil name and map symbol	Ecological site	Potential annual production for kind of growing season		
		Favorable	Normal	Unfavorable
		Lb/acre	Lb/acre	Lb/acre
Ka Kaufman	Clayey Bottomland	7,500	6,000	4,000
KrD: Koether	Claypan Savannah	2,000	1,000	500
Rock outcrop.				
KuC, KuD Kurten	Claypan Savannah	5,000	4,000	2,500
LfA Lufkin	Claypan Savannah	5,000	4,000	2,500
LuB, LuD Luling	Blackland	7,000	4,500	3,000
MaA Mabank	Claypan Prairie	6,000	5,000	3,000
MrA: Mabank	Claypan Prairie	6,000	5,000	3,000
Rader	Sandy Loam	6,000	4,500	3,500
NvB Navasan	Deep Sand	5,000	4,000	3,000
PaC Padina	Deep Sand	4,500	3,500	2,250
RaB Rader	Sandy Loam	6,000	4,500	3,500
RbA: Rader	Sandy Loam	6,000	4,500	3,500
Tabor	Sandy Loam	6,500	5,500	3,500
ReC Rehburg	Sandy	4,000	3,000	1,500
RoB Robco	Sandy	5,000	4,000	3,000
Rr Roetex	Clayey Bottomland	6,000	5,000	3,000
RsC, RsD Rosanky	Sandy Loam	6,000	4,500	3,000
RtC Rosanky	Sandy Loam	5,000	3,900	2,500
Sa Sandow	Loamy Bottomland	7,500	6,500	4,000
ScC: Shalba	Claypan Savannah	4,500	3,500	2,000
Rock outcrop.				

Table 6.--Rangeland Productivity--Continued

Soil name and map symbol	Ecological site	Potential annual production for kind of growing season		
		Favorable	Normal	Unfavorable
		Lb/acre	Lb/acre	Lb/acre
ShA, ShC---------- Ships	Clayey Bottomland----------	7,500	6,000	4,500
SkB---------- Shiro	Sandy Loam----------	5,000	4,200	2,500
SmC, SmD---------- Silawa	Sandy Loam----------	5,500	4,500	2,500
SnB---------- Singleton	Claypan Savannah----------	5,000	4,000	2,500
SpB---------- Spiller	Sandy Loam----------	6,000	4,500	3,000
SxB---------- Styx	Sandy----------	5,500	4,500	3,000
TaA---------- Tabor	Sandy Loam----------	6,500	5,500	3,500
TgB---------- Tabor	Gravelly----------	4,500	3,500	2,000
Uh---------- Uhland	Loamy Bottomland----------	7,500	6,500	4,000
WeA, WeC, WwA---------- Weswood	Loamy Bottomland----------	8,000	6,500	5,000
Wy:				
Weswood----------	Loamy Bottomland----------	8,000	6,500	5,000
Yahola----------	Loamy Bottomland----------	7,000	4,900	3,500
WzA---------- Wilson	Claypan Prairie----------	6,000	4,500	3,000
YaA---------- Yahola	Loamy Bottomland----------	7,500	5,500	4,000
ZaB, ZaC2, ZaD, ZaE3----- Zack	Claypan Prairie----------	5,000	3,500	2,000
ZuB---------- Zulch	Claypan Prairie----------	5,000	4,000	3,500

Table 7.--Soil Groupings for Horticultural Plants

Plant type	Soil series					
	Axtell, Boonville, Derly, Gredge, Kurten, Lufkin, Mabank, Rosanky, Tabor, Zack, Zulch	Benchley, Burleson, Crockett, Dimebox, Luling, Wilson	Burlewash, Falba, Koether, Shalba, Shiro, Singleton	Coarsewood, Gladewater, Highbank, Kaufman, Sandow, Ships, Uhland, Weswood, Yahola	Chazos, Rader, Silawa, Spiller	Desan, Dutek, Eufaula, Navasan, Padina, Rehburg, Robco
Ground cover	Ajuga, Algerian ivy, English ivy, lirope, santolina, Asiatic jasmine, vinca major, mondo grass, vinca minor.	Ajuga, Algerian ivy, English ivy, lirope, honeysuckle, Asiatic jasmine, vinca major, mondo grass, vinca minor.	Algerian ivy, English ivy, lirope, honeysuckle, Asiatic jasmine, vinca major, mondo grass, vinca minor, santolina.	Ajuga, Algerian ivy, English ivy, lirope, santolina, Asiatic jasmine, vinca major, mondo grass, vinca minor.	Ajuga, Algerian ivy, English ivy, lirope, santolina, Asiatic jasmine, vinca major, mondo grass, vinca minor.	Ajuga, Algerian ivy, English ivy, lirope, santolina, Asiatic jasmine, vinca major, mondo grass, vinca minor, honeysuckle.
Vines	Carolina jessamine, wisteria, coral vine.	Carolina jessamine, coral vine, wisteria.	Carolina jessamine, coral vine, wisteria.	Carolina jessamine, coral vine, wisteria.	Carolina jessamine, wisteria, coral vine.	Carolina jessamine, wisteria, coral vine.
Shrubs (1 to 3 feet)	Dwarf abelia, aspidistra, dwarf Burford holly, Chinese holly, dwarf gardenia, dwarf yaupon holly, red yucca.	Dwarf abelia, aspidistra, dwarf Burford holly, dwarf yaupon holly, red yucca.	Dwarf abelia, aspidistra, dwarf Burford holly, Chinese holly, dwarf gardenia, dwarf yaupon holly, red yucca.	Dwarf abelia, aspidistra, dwarf Burford holly, Chinese holly, dwarf gardenia, dwarf yaupon holly, red yucca.	Dwarf abelia, aspidistra, dwarf Burford holly, Chinese holly, dwarf gardenia, dwarf yaupon holly, red yucca.	Dwarf abelia, aspidistra, dwarf Burford holly, Chinese holly, dwarf gardenia, dwarf yaupon holly, red yucca.
Shrubs (3 to 5 feet)	Aucuba, gardenia, Japanese barberry, hydrangea, boxwood, nandina, spirea, Indian hawthorn, azalea.	Glossy abelia, aucuba, boxwood, nandina, Japanese barberry, Indian hawthorn, spirea.	Gardenia, hydrangea, boxwood, nandina, Japanese yew, spirea, azalea.	Aucuba, gardenia, hydrangea, boxwood, nandina, spirea, Indian hawthorn, Japanese yew.	Aucuba, gardenia, hydrangea, boxwood, nandina, spirea, Indian hawthorn, Japanese yew, azalea.	Aucuba, gardenia, Japanese barberry, hydrangea, boxwood, nandina, azalea, Indian hawthorn, spirea.
Shrubs (6 to 9 feet)	Elaeagnus-silverberry, photenia-red top, Burford holly, althea, Pfitzer juniper, waxmyrtle, crapemyrtle.	Elaeagnus-silverberry, photenia-red top, hollies (most), althea, pyracantha, Pfitzer juniper, crapemyrtle.	Azalea (indica), camellia japonica, camellia sasanqua, elaeagnus-silverberry, photenia-red top, hollies (most), althea, waxmyrtle, crapemyrtle.	Elaeagnus-silverberry, photenia-red top, hollies (most), althea, Pfitzer juniper, waxmyrtle, crapemyrtle.	Azalea (indica), camellia japonica, camellia sasanqua, elaeagnus-silverberry, photenia-red top, Burford holly, althea, Pfitzer juniper, waxmyrtle, crapemyrtle.	Azalea (indica), camellia japonica, camellia sasanqua, elaeagnus-silverberry, photenia-red top, Burford holly, althea, Pfitzer juniper, waxmyrtle, crapemyrtle.

Table 7.--Soil Groupings for Horticultural Plants--Continued

Plant type	Soil series					
	Axtell, Boonville, Derly, Gredge, Kurten, Lufkin, Mabank, Rosanky, Tabor, Zack, Zulch	Benchley, Burleson, Crockett, Dimebox, Luling, Wilson	Burlewash, Falba, Koether, Shalba, Shiro, Singleton	Coarsewood, Gladewater, Highbank, Kaufman, Sandow, Ships, Uhland, Weswood, Yahola	Chazos, Rader, Silawa, Spiller	Desan, Dutek, Eufaula, Navasan, Padina, Rehburg, Robco
Shrubs (10 to 25 feet)	Texas persimmon, loquat, crapemyrtle, cherry laurel, mountain laurel, possumhaw holly.	Texas persimmon, loquat, crapemyrtle, cherry laurel, mountain laurel, possumhaw holly, roughleaf dogwood.	Texas persimmon, loquat, crapemyrtle, cherry laurel, dogwood (florida).	Texas persimmon, loquat, crapemyrtle, cherry laurel, dogwood (florida).	Texas persimmon, loquat, crapemyrtle, cherry laurel, dogwood (florida).	Texas persimmon, loquat, crapemyrtle, cherry laurel, dogwood (florida), possumhaw holly, mountain laurel.
Trees (20 to 35 feet)	American holly, rusty blackhaw, Chinese pistachio, dogwood, redbud.	Desert willow, American holly, Chinese pistachio, dogwood, redbud.	American holly, aristocrat pear, Bradford pear, Chinese pistachio, dogwood, redbud.	Crabapple, Mexican plum, American holly, aristocrat pear, Bradford pear, Chinese pistachio, dogwood (cornus florida), red buckeye.	Crabapple, Mexican plum, American holly, aristocrat pear, Bradford pear, Chinese pistachio, dogwood (cornus florida).	Crabapple, Mexican plum, Chinese pistachio, dogwood, redbud, river birch.
Trees (35 feet or higher)	Baldcypress, bur oak, cedar elm, sweetgum, eastern redcedar, eastern magnolia, southern red oak, Shumard oak, shagbark hickory.	Baldcypress, bur oak, cedar elm, sweetgum, eastern redcedar, eastern magnolia, southern red oak, Shumard oak, shagbark hickory.	Baldcypress, bur oak, cedar elm, sweetgum, eastern redcedar, eastern magnolia, southern red oak, Shumard oak, shagbark hickory.	Baldcypress, bur oak, cedar elm, Shumard oak, eastern magnolia, sweetgum, southern red oak, shagbark hickory, water oak.	Baldcypress, bur oak, cedar elm, sweetgum, eastern redcedar, eastern magnolia, southern red oak, shagbark hickory.	Baldcypress, bur oak, cedar elm, sweetgum, eastern redcedar, eastern magnolia, southern red oak.

Table 8.--Selected Flowering Plants

Plant type	Soil and light requirements	Plant name
Annuals (early flowering)	Sun; well drained soils	Calendula, larkspur, flowering kale (curly leaf), California poppy, viola, flowering cabbage (smooth leaf), nasturtium, Iceland poppy, pansy, sweetpea, dianthus, stock.
Annuals (summer flowering)	Sun; well drained soils	Ageratum, zinnia, morning glory vine, amaranthus, globe amaranthus, balsam, gaillardia, bachelor button, cleome, petunia, alyssum, cosmos, Mexican petunia, copper plant, periwinkle, verbena.
Annuals (summer flowering)	Part shade or shade	Begonia, black-eyed Susan, impatiens, Mexican petunia, coleum, caladium, forget-me-not.
Annuals (fall flowering)	Full sun; well drained soils	Asters, celosia (cockscomb), gaillardia, ageratum, periwinkle, lantana, amaranthus, copper plant.
Perennials (bulbs, corms, tubers)	Sun; well drained soils	Snowdrop, Dutch iris, anemone, bearded iris, crocus, spuria iris, grape hyacinth, tulip (as annual), hyacinth, daffodil, gladiola, narcissus.
Perennials (wetland plants, water garden)	Sun or part shade; poorly drained soils	Louisiana iris, equisetum (horsetail), dwarf papyrus, umbrella plant, lotus, water lily.
Perennials	Full sun; well drained soils	Yarrow, oxalis, southernwood (foliage), obedient plant, Shasta daisy, oxblood lily, chrysanthemum, dianthus spp., rosemary, purple coneflower, thyme (common), Maximilian sunflower, verbena, day lily, Texas star hibiscus, candi lily, canna, spider lily (lycoris), salvia spp.
Perennials	Part shade or shade; well drained soils	Perennial phlox, comfrey, dahlia, canna, crinum lily, hardy hibiscus, maidenhair fern, wood fern, holly fern.

Table 9.--Recreational Development

(See text for definitions of terms used in this table. 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
AxB Axtell	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Severe: erodes easily.	Moderate: droughty.
BeA Benchley	Slight	Slight	Slight	Slight	Slight.
BeB Benchley	Slight	Slight	Moderate: slope.	Slight	Slight.
BoA, BoB Boonville	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
BrB: Boonville	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
Urban land.					
BuA Burleson	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Moderate: too clayey.	Moderate: too clayey.	Severe: too clayey.
BuB, BuC Burleson	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Moderate: slope, too clayey.	Moderate: too clayey.	Severe: too clayey.
BwC Burlewash	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, depth to rock, percs slowly.	Severe: erodes easily.	Moderate: droughty, depth to rock.
BwD Burlewash	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: droughty, depth to rock.
ChC Chazos	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: droughty.
ChD Chazos	Slight	Slight	Severe: slope.	Slight	Moderate: droughty.
CoA Coarsewood	Severe: flooding.	Slight	Slight	Slight	Slight.
CrB, CrB2 Crockett	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Severe: erodes easily.	Moderate: droughty.
DeA: Derly	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.

Table 9.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
DeA:					
Rader	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Slight	Slight.
DfC	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.	Moderate: droughty.
DmA	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Moderate: too clayey, percs slowly.	Moderate: too clayey.	Severe: too clayey.
DuC	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.	Moderate: droughty.
EuB	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.	Moderate: droughty.
FaB	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
Gd	Severe: flooding, percs slowly, too clayey.	Severe: too clayey, percs slowly.	Severe: too clayey, flooding, percs slowly.	Severe: too clayey.	Severe: flooding, too clayey.
GrC, GrC2	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight	Moderate: droughty.
GrD	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Slight	Moderate: droughty.
GvC	Severe: small stones.	Severe: small stones.	Severe: small stones.	Severe: small stones.	Severe: small stones.
GyC	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Moderate: slope, too clayey.	Moderate: too clayey.	Severe: too clayey.
HbA	Severe: flooding.	Slight	Slight	Slight	Slight.
Ka	Severe: flooding, percs slowly, too clayey.	Severe: too clayey, percs slowly.	Severe: too clayey, flooding, percs slowly.	Severe: too clayey.	Severe: flooding, too clayey.
KrD:					
Koether	Severe: depth to rock.	Severe: depth to rock.	Severe: large stones, slope, depth to rock.	Moderate: large stones, too sandy.	Severe: large stones, droughty.
Rock outcrop.					
KuC	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight	Moderate: droughty.

Table 9.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
KuD--Kurten	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Slight	Moderate: droughty.
LfA--Lufkin	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: percs slowly.	Slight	Moderate: droughty.
LuB--Luling	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Moderate: slope, too clayey, percs slowly.	Moderate: too clayey.	Severe: too clayey.
LuD--Luling	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Severe: slope.	Moderate: too clayey.	Severe: too clayey.
MaA--Mabank	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: percs slowly.	Slight	Moderate: droughty.
MrA:					
Mabank	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: percs slowly.	Slight	Moderate: droughty.
Rader	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Slight	Slight.
NvB--Navasan	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: droughty.
PaC--Padina	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.	Moderate: droughty.
Pt--Pits	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: droughty, slope.
RaB--Rader	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Slight	Slight.
RbA:					
Rader	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Slight	Slight.
Tabor	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, small stones, percs slowly.	Slight	Moderate: droughty.
ReC--Rehburg	Moderate: percs slowly, too sandy.	Moderate: too sandy, percs slowly.	Moderate: slope, too sandy.	Moderate: too sandy.	Moderate: droughty.
RoB--Robco	Moderate: wetness, too sandy.	Moderate: wetness, too sandy.	Moderate: slope, small stones, too sandy.	Moderate: wetness, too sandy.	Moderate: wetness, droughty.

Table 9.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Rr Roetex	Severe: flooding, ponding, percs slowly.	Severe: ponding, too clayey, percs slowly.	Severe: too clayey, ponding, flooding.	Severe: ponding, too clayey.	Severe: ponding, flooding, too clayey.
RsC Rosanky	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
RsD Rosanky	Slight	Slight	Severe: slope.	Slight	Slight.
RtC Rosanky	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
RuC: Rosanky	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
Urban land.					
Sa Sandow	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
Sb: Sandow	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
Urban land.					
ScC: Shalba	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight	Severe: depth to rock.
Rock outcrop	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight	Severe: depth to rock.
ShA, ShC Ships	Severe: flooding, percs slowly, too clayey.	Severe: too clayey, percs slowly.	Severe: too clayey, percs slowly.	Severe: too clayey.	Severe: too clayey.
SkB Shiro	Slight	Slight	Moderate: slope, depth to rock.	Slight	Moderate: droughty, depth to rock.
SmC Silawa	Slight	Slight	Moderate: slope.	Slight	Slight.
SmD Silawa	Slight	Slight	Severe: slope.	Slight	Slight.
SnB Singleton	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, depth to rock, percs slowly.	Slight	Moderate: droughty, depth to rock.
SpB Spiller	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.

Table 9.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
SxB---------- Styx	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.	Moderate: droughty.
TaA---------- Tabor	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: small stones, percs slowly.	Slight----------	Moderate: droughty.
TgB---------- Tabor	Severe: small stones.	Severe: small stones.	Severe: small stones.	Severe: small stones.	Severe: small stones.
TuA: Tabor----------	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: small stones, percs slowly.	Slight----------	Moderate: droughty.
Urban land.					
Uh---------- Uhland	Severe: flooding.	Moderate: flooding, wetness.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
Ur. Urban land					
Us---------- Ustarents	Slight----------	Slight----------	Slight----------	Slight----------	Moderate: droughty.
WeA---------- Weswood	Severe: flooding.	Slight----------	Slight----------	Slight----------	Slight.
WeC---------- Weswood	Severe: flooding.	Slight----------	Moderate: slope.	Slight----------	Slight.
WwA---------- Weswood	Severe: flooding.	Slight----------	Slight----------	Slight----------	Slight.
Wy: Weswood----------	Severe: flooding.	Moderate: flooding.	Slight----------	Moderate: flooding.	Severe: flooding.
Yahola----------	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
WzA---------- Wilson	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: percs slowly.	Slight----------	Moderate: droughty.
YaA---------- Yahola	Severe: flooding.	Slight----------	Slight----------	Slight----------	Slight.
ZaB, ZaC2---------- Zack	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Severe: erodes easily.	Slight.
ZaD---------- Zack	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Severe: erodes easily.	Slight.
ZaE3---------- Zack	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.

Table 9.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
ZcB:					
Zack	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Severe: erodes easily.	Slight.
Urban land.					
ZcD:					
Zack	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Severe: erodes easily.	Slight.
Urban land.					
ZuB	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight	Slight.
Zulch					

Table 10.--Wildlife Habitat

(See text for definitions of terms used in this table. 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	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
AxB---------- Axtell	Good	Good	Good	---	Good	Poor	Very poor.	Good	Good	Very poor.	Good.
BeA, BeB---------- Benchley	Good	Good	Fair	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
BoA, BoB---------- Boonville	Fair	Good	Good	---	Good	Fair	Fair	Good	---	Fair	Good.
BrB:											
Boonville---------	Fair	Good	Good	---	Good	Fair	Fair	Good	---	Fair	Good.
Urban land.											
BuA, BuB, BuC------ Burleson	Good	Good	Poor	---	Poor	Very poor.	Very poor.	Fair	---	Very poor.	Poor.
BwC---------- Burlewash	Fair	Good	Good	Fair	Good	Poor	Very poor.	Good	Fair	Very poor.	Good.
BwD---------- Burlewash	Poor	Fair	Good	Fair	Good	Very poor.	Very poor.	Fair	Fair	Very poor.	Good.
ChC, ChD---------- Chazos	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Fair	Very poor.	Good.
CoA---------- Coarsewood	Good	Good	Good	Good	Good	Poor	Very poor.	Good	---	Very poor.	Good.
CrB, CrB2---------- Crockett	Fair	Good	Good	Good	Good	Poor	Poor	Good	---	Poor	Good.
DeA:											
Derly----------	Poor	Fair	Good	Fair	Fair	Good	Good	Fair	Fair	Good	Fair.
Rader----------	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor	Good.
DfC---------- Desan	Fair	Good	Fair	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
DmA---------- Dimebox	Good	Good	Poor	---	Poor	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
DuC---------- Dutek	Poor	Fair	Good	Fair	Good	Very poor.	Very poor.	Fair	Fair	Very poor.	Good.
EuB---------- Eufaula	Fair	Fair	Fair	Fair	Good	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
FaB---------- Falba	Fair	Good	Fair	Fair	Fair	Poor	Poor	Fair	Fair	Poor	Fair.
Gd---------- Gladewater	Poor	Fair	Fair	Fair	---	Good	Good	Fair	Fair	Good	---
GrC, GrC2, GrD, GvC---------- Gredge	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.	Good.

Table 10.--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	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
GyC---------- Greenvine	Fair	Fair	Poor	---	Fair	Poor	Very poor.	Poor	---	Very poor.	Poor.
HbA---------- Highbank	Good	Good	Fair	---	Fair	Poor	Very poor.	Good	---	Very poor.	Fair.
Ka---------- Kaufman	Fair	Fair	Poor	Good	Fair	Poor	Good	Fair	Good	Fair	Poor.
KrD:											
Koether----------	Very poor.	Very poor.	Very poor.	---	Poor	Very poor.	Very poor.	Very poor.	---	Very poor.	Very poor.
Rock outcrop.											
KuC, KuD---------- Kurten	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.	Good.
LfA---------- Lufkin	Fair	Good	Fair	Good	---	Fair	Fair	Fair	Good	Fair	---
LuB---------- Luling	Good	Good	Poor	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Poor.
LuD---------- Luling	Fair	Good	Poor	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Poor.
MaA---------- Mabank	Fair	Good	Good	---	Fair	Fair	Poor	Good	---	Fair	Fair.
MrA:											
Mabank----------	Fair	Good	Good	---	Fair	Fair	Fair	Good	---	Fair	Fair.
Rader----------	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor	Good.
NvB---------- Navasan	Poor	Fair	Fair	Good	Fair	Poor	Very poor.	Fair	Good	Very poor.	Fair.
PaC---------- Padina	Poor	Fair	Fair	Good	Fair	Poor	Very poor.	Fair	Good	Very poor.	Fair.
Pt---------- Pits	Very poor.	Very poor.	Very poor.	---	Very poor.	Very poor.	Very poor.	Very poor.	---	Very poor.	Very poor.
RaB---------- Rader	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor	Good.
RbA:											
Rader----------	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor	Good.
Tabor----------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
ReC---------- Rehburg	Fair	Fair	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.	Good.
RoB---------- Robco	Fair	Fair	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.	Good.
Rr---------- Roetex	Very poor.	Poor	Poor	---	Poor	Good	Good	Poor	---	Good	Poor.

Table 10.--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	Shrubs	Wetland plants	Shallow water areas	Open-land wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
RsC, RsD, RtC---Rosanky	Fair	Good	Good	Good	Fair	Poor	Very poor.	Good	Good	Very poor.	Fair.
RuC:											
Rosanky	Fair	Good	Good	Good	Fair	Poor	Very poor.	Good	Good	Very poor.	Fair.
Urban land.											
Sa---Sandow	Poor	Fair	Fair	Good	Good	Poor	Poor	Fair	Fair	Poor	Good.
Sb:											
Sandow	Poor	Fair	Fair	Good	Good	Poor	Poor	Fair	Fair	Poor	Good.
Urban land.											
ScC:											
Shalba	Poor	Poor	Poor	Poor	Fair	Poor	Very poor.	Poor	Poor	Very poor.	Poor.
Rock outcrop.											
ShA, ShC---Ships	Good	Good	Fair	---	Fair	Poor	Poor	Good	---	Poor	Fair.
SkB---Shiro	Fair	Good	Good	Fair	---	Poor	Very poor.	Good	Good	Poor	---
SmC, SmD---Silawa	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.	Good.
SnB---Singleton	Fair	Good	Good	Fair	Good	Poor	Poor	Good	Fair	Poor	Fair.
SpB---Spiller	Poor	Fair	Good	Good	Good	Poor	Poor	Fair	Good	Poor	Good.
SxB---Styx	Poor	Fair	Good	Fair	Good	Very poor.	Very poor.	Fair	Fair	Very poor.	Good.
TaA---Tabor	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
TgB---Tabor	Poor	Fair	Fair	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Fair.
TuA:											
Tabor	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
Urban land.											
Uh---Uhland	Poor	Fair	Fair	Good	Good	Poor	Poor	Poor	Good	Poor	Fair.
Ur.											
Urban land											
Us---Ustarents	Poor	Fair	Fair	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.

Table 10.--Wildlife Habitat--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herba-ceous plants	Hardwood trees	Shrubs	Wetland plants	Shallow water areas	Open-land wild-life	Wood-land wild-life	Wetland wild-life	Range-land wild-life
WeA---------- Weswood	Good	Good	Fair	---	Good	Poor	Very poor.	Good	---	Very poor.	Fair.
WeC---------- Weswood	Fair	Good	Fair	---	Good	Poor	Very poor.	Fair	---	Very poor.	Fair.
WwA---------- Weswood	Good	Good	Fair	---	Good	Poor	Very poor.	Good	---	Very poor.	Fair.
Wy:											
Weswood----------	Poor	Good	Fair	---	Good	Poor	Very poor.	Fair	---	Very poor.	Fair.
Yahola----------	Poor	Fair	Fair	---	Good	Poor	Very poor.	Fair	---	Very poor.	Fair.
WzA---------- Wilson	Fair	Good	Good	---	Fair	Fair	Fair	Good	---	Fair	Fair.
YaA---------- Yahola	Good	Good	Good	---	Good	Poor	Very poor.	---	Good	Very poor.	Fair.
ZaB, ZaC2, ZaD, ZaE3---------- Zack	Fair	Good	Good	---	Good	Poor	Very poor.	Good	---	Very poor.	Good.
ZcB, ZcD:											
Zack----------	Fair	Good	Good	---	Good	Poor	Very poor.	Good	---	Very poor.	Good.
Urban land.											
ZuB---------- Zulch	Fair	Good	Good	---	Fair	Fair	Poor	Good	---	Fair	Good.

Table 11.--Building Site Development

(See text for definitions of terms used in this table. 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
AxB--- Axtell	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Moderate: droughty.
BeA, BeB--- Benchley	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
BoA, BoB--- Boonville	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness.
BrB: Boonville---	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness.
Urban land.						
BuA, BuB, BuC--- Burleson	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
BwC, BwD--- Burlewash	Moderate: depth to rock, too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Moderate: droughty, depth to rock.
ChC--- Chazos	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Moderate: droughty.
ChD--- Chazos	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Moderate: droughty.
CoA--- Coarsewood	Slight---	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Slight.
CrB, CrB2--- Crockett	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Moderate: droughty.
DeA: 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.
DfC--- Desan	Severe: cutbanks cave.	Slight---	Slight---	Moderate: slope.	Slight---	Moderate: droughty.

Table 11.--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
DmA--- Dimebox	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
DuC--- Dutek	Severe: cutbanks cave.	Slight---	Slight---	Moderate: slope.	Slight---	Moderate: droughty.
EuB--- Eufaula	Severe: cutbanks cave.	Slight---	Slight---	Slight---	Slight---	Moderate: droughty.
FaB--- Falba	Moderate: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Moderate: wetness.
Gd--- 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.
GrC, GrC2--- Gredge	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Moderate: droughty.
GrD--- Gredge	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Moderate: droughty.
GvC--- Gredge	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Severe: small stones.
GyC--- Greenvine	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
HbA--- Highbank	Moderate: too clayey.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: shrink-swell, low strength.	Slight.
Ka--- Kaufman	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.
KrD:						
Koether---	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: large stones, droughty.
Rock outcrop---	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
KuC, KuD--- Kurten	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Moderate: droughty.
LfA--- Lufkin	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Moderate: droughty.
LuB, LuD--- Luling	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.

Table 11.--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
MaA---------- Mabank	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Moderate: droughty.
MrA:						
Mabank----------	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Moderate: droughty.
Rader----------	Severe: wetness.	Moderate: wetness.	Severe: wetness, shrink-swell.	Moderate: wetness.	Moderate: wetness.	Slight.
NvB---------- Navasan	Severe: cutbanks cave.	Slight---------	Moderate: wetness.	Slight---------	Slight---------	Moderate: droughty.
PaC---------- Padina	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: droughty.
Pt---------- Pits	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
RaB---------- Rader	Severe: wetness.	Moderate: wetness.	Severe: wetness, shrink-swell.	Moderate: wetness.	Moderate: wetness.	Slight.
RbA:						
Rader----------	Severe: wetness.	Moderate: wetness.	Severe: wetness, shrink-swell.	Moderate: wetness.	Moderate: wetness.	Slight.
Tabor----------	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Moderate: droughty.
ReC---------- Rehburg	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Moderate: droughty.
RoB---------- Robco	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness, shrink-swell.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness, droughty.
Rr---------- Roetex	Severe: cutbanks cave, ponding.	Severe: flooding, ponding, shrink-swell.	Severe: flooding, ponding, shrink-swell.	Severe: flooding, ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.	Severe: ponding, flooding, too clayey.
RsC---------- Rosanky	Moderate: too clayey.	Moderate: shrink-swell.	Slight---------	Moderate: shrink-swell.	Severe: low strength.	Slight.
RsD---------- Rosanky	Moderate: too clayey.	Moderate: shrink-swell.	Slight---------	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
RtC---------- Rosanky	Moderate: too clayey.	Moderate: shrink-swell.	Slight---------	Moderate: shrink-swell.	Severe: low strength.	Slight.

Table 11.--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
RuC:						
Rosanky	Moderate: too clayey.	Moderate: shrink-swell.	Slight	Moderate: shrink-swell.	Severe: low strength.	Slight.
Urban land.						
Sa--Sandow	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.	Severe: flooding.
Sb:						
Sandow	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.	Severe: flooding.
Urban land.						
ScC:						
Shalba	Severe: depth to rock.	Severe: shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: depth to rock.
Rock outcrop	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
ShA, ShC--Ships	Severe: cutbanks cave.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
SkB--Shiro	Moderate: depth to rock, too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Moderate: droughty, depth to rock.
SmC--Silawa	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Slight.
SmD--Silawa	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Slight.
SnB--Singleton	Moderate: depth to rock, too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Moderate: droughty, depth to rock.
SpB--Spiller	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Moderate: droughty.
SxB--Styx	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Slight	Moderate: droughty.
TaA--Tabor	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Moderate: droughty.
TgB--Tabor	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: small stones.
TuA:						
Tabor	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Moderate: droughty.
Urban land.						

Table 11.--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
Uh---------- Uhland	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding.	Severe: flooding.
Ur. Urban land						
Us---------- Ustarents	Slight---------	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Moderate: droughty.
WeA, WeC, WwA----- Weswood	Slight---------	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength.	Slight.
Wy: Weswood----------	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.	Severe: flooding.
Yahola----------	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
WzA---------- Wilson	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
YaA---------- Yahola	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Slight.
ZaB, ZaC2--------- Zack	Moderate: too clayey.	Moderate: shrink-swell.	Slight---------	Moderate: shrink-swell.	Severe: low strength.	Slight.
ZaD---------- Zack	Moderate: too clayey.	Moderate: shrink-swell.	Slight---------	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
ZaE3---------- Zack	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
ZcB: Zack----------	Moderate: too clayey.	Moderate: shrink-swell.	Slight---------	Moderate: shrink-swell.	Severe: low strength.	Slight.
Urban land.						
ZcD: Zack----------	Moderate: too clayey.	Moderate: shrink-swell.	Slight---------	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
Urban land.						
ZuB---------- Zulch	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.

Table 12.--Sanitary Facilities

(See text for definitions of terms used in this table. 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
AxB Axtell	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
BeA Benchley	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
BeB Benchley	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
BoA Boonville	Severe: wetness, percs slowly.	Moderate: seepage.	Severe: wetness.	Severe: wetness.	Poor: hard to pack, wetness.
BoB Boonville	Severe: wetness, percs slowly.	Moderate: seepage, slope.	Severe: wetness.	Severe: wetness.	Poor: hard to pack, wetness.
BrB: Boonville	Severe: wetness, percs slowly.	Moderate: seepage.	Severe: wetness.	Severe: wetness.	Poor: hard to pack, wetness.
Urban land.					
BuA Burleson	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
BuB, BuC Burleson	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
BwC, BwD Burlewash	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: depth to rock, too clayey, hard to pack.
ChC, ChD Chazos	Severe: percs slowly.	Severe: seepage.	Moderate: too clayey.	Slight	Poor: hard to pack.
CoA Coarsewood	Moderate: flooding.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good.
CrB, CrB2 Crockett	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
DeA: 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.

Table 12.--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
DfC Desan	Severe: poor filter.	Severe: seepage.	Severe: too sandy.	Severe: seepage.	Poor: seepage, too sandy.
DmA Dimebox	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
DuC Dutek	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
EuB Eufaula	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: seepage.
FaB Falba	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: depth to rock, too clayey, hard to pack.
Gd Gladewater	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding.	Poor: too clayey, hard to pack.
GrC, GrC2, GrD, GvC Gredge	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Poor: hard to pack.
GyC Greenvine	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: depth to rock, too clayey, hard to pack.
HbA Highbank	Severe: percs slowly.	Moderate: seepage.	Severe: too clayey.	Moderate: flooding.	Poor: too clayey, hard to pack.
Ka Kaufman	Severe: flooding, wetness, percs slowly.	Slight	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack.
KrD: Koether	Severe: depth to rock.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage.	Severe: depth to rock.	Poor: depth to rock, seepage, large stones.
Rock outcrop	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock.
KuC, KuD Kurten	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
LfA Lufkin	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.

Table 12.--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
LuB, LuD---------- Luling	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight----------	Poor: too clayey, hard to pack.
MaA---------- Mabank	Severe: percs slowly.	Slight----------	Severe: too clayey.	Slight----------	Poor: too clayey, hard to pack.
MrA:					
Mabank----------	Severe: percs slowly.	Slight----------	Severe: too clayey.	Slight----------	Poor: too clayey, hard to pack.
Rader----------	Severe: wetness, percs slowly.	Severe: seepage.	Severe: too clayey.	Severe: seepage.	Poor: too clayey, hard to pack.
NvB---------- Navasan	Severe: percs slowly, poor filter.	Severe: seepage.	Moderate: too sandy.	Severe: seepage.	Fair: too sandy.
PaC---------- Padina	Severe: poor filter.	Severe: seepage.	Severe: too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Pt---------- Pits	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
RaB---------- Rader	Severe: wetness, percs slowly.	Severe: seepage.	Severe: too clayey.	Severe: seepage.	Poor: too clayey, hard to pack.
RbA:					
Rader----------	Severe: wetness, percs slowly.	Severe: seepage.	Severe: too clayey.	Severe: seepage.	Poor: too clayey, hard to pack.
Tabor----------	Severe: percs slowly.	Moderate: seepage, slope.	Severe: too clayey.	Slight----------	Poor: too clayey, hard to pack.
ReC---------- Rehburg	Severe: wetness, percs slowly.	Severe: seepage.	Severe: depth to rock, too clayey.	Severe: seepage.	Poor: too clayey, hard to pack.
RoB---------- Robco	Severe: wetness, percs slowly, poor filter.	Severe: seepage.	Severe: wetness.	Severe: seepage.	Poor: thin layer.
Rr---------- Roetex	Severe: flooding, ponding, percs slowly.	Severe: flooding, ponding.	Severe: flooding, ponding, too clayey.	Severe: flooding, ponding.	Poor: too clayey, hard to pack, ponding.
RsC, RsD, RtC------- Rosanky	Severe: percs slowly.	Moderate: slope.	Slight----------	Slight----------	Poor: thin layer.

Table 12.--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
RuC:					
Rosanky	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Poor: thin layer.
Urban land.					
Sa	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Fair: too clayey.
Sb:					
Sandow	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Fair: too clayey.
Urban land.					
ScC:					
Shalba	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: depth to rock, too clayey, hard to pack.
Rock outcrop	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock.
ShA	Severe: percs slowly.	Slight	Severe: too clayey.	Moderate: flooding.	Poor: too clayey, hard to pack.
ShC	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Moderate: flooding.	Poor: too clayey, hard to pack.
SkB	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: depth to rock, too clayey, hard to pack.
SmC, SmD	Moderate: percs slowly.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: too clayey, thin layer.
SnB	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: depth to rock, too clayey, hard to pack.
SpB	Severe: percs slowly.	Severe: seepage.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
SxB	Moderate: wetness.	Severe: seepage.	Moderate: wetness, too clayey.	Severe: seepage.	Fair: too clayey.
TaA	Severe: percs slowly.	Moderate: seepage.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.

Table 12.--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
TgB Tabor	Severe: percs slowly.	Moderate: seepage, slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
TuA: Tabor	Severe: percs slowly.	Moderate: seepage.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
Urban land.					
Uh Uhland	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding.	Fair: wetness.
Ur. Urban land					
Us Ustarents	Severe: percs slowly.	Slight	Slight	Slight	Poor: hard to pack.
WeA Weswood	Moderate: flooding, percs slowly.	Moderate: seepage.	Moderate: flooding.	Moderate: flooding.	Good.
WeC Weswood	Moderate: flooding, percs slowly.	Moderate: seepage, slope.	Moderate: flooding.	Moderate: flooding.	Good.
WwA Weswood	Moderate: flooding, percs slowly.	Moderate: seepage.	Moderate: flooding.	Moderate: flooding.	Good.
Wy: Weswood	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Good.
Yahola	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding, seepage.	Severe: flooding, seepage.	Good.
WzA Wilson	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
YaA Yahola	Moderate: flooding.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good.
ZaB, ZaC2, ZaD Zack	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
ZaE3 Zack	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
ZcB, ZcD: Zack	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Urban land.					

Table 12.--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
ZuB---------- Zulch	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight----------	Poor: too clayey, hard to pack.

Table 13.--Construction Materials

(See text for definitions of terms used in this table. 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
AxB Axtell	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
BeA, BeB Benchley	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
BoA, BoB Boonville	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
BrB: Boonville	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Urban land.				
BuA, BuB, BuC Burleson	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
BwC, BwD Burlewash	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, too acid.
ChC, ChD Chazos	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
CoA Coarsewood	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
CrB, CrB2 Crockett	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
DeA: 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.
DfC Desan	Good	Probable	Improbable: too sandy.	Poor: too sandy.
DmA Dimebox	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
DuC Dutek	Good	Probable	Improbable: too sandy.	Poor: too sandy.
EuB Eufaula	Good	Probable	Improbable: too sandy.	Fair: too sandy.

Table 13.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
FaB Falba	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Gd Gladewater	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
GrC, GrC2, GrD, GvC Gredge	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
GyC Greenvine	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
HbA Highbank	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Ka Kaufman	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
KrD: Koether	Poor: depth to rock.	Improbable: thin layer.	Improbable: too sandy.	Poor: depth to rock, large stones.
Rock outcrop.				
KuC, KuD Kurten	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
LfA Lufkin	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
LuB, LuD Luling	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
MaA Mabank	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
MrA: Mabank	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Rader	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
NvB Navasan	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
PaC Padina	Good	Probable	Improbable: too sandy.	Poor: too sandy.

Table 13.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Pt. Pits				
RaB---------- Rader	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
RbA: Rader----------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
Tabor----------	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
ReC---------- Rehburg	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
RoB---------- Robco	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, small stones.
Rr---------- Roetex	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
RsC, RsD, RtC--------- Rosanky	Fair: thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones.
RuC: Rosanky---------- Urban land.	Fair: thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones.
Sa---------- Sandow	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Sb: Sandow---------- Urban land.	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
ScC: Shalba---------- Rock outcrop.	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, too clayey.
ShA, ShC---------- Ships	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
SkB---------- Shiro	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.

Table 13.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
SmC, SmD--Silawa	Good	Probable	Probable	Fair: too clayey, small stones, area reclaim.
SnB--Singleton	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
SpB--Spiller	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
SxB--Styx	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.
TaA--Tabor	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
TgB--Tabor	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones.
TuA:				
Tabor	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Urban land.				
Uh--Uhland	Fair: thin layer, wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Ur.				
Urban land				
Us--Ustarents	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
WeA, WeC, WwA--Weswood	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Wy:				
Weswood	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Yahola	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
WzA--Wilson	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
YaA--Yahola	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
ZaB, ZaC2, ZaD--Zack	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.

Table 13.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
ZaE3---------- Zack	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
ZcB, ZcD: Zack---------- Urban land.	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
ZuB---------- Zulch	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.

Table 14.--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--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
AxB---------- Axtell	Slight---------	Severe: hard to pack.	Deep to water	Droughty-------	Erodes easily, percs slowly.	Erodes easily, droughty.
BeA, BeB---------- Benchley	Slight---------	Severe: hard to pack.	Deep to water	Percs slowly---	Percs slowly---	Percs slowly.
BoA, BoB---------- Boonville	Slight---------	Severe: wetness.	Percs slowly---	Wetness, percs slowly.	Erodes easily, wetness.	Wetness, erodes easily, percs slowly.
BrB:						
Boonville--------	Slight---------	Severe: wetness.	Percs slowly---	Wetness, percs slowly.	Erodes easily, wetness.	Wetness, erodes easily, percs slowly.
Urban land.						
BuA, BuB---------- Burleson	Slight---------	Severe: hard to pack.	Deep to water	Slow intake, percs slowly.	Percs slowly---	Percs slowly.
BuC---------- Burleson	Slight---------	Severe: hard to pack.	Deep to water	Slope, slow intake, percs slowly.	Percs slowly---	Percs slowly.
BwC, BwD---------- Burlewash	Moderate: depth to rock, slope.	Severe: thin layer.	Deep to water	Slope, droughty.	Depth to rock, erodes easily.	Erodes easily, droughty.
ChC, ChD---------- Chazos	Slight---------	Moderate: hard to pack.	Deep to water	Slope, droughty, fast intake.	Soil blowing, percs slowly.	Droughty, percs slowly.
CoA---------- Coarsewood	Severe: seepage.	Severe: piping.	Deep to water	Erodes easily	Erodes easily	Erodes easily.
CrB---------- Crockett	Slight---------	Severe: hard to pack.	Deep to water	Droughty, percs slowly.	Erodes easily, percs slowly.	Erodes easily, droughty.
CrB2---------- Crockett	Slight---------	Severe: hard to pack.	Deep to water	Slope, droughty, percs slowly.	Erodes easily, percs slowly.	Erodes easily, droughty.
DeA:						
Derly----------	Slight---------	Severe: wetness.	Percs slowly---	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
Rader----------	Slight---------	Moderate: hard to pack, wetness.	Percs slowly---	Wetness, soil blowing.	Erodes easily, wetness.	Erodes easily, percs slowly.
DfC---------- Desan	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, droughty, fast intake.	Too sandy------	Droughty.

Table 14.--Water Management--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
DmA---------- Dimebox	Slight---------	Severe: hard to pack.	Deep to water	Slow intake, percs slowly.	Percs slowly---	Percs slowly.
DuC---------- Dutek	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, droughty, fast intake.	Too sandy------	Droughty.
EuB---------- Eufaula	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake.	Favorable------	Droughty.
FaB---------- Falba	Moderate: depth to rock.	Severe: hard to pack, wetness.	Percs slowly, depth to rock.	Wetness--------	Depth to rock, wetness.	Wetness, depth to rock, percs slowly.
Gd---------- Gladewater	Slight---------	Severe: hard to pack.	Percs slowly, flooding.	Wetness, slow intake, percs slowly.	Wetness, percs slowly.	Percs slowly.
GrC, GrC2, GrD---- Gredge	Slight---------	Moderate: hard to pack.	Deep to water	Slope, droughty.	Erodes easily, percs slowly.	Erodes easily, droughty, percs slowly.
GvC---------- Gredge	Slight---------	Moderate: hard to pack.	Deep to water	Slope, droughty.	Erodes easily, percs slowly.	Erodes easily, droughty, percs slowly.
GyC---------- Greenvine	Moderate: depth to rock, slope.	Severe: hard to pack.	Deep to water	Slope, slow intake, percs slowly.	Depth to rock, percs slowly.	Depth to rock, percs slowly.
HbA---------- Highbank	Slight---------	Severe: hard to pack.	Deep to water	Percs slowly---	Percs slowly---	Percs slowly.
Ka---------- Kaufman	Slight---------	Severe: hard to pack, wetness.	Percs slowly, flooding.	Wetness, slow intake, percs slowly.	Wetness, percs slowly.	Percs slowly.
KrD:						
Koether----------	Severe: depth to rock, seepage.	Severe: seepage, piping, large stones.	Deep to water	Slope, large stones, droughty.	Large stones, depth to rock.	Large stones, droughty.
Rock outcrop-----	Severe: depth to rock.	Severe: depth to rock.	Deep to water	Slope, depth to rock.	Depth to rock	Depth to rock.
KuC, KuD---------- Kurten	Moderate: slope.	Severe: hard to pack.	Deep to water	Slope, droughty.	Erodes easily, percs slowly.	Erodes easily, droughty, percs slowly.
LfA---------- Lufkin	Slight---------	Severe: hard to pack.	Percs slowly---	Soil blowing, percs slowly.	Erodes easily	Erodes easily, percs slowly.
LuB---------- Luling	Slight---------	Severe: hard to pack.	Deep to water	Slow intake, percs slowly.	Percs slowly---	Percs slowly.
LuD---------- Luling	Slight---------	Severe: hard to pack.	Deep to water	Slope, slow intake, percs slowly.	Percs slowly---	Percs slowly.

Table 14.--Water Management--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
MaA---------- Mabank	Slight---------	Severe: hard to pack.	Percs slowly---	Percs slowly---	Erodes easily, percs slowly.	Erodes easily, percs slowly.
MrA:						
Mabank----------	Slight---------	Severe: hard to pack.	Percs slowly---	Percs slowly---	Erodes easily, percs slowly.	Erodes easily, percs slowly.
Rader----------	Slight---------	Moderate: hard to pack, wetness.	Percs slowly---	Wetness, soil blowing.	Erodes easily, wetness.	Erodes easily, percs slowly.
NvB---------- Navasan	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake.	Too sandy------	Droughty.
PaC---------- Padina	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, droughty, fast intake.	Too sandy------	Droughty.
Pt---------- Pits	Severe: slope.	Slight---------	Deep to water	Slope, droughty, excess salt.	Slope----------	Slope, excess salt, droughty.
RaB---------- Rader	Slight---------	Moderate: hard to pack, wetness.	Percs slowly---	Wetness, soil blowing.	Erodes easily, wetness.	Erodes easily, percs slowly.
RbA:						
Rader----------	Slight---------	Moderate: hard to pack, wetness.	Percs slowly---	Wetness, soil blowing.	Erodes easily, wetness.	Erodes easily, percs slowly.
Tabor----------	Slight---------	Moderate: hard to pack.	Deep to water	Droughty, soil blowing.	Erodes easily, percs slowly.	Erodes easily, droughty, percs slowly.
ReC---------- Rehburg	Severe: seepage.	Severe: thin layer.	Deep to water	Slope, droughty, fast intake.	Erodes easily, percs slowly.	Erodes easily, droughty, percs slowly.
RoB---------- Robco	Severe: seepage.	Moderate: wetness.	Percs slowly---	Wetness--------	Erodes easily, wetness, percs slowly.	Erodes easily, droughty, percs slowly.
Rr---------- Roetex	Slight---------	Severe: hard to pack, ponding.	Ponding, percs slowly, flooding.	Ponding, slow intake, percs slowly.	Ponding, percs slowly.	Wetness, percs slowly.
RsC, RsD---------- Rosanky	Slight---------	Severe: piping.	Deep to water	Slope----------	Erodes easily	Erodes easily.
RtC---------- Rosanky	Moderate: slope.	Severe: piping.	Deep to water	Slope----------	Erodes easily	Erodes easily.
RuC:						
Rosanky----------	Slight---------	Severe: piping.	Deep to water	Slope----------	Erodes easily	Erodes easily.
Urban land.						

Table 14.--Water Management--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Sa---------- Sandow	Slight---------	Severe: piping.	Deep to water	Erodes easily, flooding.	Erodes easily	Erodes easily.
Sb:						
Sandow----------	Slight---------	Severe: piping.	Deep to water	Erodes easily, flooding.	Erodes easily	Erodes easily.
Urban land.						
ScC:						
Shalba----------	Severe: depth to rock.	Severe: hard to pack.	Deep to water	Slope, percs slowly.	Depth to rock, erodes easily.	Erodes easily, depth to rock, percs slowly.
Rock outcrop-----	Severe: depth to rock.	Severe: depth to rock.	Deep to water	Slope, depth to rock.	Depth to rock	Depth to rock.
ShA---------- Ships	Slight---------	Severe: hard to pack.	Deep to water	Slow intake, percs slowly.	Percs slowly---	Percs slowly.
ShC---------- Ships	Slight---------	Severe: hard to pack.	Deep to water	Slope, slow intake, percs slowly.	Percs slowly---	Percs slowly.
SkB---------- Shiro	Moderate: depth to rock.	Severe: thin layer.	Deep to water	Droughty, fast intake.	Depth to rock, percs slowly.	Droughty, depth to rock, percs slowly.
SmC, SmD---------- Silawa	Severe: seepage.	Severe: thin layer.	Deep to water	Slope----------	Favorable------	Favorable.
SnB---------- Singleton	Moderate: depth to rock.	Severe: thin layer.	Deep to water	Droughty-------	Depth to rock, erodes easily.	Erodes easily, droughty, depth to rock.
SpB---------- Spiller	Slight---------	Moderate: thin layer, hard to pack.	Deep to water	Droughty-------	Percs slowly---	Droughty, percs slowly.
SxB---------- Styx	Severe: seepage.	Moderate: piping.	Deep to water	Droughty, fast intake.	Favorable------	Droughty.
TaA---------- Tabor	Slight---------	Moderate: hard to pack.	Deep to water	Droughty-------	Erodes easily, percs slowly.	Erodes easily, droughty, percs slowly.
TgB---------- Tabor	Slight---------	Moderate: hard to pack.	Deep to water	Droughty-------	Percs slowly---	Droughty, percs slowly.
TuA:						
Tabor----------	Slight---------	Moderate: hard to pack.	Deep to water	Droughty-------	Erodes easily, percs slowly.	Erodes easily, droughty, percs slowly.
Urban land.						
Uh---------- Uhland	Moderate: seepage.	Severe: piping.	Flooding-------	Wetness, erodes easily.	Erodes easily, wetness.	Erodes easily.
Ur. Urban land						

Table 14.--Water Management--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Us Ustarents	Slight	Severe: hard to pack.	Deep to water	Droughty	Favorable	Droughty.
WeA Weswood	Moderate: seepage.	Severe: piping.	Deep to water	Erodes easily	Erodes easily	Erodes easily.
WeC Weswood	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
WwA Weswood	Moderate: seepage.	Severe: piping.	Deep to water	Erodes easily	Erodes easily	Erodes easily.
Wy: Weswood	Moderate: seepage.	Severe: piping.	Deep to water	Erodes easily, flooding.	Erodes easily	Erodes easily.
Yahola	Severe: seepage.	Severe: piping.	Deep to water	Favorable	Soil blowing	Favorable.
WzA Wilson	Slight	Severe: hard to pack.	Percs slowly	Percs slowly	Erodes easily, percs slowly.	Erodes easily, percs slowly.
YaA Yahola	Severe: seepage.	Severe: piping.	Deep to water	Favorable	Favorable	Favorable.
ZaB, ZaC2, ZaD Zack	Moderate: slope.	Moderate: piping.	Deep to water	Slope, percs slowly.	Erodes easily	Erodes easily, percs slowly.
ZaE3 Zack	Severe: slope.	Moderate: piping.	Deep to water	Slope, percs slowly.	Slope, erodes easily.	Slope, erodes easily, percs slowly.
ZcB, ZcD: Zack	Moderate: slope.	Moderate: piping.	Deep to water	Slope, percs slowly.	Erodes easily	Erodes easily, percs slowly.
Urban land.						
ZuB Zulch	Slight	Moderate: hard to pack.	Deep to water, percs slowly.	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.

Table 15.--Engineering Index Properties

(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	
AxB--------- Axtell	0-8	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
	8-40	Clay loam, clay	CL, CH	A-7-6	0-2	95-100	95-100	85-100	70-98	41-65	25-42
	40-50	Clay loam, clay	CL, CH	A-7-6	0-2	95-100	95-100	85-100	70-98	41-65	25-42
	50-80	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
BeA--------- Benchley	0-15	Loam---------	CL	A-6, A-7	0	90-100	90-100	80-95	60-80	30-43	11-22
	15-80	Clay, clay loam	CH	A-7	0	95-100	90-100	90-100	75-95	56-75	33-46
BeB--------- Benchley	0-10	Loam---------	CL	A-6, A-7	0	90-100	90-100	80-95	60-80	30-43	11-22
	10-16	Clay loam, clay	CL, CH	A-7	0	90-100	90-100	80-95	70-95	44-66	23-41
	16-70	Clay, clay loam	CH	A-7	0	95-100	90-100	90-100	75-95	56-75	33-46
	70-80	Stratified clay to shaly clay.	CL, CH	A-7	0	95-100	90-100	60-90	50-85	41-60	21-36
BoA--------- Boonville	0-17	Fine sandy loam	ML, SM, CL-ML, SC-SM	A-4	0-1	95-100	85-98	70-95	40-65	<20	NP-7
	17-24	Clay, clay loam	CH, CL	A-7	0	95-100	90-100	85-100	70-90	45-65	25-40
	24-73	Loam, sandy clay loam, clay loam.	CH, CL	A-7, A-6	0	95-100	95-100	80-100	50-95	35-60	15-35
	73-80	Sandy clay loam, clay loam, clay.	CL, SC	A-7, A-6	0-1	80-100	80-98	65-95	45-95	35-50	15-30
BoB--------- Boonville	0-17	Fine sandy loam	ML, SM, CL-ML, SC-SM	A-4	0-1	95-100	85-98	70-95	40-65	<20	NP-7
	17-36	Clay, clay loam	CH, CL	A-7	0	95-100	90-100	85-100	70-90	45-65	25-40
	36-73	Loam, sandy clay loam, clay loam.	CH, CL	A-7, A-6	0	95-100	95-100	80-100	50-95	35-60	15-35
	73-88	Sandy clay loam, clay loam, clay.	CL, SC	A-7, A-6	0-1	80-100	80-98	65-95	45-95	35-50	15-30
BrB:											
Boonville-------	0-12	Fine sandy loam	ML, SM, CL-ML, SC-SM	A-4	0-1	95-100	85-98	70-95	40-65	<20	NP-7
	12-65	Clay, clay loam	CH, CL	A-7	0	95-100	90-100	85-100	70-90	45-65	25-40
	65-80	Sandy clay loam, clay loam, clay.	CL, SC	A-7, A-6	0-1	80-100	80-98	65-95	45-95	35-50	15-30
Urban land.											
BuA--------- Burleson	0-8	Clay---------	CH, CL	A-7-6	0-2	90-100	90-100	90-99	67-97	56-75	33-49
	8-40	Clay, silty clay	CH	A-7-6	0-1	90-100	90-100	90-99	80-99	56-75	34-54
	40-80	Clay, silty clay, clay loam.	CH	A-7-6	0-2	90-100	80-100	75-99	67-98	51-75	34-54
BuB--------- Burleson	0-7	Clay---------	CH, CL	A-7-6	0-2	90-100	90-100	90-99	67-97	56-75	33-49
	7-48	Clay, silty clay	CH	A-7-6	0-1	90-100	90-100	90-99	80-99	56-75	34-54
	48-80	Clay, silty clay, clay loam.	CH	A-7-6	0-2	90-100	80-100	75-99	67-98	51-75	34-54
BuC--------- Burleson	0-6	Clay---------	CH, CL	A-7-6	0-2	90-100	90-100	90-99	67-97	56-75	33-49
	6-45	Clay, silty clay	CH	A-7-6	0-1	90-100	90-100	90-99	80-99	56-75	34-54
	45-80	Clay, silty clay, clay loam.	CH	A-7-6	0-2	90-100	80-100	75-99	67-98	51-75	34-54

Table 15.--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	
BwC--- Burlewash	0-8	Fine sandy loam	SM, ML, SC-SM, CL-ML	A-4	0	90-100	90-100	70-95	40-60	0-25	NP-7
	8-24	Clay, sandy clay	CL, CH	A-7	0	95-100	95-100	90-100	51-90	41-55	20-30
	24-35	Clay loam, sandy clay loam, clay.	CL	A-6, A-7	0	95-100	95-100	75-95	51-75	35-45	18-25
	35-40	Weathered bedrock	---	---	---	---	---	---	---	---	---
BwD--- Burlewash	0-4	Fine sandy loam	SM, ML, SC-SM, CL-ML	A-4	0	90-100	90-100	70-95	40-60	0-25	NP-7
	4-30	Clay, sandy clay	CL, CH	A-7	0	95-100	95-100	90-100	51-90	41-55	20-30
	30-40	Weathered bedrock	---	---	---	---	---	---	---	---	---
ChC--- Chazos	0-14	Loamy fine sand	SM, SC-SM	A-2-4, A-4	0	80-100	75-100	60-98	20-50	<25	NP-4
	14-26	Sandy clay, clay	CL, CH	A-7-6	0	90-100	75-100	75-100	55-85	43-58	21-35
	26-52	Clay loam, sandy clay loam, sandy clay.	CL, CH, SC	A-7-6	0	90-100	75-100	65-95	35-75	43-58	21-35
	52-80	Clay loam, silty clay loam, clay.	CL, CH	A-7-6, A-6	0	90-100	75-100	70-95	50-85	35-55	15-35
ChD--- Chazos	0-11	Loamy fine sand	SM, SC-SM	A-2-4, A-4	0	80-100	75-100	60-98	20-50	<25	NP-4
	11-23	Sandy clay, clay	CL, CH	A-7-6	0	90-100	75-100	75-100	55-85	43-58	21-35
	23-65	Clay loam, sandy clay loam, sandy clay.	CL, CH, SC	A-7-6	0	90-100	75-100	65-95	35-75	43-58	21-35
	65-80	Clay loam, silty clay loam, clay.	CL, CH	A-7-6, A-6	0	90-100	75-100	70-95	50-85	35-55	15-35
CoA--- Coarsewood	0-7	Silt loam--------	ML, CL-ML, CL	A-4	0	100	96-100	95-100	64-95	<28	NP-10
	7-48	Very fine sandy loam, loam, silt loam.	ML, CL-ML, CL	A-4	0	100	96-100	95-100	64-95	<28	NP-10
	48-80	Very fine sandy loam, loam, silt loam.	ML, CL-ML, CL	A-4	0	100	96-100	90-100	64-95	<28	NP-10
CrB--- Crockett	0-8	Loam----------	SM, ML, CL, SC	A-4, A-6	0-2	98-100	94-100	89-100	40-96	15-35	3-15
	8-21	Clay, clay loam, sandy clay.	CH, CL	A-7, A-6	0	89-100	75-100	75-100	60-98	35-59	23-42
	21-34	Clay, clay loam, sandy clay.	CH, CL	A-7, A-6	0	89-100	75-100	75-100	65-98	35-59	23-42
	34-45	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
	45-80	Stratified loam to clay.	CH, CL	A-7	0-5	90-100	90-100	90-100	70-99	45-71	27-52
CrB2--- Crockett	0-5	Loam----------	SM, ML, CL, SC	A-4, A-6	0-2	98-100	94-100	89-100	40-96	15-35	3-15
	5-16	Clay, clay loam, sandy clay.	CH, CL	A-7, A-6	0	89-100	75-100	75-100	60-98	35-59	23-42
	16-32	Clay, clay loam, sandy clay.	CH, CL	A-7, A-6	0	89-100	75-100	75-100	65-98	35-59	23-42
	32-45	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
	45-65	Stratified loam to clay.	CH, CL	A-7	0-5	90-100	90-100	90-100	70-99	45-71	27-52

Table 15.--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	
DeA:											
Derly	0-6	Loam	ML, CL, CL-ML	A-4	0	100	100	85-100	55-90	<30	NP-10
	6-16	Clay loam, silty clay loam, silty clay.	CL, CH	A-7, A-6	0	100	100	90-100	70-95	35-60	20-36
	16-44	Clay loam, silty clay loam, clay.	CH, CL	A-7, A-6	0	100	100	90-100	75-95	38-60	26-36
	44-80	Loam, clay loam, clay.	CH, CL	A-7, A-6	0	100	100	90-100	56-95	34-60	20-36
Rader	0-9	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
	9-19	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
	19-24	Loam, sandy clay loam, clay loam.	SC, CL	A-6	0	95-100	95-100	90-100	36-75	26-40	11-22
	24-65	Clay loam, sandy clay, clay.	CL, CH	A-6, A-7	0	95-100	95-100	90-100	51-90	36-60	18-38
DfC Desan	0-8	Loamy fine sand	SM, SP-SM, SC-SM	A-2-4, A-3	0	98-100	95-100	85-100	8-28	16-25	NP-5
	8-52	Loamy fine sand, fine sand.	SM, SP-SM, SC-SM	A-2-4, A-3	0	98-100	95-100	85-100	8-28	16-25	NP-5
	52-80	Sandy clay loam, fine sandy loam.	SC	A-2, A-4, A-6	0	98-100	95-100	90-100	25-50	20-36	8-20
DmA Dimebox	0-11	Clay	CH	A-7-6, A-7-5	0	90-100	90-100	90-100	85-96	51-90	27-55
	11-37	Clay, silty clay	CH	A-7-6, A-7-5	0	90-100	90-100	90-100	85-96	51-90	27-55
	37-80	Clay	CH	A-7-6, A-7-5	0	90-100	90-100	85-100	75-96	51-90	30-57
DuC Dutek	0-6	Loamy fine sand	SM, SP-SM	A-2, A-3	0	95-100	95-100	85-100	9-25	<22	NP-3
	6-35	Fine sand, loamy fine sand, loamy sand.	SM, SP-SM	A-2, A-3	0	95-100	95-100	85-100	9-25	<22	NP-3
	35-55	Sandy clay loam, clay loam, sandy clay.	CL, SC, SC-SM, CL-ML	A-2, A-4, A-6	0	98-100	95-100	90-100	30-55	24-40	6-20
	55-85	Fine sandy loam, sandy clay loam, loam.	SC, SC-SM, CL-ML, CL	A-2, A-4, A-6	0	95-100	95-100	90-100	22-55	20-40	4-20
EuB Eufaula	0-62	Loamy fine sand	SM	A-2	0	100	98-100	90-100	15-35	<25	NP-4
	62-82	Loamy fine sand, fine sand, fine sandy loam.	SM, SP-SM	A-2, A-3	0	100	98-100	82-100	5-35	<25	NP-4
FaB Falba	0-7	Fine sandy loam	SC-SM, SM, CL-ML, ML	A-4	0	98-100	95-100	70-98	40-60	15-30	NP-10
	7-13	Clay loam, clay	CH	A-7	0	98-100	95-100	90-100	75-95	51-70	34-48
	13-36	Sandy clay loam, clay loam, clay.	CH, CL, SC, GC	A-6, A-7	0-2	60-100	55-100	50-100	35-95	34-75	21-48
	36-50	Weathered bedrock	---	---	---	---	---	---	---	---	---
Gd Gladewater	0-8	Clay	CH, CL	A-7	0	100	100	90-100	80-95	48-75	25-50
	8-80	Clay	CH	A-7	0	100	100	95-100	90-100	51-75	30-50

Table 15.--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	
GrC---------	0-7	Fine sandy loam	SM, ML, SC-SM, CL-ML	A-4	0-1	90-100	90-100	75-85	35-55	<31	NP-7
Gredge											
	7-21	Sandy clay, clay	CH, CL	A-7-6	0-1	90-100	85-100	75-100	51-98	45-65	28-42
	21-40	Clay loam, sandy clay loam.	CL, CH	A-7-6	0-1	90-100	90-100	80-100	51-85	41-60	25-40
	40-57	Clay loam, sandy clay loam.	CL, SC	A-6, A-7-6	0-1	90-100	90-100	80-100	36-80	35-50	15-30
	57-68	Clay loam, sandy clay loam, fine sandy loam.	SC, CL	A-4, A-6	0-3	90-100	90-100	65-100	36-75	22-40	7-20
GrC2---------	0-3	Fine sandy loam	SM, ML, SC-SM, CL-ML	A-4	0-1	90-100	90-100	75-85	35-55	<31	NP-7
Gredge											
	3-15	Sandy clay, clay	CH, CL	A-7-6	0-1	90-100	85-100	75-100	51-98	45-65	28-42
	15-25	Clay loam, sandy clay loam.	CL, CH	A-7-6	0-1	90-100	90-100	80-100	51-85	41-60	25-40
	25-62	Clay loam, sandy clay loam.	CL, SC	A-6, A-7-6	0-1	90-100	90-100	80-100	36-80	35-50	15-30
	62-80	Clay loam, sandy clay loam, fine sandy loam.	SC, CL	A-4, A-6	0-3	90-100	90-100	65-100	36-75	22-40	7-20
GrD---------	0-7	Fine sandy loam	SM, ML, SC-SM, CL-ML	A-4	0-1	90-100	90-100	75-85	35-55	<31	NP-7
Gredge											
	7-28	Sandy clay, clay	CH, CL	A-7-6	0-1	90-100	85-100	75-100	51-98	45-65	28-42
	28-35	Clay loam, sandy clay loam.	CL, CH	A-7-6	0-1	90-100	90-100	80-100	51-85	41-60	25-40
	35-65	Clay loam, sandy clay loam.	CL, SC	A-6, A-7-6	0-1	90-100	90-100	80-100	36-80	35-50	15-30
	65-75	Clay loam, sandy clay loam, fine sandy loam.	SC, CL	A-4, A-6	0-3	90-100	90-100	65-100	36-75	22-40	7-20
GvC---------	0-8	Very gravelly fine sandy loam.	SM, SC-SM	A-4, A-2-4	0-5	80-95	25-65	25-65	25-49	<31	NP-7
Gredge											
	8-26	Sandy clay, clay	CH, CL	A-7-6	0-1	90-100	85-100	75-100	51-98	45-65	28-42
	26-61	Clay loam, sandy clay loam.	CL, CH	A-7-6	0-1	90-100	90-100	80-100	51-85	41-60	25-40
	61-70	Clay loam, sandy clay loam.	CL, SC	A-6, A-7-6	0-1	90-100	90-100	80-100	36-80	35-50	15-30
GyC---------	0-7	Clay----------	CH	A-7-6	0	100	95-100	90-100	75-98	55-75	32-50
Greenvine	7-24	Clay, silty clay	CH	A-7-6	0	100	95-100	90-100	75-98	55-92	32-62
	24-35	Clay, silty clay	CH	A-7-6	0	100	100	90-100	75-98	55-92	32-62
	35-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
HbA---------	0-8	Silty clay loam	CL	A-7, A-6	0	100	100	95-100	75-98	30-50	15-30
Highbank	8-19	Silty clay, silty clay loam.	CL, CH	A-7, A-6	0	100	100	95-100	90-100	35-60	20-40
	19-80	Clay----------	CH	A-7-6	0	99-100	99-100	95-100	95-100	55-75	35-50
Ka----------	0-10	Clay----------	CH	A-7-5, A-7-6	0	100	100	90-100	80-100	56-96	35-60
Kaufman											
	10-31	Clay----------	CH	A-7-5	0	100	100	95-100	90-100	65-100	35-65
	31-80	Clay----------	CH	A-7-5, A-7-6	0	100	100	95-100	85-100	65-100	35-65

Table 15.--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	
KrD:											
Koether	0-12	Very stony loamy fine sand.	SM, SP-SM	A-2	25-45	80-98	75-95	60-85	10-25	<20	NP-4
	12-20	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop	0-80	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
KuC	0-4	Fine sandy loam	SM, ML, SC-SM, CL-ML	A-2-4, A-4	0-2	95-100	95-100	85-100	34-80	15-30	NP-7
Kurten	4-33	Clay, silty clay, clay loam.	CH, CL	A-7-6	0-2	95-100	95-100	89-100	65-95	41-59	25-42
	33-45	Clay, silty clay, clay loam.	CH, CL	A-7-6	0-1	95-100	95-100	89-100	65-95	41-59	25-42
	45-80	Clay, clay loam, loam.	CH, CL	A-6, A-7-6	0-1	95-100	95-100	89-100	60-90	35-59	20-40
KuD	0-3	Fine sandy loam	SM, ML, SC-SM, CL-ML	A-2-4, A-4	0-2	95-100	95-100	85-100	34-80	15-30	NP-7
Kurten	3-26	Clay, silty clay, clay loam.	CH, CL	A-7-6	0-2	95-100	95-100	89-100	65-95	41-59	25-42
	26-42	Clay, silty clay, clay loam.	CH, CL	A-7-6	0-1	95-100	95-100	89-100	65-95	41-59	25-42
	42-60	Clay, clay loam, loam.	CH, CL	A-6, A-7-6	0-1	95-100	95-100	89-100	60-90	35-59	20-40
LfA	0-9	Fine sandy loam, loam.	SM, CL, ML, SC	A-4	0-5	90-100	80-100	80-100	40-85	15-30	NP-10
Lufkin	9-25	Clay, clay loam, silty clay loam.	CH, CL	A-7-6	0	90-100	90-100	90-100	65-95	45-67	30-45
	25-80	Loam, clay loam, sandy clay loam.	CH, CL, SC	A-7	0	85-100	85-100	80-100	48-90	40-86	25-55
LuB	0-5	Clay	CH	A-7-6	0-2	95-100	90-100	80-100	65-98	51-70	30-45
Luling	5-31	Clay, silty clay	CH	A-7-6	0-2	95-100	90-100	80-100	65-98	51-70	30-45
	31-62	Clay, silty clay	CH	A-7-6	0-2	95-100	90-100	80-100	65-98	51-70	30-45
	62-75	Shaly clay, shaly silty clay.	CH	A-7-6	0-2	95-100	90-100	80-100	65-98	51-70	30-45
LuD	0-11	Clay	CH	A-7-6	0-2	95-100	90-100	80-100	65-98	51-70	30-45
Luling	11-65	Clay, silty clay	CH	A-7-6	0-2	95-100	90-100	80-100	65-98	51-70	30-45
	65-75	Shaly clay, shaly silty clay.	CH	A-7-6	0-2	95-100	90-100	80-100	65-98	51-70	30-45
MaA	0-8	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	8-65	Clay, clay loam	CH, CL	A-7, A-6	0	95-100	95-100	95-100	60-85	38-55	22-37
	65-80	Clay, clay loam	CH, CL	A-7, A-6	0	95-100	95-100	95-100	60-85	38-55	22-37
MrA:											
Mabank	0-5	Loam	CL, CL-ML, SC-SM, SC	A-4, A-6	0	95-100	95-100	80-98	40-70	19-32	4-15
	5-65	Clay, clay loam	CH, CL	A-7, A-6	0	95-100	95-100	95-100	60-85	38-55	22-37
	65-70	Clay, clay loam	CH, CL	A-7, A-6	0	95-100	95-100	95-100	60-85	38-55	22-37

Table 15.--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	
MrA:											
Rader	0-17	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
	17-23	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
	23-27	Loam, sandy clay loam, clay loam.	SC, CL	A-6	0	95-100	95-100	90-100	36-75	26-40	11-22
	27-35	Clay loam, sandy clay, clay.	CL, CH	A-6, A-7	0	95-100	95-100	90-100	51-90	36-60	18-38
	35-70	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
NvB	0-4	Loamy fine sand	SM, SC-SM	A-2-4	0	95-100	95-100	50-75	15-35	16-25	NP-5
Navasan	4-51	Loamy fine sand, loamy sand.	SM, SC-SM	A-2-4	0	95-100	95-100	50-75	15-35	16-25	NP-5
	51-66	Sandy loam, fine sandy loam.	SM, SC, ML, CL	A-4	0-1	90-100	90-100	60-85	35-60	20-30	3-10
	66-90	Fine sand, sandy clay loam, clay loam.	SC, CL	A-4, A-6	0-1	90-100	90-100	65-95	35-75	22-36	8-20
PaC	0-8	Loamy fine sand	SM, SC-SM	A-2-4	0	100	95-100	85-100	15-35	16-25	NP-5
Padina	8-62	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
	62-82	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
Pt.											
Pits											
RaB	0-11	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	11-17	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
	17-28	Loam, sandy clay loam, clay loam.	SC, CL	A-6	0	95-100	95-100	90-100	36-75	26-40	11-22
	28-65	Clay loam, sandy clay, clay.	CL, CH	A-6, A-7	0	95-100	95-100	90-100	51-90	36-60	18-38
RbA:											
Rader	0-11	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
	11-28	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
	28-35	Loam, sandy clay loam, clay loam.	SC, CL	A-6	0	95-100	95-100	90-100	36-75	26-40	11-22
	35-65	Clay loam, sandy clay, clay.	CL, CH	A-6, A-7	0	95-100	95-100	90-100	51-90	36-60	18-38
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
	12-70	Clay	CH, CL	A-7	0	95-100	90-100	85-100	55-90	45-65	25-40

Table 15.--Engineering Index Properties--Continued

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	
ReC-------------- Rehburg	0-12	Loamy fine sand	SM, SC-SM	A-2-4, A-4	0	95-100	90-100	70-98	20-40	15-25	NP-7
	12-24	Loamy fine sand, fine sand.	SM, SC-SM	A-2-4, A-4	0	95-100	85-100	60-95	15-40	15-25	NP-7
	24-46	Clay, sandy clay, clay loam.	CH, CL, SC	A-7-6, A-6	0	95-100	95-100	80-100	40-95	36-52	17-30
	46-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
RoB-------------- Robco	0-15	Loamy fine sand	SM, SP-SM	A-2-4, A-3	0	80-100	80-100	65-95	8-35	<25	NP-3
	15-28	Loamy fine sand, fine sand.	SM, SP-SM	A-2-4, A-3	0	80-100	80-100	65-95	8-35	<25	NP-3
	28-33	Sandy clay loam, loam, clay loam.	SC, CL	A-6, A-4	0	98-100	98-100	80-100	36-75	26-40	8-22
	33-65	Clay loam, sandy clay loam.	CL	A-6, A-7	0	98-100	98-100	80-100	50-80	36-50	16-28
	65-82	Sandy clay loam, clay loam, clay.	CL, SC	A-6, A-7	0	98-100	98-100	80-100	40-95	32-50	13-28
Rr--------------- Roetex	0-15	Clay----------	CH, CL	A-7	0	100	100	95-100	90-100	48-70	35-50
	15-56	Clay----------	CH, CL	A-7	0	100	98-100	95-100	90-100	48-66	35-50
	56-75	Clay, silty clay, clay loam.	CH, CL	A-6, A-7	0	100	98-100	95-100	75-100	38-66	25-50
RsC-------------- Rosanky	0-8	Fine sandy loam	SM, SC-SM	A-2-4, A-4	0-2	80-100	75-100	75-100	30-50	15-25	NP-7
	8-41	Sandy clay, clay	CL, SC, CH	A-6, A-7-6	0-2	85-100	75-100	75-100	49-90	37-56	19-34
	41-65	Sandy clay loam, fine sandy loam.	SC, CL, CL-ML, SC-SM	A-4, A-6	0	80-100	75-100	75-100	36-60	23-40	5-19
	65-80	Weathered bedrock	---	---	---	---	---	---	---	---	---
RsD-------------- Rosanky	0-6	Fine sandy loam	SM, SC-SM	A-2-4, A-4	0-2	80-100	75-100	75-100	30-50	15-25	NP-7
	6-58	Sandy clay, clay	CL, SC, CH	A-6, A-7-6	0-2	85-100	75-100	75-100	49-90	37-56	19-34
	58-70	Weathered bedrock	---	---	---	---	---	---	---	---	---
RtC-------------- Rosanky	0-2	Loam----------	SM, SC-SM	A-2-4, A-4	0-2	80-100	75-100	75-100	30-50	16-30	NP-7
	2-65	Sandy clay, clay	CL, SC, CH	A-6, A-7-6	0-2	85-100	75-100	75-100	49-90	37-56	19-34
	65-80	Weathered bedrock	---	---	---	---	---	---	---	---	---
RuC: Rosanky----------	0-8	Fine sandy loam	SM, SC-SM	A-2-4, A-4	0-2	80-100	75-100	75-100	30-50	15-25	NP-7
	8-65	Sandy clay, clay	CL, SC, CH	A-6, A-7-6	0-2	85-100	75-100	75-100	49-90	37-56	19-34
	65-80	Weathered bedrock	---	---	---	---	---	---	---	---	---
Urban land.											
Sa--------------- Sandow	0-6	Loam----------	SC, CL, CL-ML, SC-SM	A-4, A-6	0	100	100	80-95	45-80	25-40	6-20
	6-80	Stratified fine sandy loam to clay loam.	SC, CL, CL-ML	A-4, A-6, A-7-6	0	100	100	80-100	40-90	25-47	7-28

Table 15.--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	
Sb:											
Sandow----------	0-6	Loam----------	SC, CL, CL-ML, SC-SM	A-4, A-6	0	100	100	80-95	45-80	25-40	6-20
	6-80	Stratified fine sandy loam to clay loam.	SC, CL, CL-ML	A-4, A-6, A-7-6	0	100	100	80-100	40-90	25-47	7-28
Urban land.											
ScC:											
Shalba----------	0-4	Fine sandy loam	SC-SM, SM, CL-ML, ML	A-4	0	95-100	95-100	70-98	40-60	15-25	NP-7
	4-18	Clay----------	CH	A-7	0	95-100	95-100	90-100	75-95	51-70	34-48
	18-30	Weathered bedrock	---	---	---	---	---	---	---	---	---
Rock outcrop----	0-80	Variable---------	---	---	---	---	---	---	---	---	---
ShA----------	0-8	Clay----------	CH	A-7-6	0	100	100	95-100	95-100	55-75	35-50
Ships	8-47	Clay----------	CH	A-7-6	0	100	100	95-100	95-100	55-75	35-50
	47-80	Clay, silty clay, silty clay loam.	CH	A-7-6	0	100	100	95-100	85-100	51-70	32-50
ShC----------	0-7	Clay----------	CH	A-7-6	0	100	100	95-100	95-100	55-75	35-50
Ships	7-62	Clay----------	CH	A-7-6	0	100	100	95-100	95-100	55-75	35-50
	62-65	Clay, silty clay	CH	A-7-6	0	100	100	95-100	85-100	51-70	32-50
SkB----------	0-15	Loamy fine sand	SM, SC-SM	A-2-4, A-4	0	95-100	95-100	60-95	15-40	15-25	NP-7
Shiro	15-24	Clay, sandy clay, clay loam.	CL, CH	A-7-6	0	95-100	95-100	85-100	51-95	45-65	23-38
	24-34	Clay, sandy clay, clay loam.	CL, CH, SC	A-7-6	0	95-100	95-100	75-100	40-70	45-65	25-38
	34-50	Weathered bedrock	---	---	---	---	---	---	---	---	---
SmC----------	0-9	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	9-51	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
	51-80	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
SmD----------	0-15	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	15-40	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
	40-50	Fine sandy loam, gravelly fine sandy loam, sandy clay loam.	CL, CL-ML, SC, SC-SM	A-4, A-6, A-2-4, A-2-6	0-2	70-100	70-100	38-100	18-60	21-34	4-14
	50-60	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

Table 15.--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	
SnB--- Singleton	0-9	Fine sandy loam	SC-SM, SM, CL-ML, ML	A-4	0	95-100	90-100	70-95	40-60	16-25	NP-7
	9-17	Clay---	CH	A-7-6	0	95-100	90-100	90-100	75-95	51-70	34-48
	17-28	Clay, clay loam, sandy clay.	CH, CL	A-7-6	0	95-100	90-100	85-100	51-95	45-60	23-36
	28-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
SpB--- Spiller	0-18	Loamy fine sand	SM, SC-SM	A-2-4	0	100	95-100	80-100	15-30	16-20	NP-6
	18-43	Sandy clay, clay loam, clay.	CL, CH, SC	A-7-6	0	100	95-100	90-100	40-70	41-55	18-28
	43-54	Sandy clay, clay loam, sandy clay loam.	CL, SC	A-2-7, A-6, A-7-6	0	100	95-100	85-100	30-70	30-49	11-25
	54-85	Fine sandy loam, sandy clay loam, sandy clay.	CL, CL-ML, SC, CH	A-4, A-6, A-7-6, A-2	0	100	95-100	80-100	20-60	26-55	5-28
SxB--- Styx	0-8	Loamy fine sand	SM, SC-SM	A-2-4, A-4	0	100	100	70-100	15-40	<25	NP-4
	8-24	Fine sand, loamy fine sand.	SM, SC-SM	A-2-4, A-4	0	100	100	70-100	15-40	<25	NP-4
	24-68	Sandy clay loam, clay loam.	SC, CL	A-6, A-4	0	100	100	80-100	36-70	20-40	8-20
TaA--- Tabor	0-14	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
	14-42	Clay---	CH, CL	A-7	0	95-100	90-100	85-100	55-90	45-65	25-40
	42-80	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
TgB--- Tabor	0-18	Very gravelly fine sandy loam.	GM, SM, SC-SM, SP-SM	A-1, A-3, A-2	0-10	15-80	15-75	12-65	5-25	15-20	NP-5
	18-38	Clay---	CH, CL	A-7	0	95-100	90-100	85-100	55-90	45-65	25-40
	38-80	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
TuA:											
Tabor---	0-15	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
	15-28	Clay---	CH, CL	A-7	0	95-100	90-100	85-100	55-90	45-65	25-40
	28-80	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
Urban land.											
Uh--- Uhland	0-7	Loam---	CL, SC, ML, SM	A-4, A-6	0	97-100	97-100	80-100	36-70	22-35	3-13
	7-65	Fine sandy loam, loam.	CL, SC, ML, SM	A-4, A-6	0	97-100	95-100	80-100	36-78	18-36	3-18
Ur. Urban land											
Us--- Ustarents	0-80	Variable---	CH	A-7-6	0-1	95-100	90-100	80-100	70-99	51-80	30-54

Table 15.--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	
WeA----------	0-8	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	98-100	90-100	65-95	20-35	5-18
Weswood	8-80	Very fine sandy loam, loam, silt loam.	CL, CL-ML	A-4, A-6	0	100	98-100	95-100	70-98	20-40	5-22
WeC----------	0-8	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	98-100	90-100	65-95	20-35	5-18
Weswood	8-22	Silty clay loam, clay loam.	CL	A-4, A-6	0	100	98-100	95-100	75-98	20-40	9-22
	22-65	Very fine sandy loam, loam, silt loam.	CL, CL-ML	A-4, A-6	0	100	98-100	95-100	70-98	20-40	5-22
WwA----------	0-9	Silty clay loam	CL	A-4, A-6	0	100	98-100	95-100	75-98	20-40	9-22
Weswood	9-80	Very fine sandy loam, loam, silt loam.	CL, CL-ML	A-4, A-6	0	100	98-100	95-100	70-98	20-40	5-22
Wy:											
Weswood---------	0-6	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	98-100	90-100	65-95	20-35	5-18
	6-65	Very fine sandy loam, loam, silt loam.	CL, CL-ML	A-4, A-6	0	100	98-100	95-100	70-98	20-40	5-22
Yahola----------	0-6	Very fine sandy loam.	SM, ML, CL-ML, SC-SM	A-4	0	100	95-100	90-100	36-60	15-26	NP-7
	6-12	Fine sandy loam, loam, very fine sandy loam.	SM, ML, CL, SC	A-4	0	100	95-100	90-100	36-85	15-30	NP-10
	12-60	Stratified loam to loamy fine sand.	SM, ML, CL, SC	A-2, A-4	0	100	95-100	90-100	15-85	15-30	NP-10
WzA----------	0-8	Loam----------	CL	A-6	0	95-100	85-100	80-100	60-96	26-38	11-20
Wilson	8-34	Silty clay, clay, clay loam.	CL, CH	A-7-6	0	90-100	80-100	80-100	65-96	43-56	26-37
	34-80	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
YaA----------	0-12	Fine sandy loam	SM, ML, CL-ML, SC-SM	A-4	0	100	95-100	90-100	36-60	<26	NP-7
Yahola	12-42	Fine sandy loam, loam, very fine sandy loam.	SM, ML, CL, SC	A-4	0	100	95-100	90-100	36-85	<30	NP-10
	42-80	Stratified loam to loamy fine sand.	SM, ML, CL, SC	A-2, A-4	0	100	95-100	90-100	15-85	<30	NP-10
ZaB----------	0-7	Very fine sandy loam.	SM, ML	A-4	0-1	90-100	90-100	70-95	40-65	20-30	NP-7
Zack	7-18	Clay----------	CH	A-7-6	0-1	90-100	90-100	90-100	75-95	50-70	30-45
	18-24	Clay, clay loam	CH, CL	A-7-6	0-1	90-100	90-100	90-100	70-95	42-60	25-38
	24-36	Clay loam, silty clay loam, sandy clay loam.	CL	A-6, A-7-6	0-1	90-100	90-100	80-95	51-90	30-42	11-20
	36-60	Loam, clay loam, silty clay loam.	CL	A-4, A-6	0-1	90-100	90-100	80-100	51-90	26-40	8-20

Table 15.--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	
ZaC2--Zack	0-2	Very fine sandy loam.	SM, ML	A-4	0-1	90-100	90-100	70-95	40-65	20-30	NP-7
	2-12	Clay	CH	A-7-6	0-1	90-100	90-100	90-100	75-95	50-70	30-45
	12-38	Clay, clay loam	CH, CL	A-7-6	0-1	90-100	90-100	90-100	70-95	42-60	25-38
	38-60	Loam, clay loam, silty clay loam.	CL	A-4, A-6	0-1	90-100	90-100	80-100	51-90	26-40	8-20
ZaD--Zack	0-3	Very fine sandy loam.	SM, ML	A-4	0-1	90-100	90-100	70-95	40-65	20-30	NP-7
	3-17	Clay	CH	A-7-6	0-1	90-100	90-100	90-100	75-95	50-70	30-45
	17-30	Clay, clay loam	CH, CL	A-7-6	0-1	90-100	90-100	90-100	70-95	42-60	25-38
	30-45	Loam, clay loam, silty clay loam.	CL	A-4, A-6	0-1	90-100	90-100	80-100	51-90	26-40	8-20
ZaE3--Zack	0-3	Very fine sandy loam.	SM, ML	A-4	0-1	90-100	90-100	70-95	40-65	20-30	NP-7
	3-25	Clay	CH	A-7-6	0-1	90-100	90-100	90-100	75-95	50-70	30-45
	25-30	Clay, clay loam	CH, CL	A-7-6	0-1	90-100	90-100	90-100	70-95	42-60	25-38
	30-45	Loam, clay loam, silty clay loam.	CL	A-4, A-6	0-1	90-100	90-100	80-100	51-90	26-40	8-20
ZcB:											
Zack	0-7	Very fine sandy loam.	SM, ML	A-4	0-1	90-100	90-100	70-95	40-65	20-30	NP-7
	7-24	Clay	CH	A-7-6	0-1	90-100	90-100	90-100	75-95	50-70	30-45
	24-36	Clay, clay loam	CH, CL	A-7-6	0-1	90-100	90-100	90-100	70-95	42-60	25-38
	36-60	Loam, clay loam, silty clay loam.	CL	A-4, A-6	0-1	90-100	90-100	80-100	51-90	26-40	8-20
Urban land.											
ZcD:											
Zack	0-3	Very fine sandy loam.	SM, ML	A-4	0-1	90-100	90-100	70-95	40-65	20-30	NP-7
	3-17	Clay	CH	A-7-6	0-1	90-100	90-100	90-100	75-95	50-70	30-45
	17-30	Clay, clay loam	CH, CL	A-7-6	0-1	90-100	90-100	90-100	70-95	42-60	25-38
	30-45	Loam, clay loam, silty clay loam.	CL	A-4, A-6	0-1	90-100	90-100	80-100	51-90	26-40	8-20
Urban land.											
ZuB--Zulch	0-5	Fine sandy loam	SM, ML, CL-ML, SC-SM	A-4	0	95-100	95-100	70-100	40-60	15-30	NP-7
	5-13	Clay loam, clay, silty clay.	CH, CL	A-7-6	0	95-100	95-100	90-100	75-95	44-60	22-32
	13-36	Clay, silty clay	CH, CL	A-7-6	0	95-100	95-100	90-100	75-95	44-66	22-36
	36-60	Shaly clay, clay, clay loam.	CH, CL	A-6, A-7-6	0	95-100	95-100	90-100	65-90	44-60	22-32

Table 16.--Physical and Chemical Properties of the Soils

(See text for definitions of terms used in this table. 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
AxB	0-8	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	8-40	35-55	1.35-1.60	<0.06	0.07-0.16	4.5-5.5	High	0.37		
	40-50	27-50	1.50-1.70	<0.06	0.07-0.16	6.6-8.4	High	0.37		
	50-80	25-50	1.50-1.70	0.2-0.6	0.07-0.12	5.6-8.4	High	0.37		
BeA	0-15	20-29	1.30-1.45	0.6-2.0	0.12-0.20	5.6-7.3	Moderate	0.32	5	1-3
Benchley	15-80	35-55	1.55-1.65	0.06-0.2	0.12-0.18	5.6-8.4	High	0.32		
BeB	0-10	20-29	1.30-1.45	0.6-2.0	0.12-0.20	5.6-7.3	Moderate	0.32	5	1-3
Benchley	10-16	30-45	1.45-1.60	0.06-0.2	0.12-0.18	5.6-7.3	High	0.32		
	16-70	35-55	1.55-1.65	0.06-0.2	0.12-0.18	5.6-8.4	High	0.32		
	70-80	40-55	1.40-1.70	0.06-0.2	0.05-0.12	6.1-8.4	Moderate	0.32		
BoA	0-17	5-15	1.25-1.59	0.6-2.0	0.11-0.15	5.1-7.3	Low	0.43	5	<1
Boonville	17-24	35-55	1.25-1.45	<0.06	0.12-0.17	5.1-8.4	High	0.32		
	24-73	25-40	1.40-1.70	0.06-0.2	0.12-0.17	7.4-8.4	Moderate	0.37		
	73-80	25-55	1.35-1.70	0.06-0.2	0.10-0.15	5.6-8.4	Moderate	0.37		
BoB	0-17	5-15	1.25-1.59	0.6-2.0	0.11-0.15	5.1-7.3	Low	0.43	5	<1
Boonville	17-36	35-55	1.25-1.45	<0.06	0.12-0.17	5.1-8.4	High	0.32		
	36-73	25-40	1.40-1.70	0.06-0.2	0.12-0.17	7.4-8.4	Moderate	0.37		
	73-88	25-55	1.35-1.70	0.06-0.2	0.10-0.15	5.6-8.4	Moderate	0.37		
BrB:										
Boonville	0-12	5-15	1.25-1.59	0.6-2.0	0.11-0.15	5.1-7.3	Low	0.43	5	<1
	12-65	35-55	1.25-1.45	<0.06	0.12-0.17	5.1-8.4	High	0.32		
	65-80	25-55	1.35-1.70	0.06-0.2	0.10-0.15	5.6-8.4	Moderate	0.37		
Urban land.										
BuA	0-8	40-60	1.35-1.50	<0.06	0.12-0.18	5.6-8.4	Very high	0.32	5	1-3
Burleson	8-40	40-60	1.40-1.55	<0.06	0.12-0.18	5.6-8.4	Very high	0.32		
	40-80	35-60	1.40-1.55	<0.06	0.12-0.18	7.4-8.4	Very high	0.32		
BuB	0-7	40-60	1.35-1.50	<0.06	0.12-0.18	5.6-8.4	Very high	0.32	5	1-3
Burleson	7-48	40-60	1.40-1.55	<0.06	0.12-0.18	5.6-8.4	Very high	0.32		
	48-80	35-60	1.40-1.55	<0.06	0.12-0.18	7.4-8.4	Very high	0.32		
BuC	0-6	40-60	1.35-1.50	<0.06	0.12-0.18	5.6-8.4	Very high	0.32	5	1-3
Burleson	6-45	40-60	1.40-1.55	<0.06	0.12-0.18	5.6-8.4	Very high	0.32		
	45-80	35-60	1.40-1.55	<0.06	0.12-0.18	7.4-8.4	Very high	0.32		
BwC	0-8	5-15	1.30-1.45	0.6-2.0	0.11-0.15	4.5-6.0	Low	0.43	3	.5-2
Burlewash	8-24	40-55	1.30-1.45	<0.06	0.07-0.16	3.5-5.5	High	0.28		
	24-35	30-45	1.30-1.45	0.2-0.6	0.07-0.16	4.5-5.5	High	0.32		
	35-40	---	---	0.01-0.2	---	---		----		
BwD	0-4	5-15	1.30-1.45	0.6-2.0	0.11-0.15	4.5-6.0	Low	0.43	3	.5-2
Burlewash	4-30	40-55	1.30-1.45	<0.06	0.07-0.16	3.5-5.5	High	0.28		
	30-40	---	---	0.01-0.2	---	---		----		
ChC	0-14	2-12	1.40-1.60	2.0-6.0	0.06-0.10	5.6-7.3	Low	0.20	5	<1
Chazos	14-26	35-50	1.35-1.50	0.06-0.2	0.10-0.18	5.6-6.5	Moderate	0.32		
	26-52	20-40	1.35-1.55	0.06-0.2	0.10-0.18	5.6-7.3	Moderate	0.32		
	52-80	27-45	1.40-1.60	0.06-0.2	0.10-0.18	6.1-8.4	Moderate	0.32		

Table 16.--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
ChD----------	0-11	2-12	1.40-1.60	2.0-6.0	0.06-0.10	5.6-7.3	Low----------	0.20	5	<1
Chazos	11-41	35-50	1.35-1.50	0.06-0.2	0.10-0.18	5.6-6.5	Moderate-----	0.32		
	41-65	20-40	1.35-1.55	0.06-0.2	0.10-0.18	5.6-7.3	Moderate-----	0.32		
	65-80	27-45	1.40-1.60	0.06-0.2	0.10-0.18	6.1-8.4	Moderate-----	0.32		
CoA----------	0-7	8-18	1.18-1.40	2.0-6.0	0.11-0.15	7.4-8.4	Low----------	0.43	5	.5-2
Coarsewood	7-48	8-18	1.18-1.40	2.0-6.0	0.11-0.15	7.4-8.4	Low----------	0.43		
	48-80	6-18	1.18-1.40	2.0-6.0	0.11-0.15	7.4-8.4	Low----------	0.43		
CrB----------	0-8	5-20	1.50-1.60	0.6-2.0	0.11-0.20	5.6-7.8	Low----------	0.43	5	.5-2
Crockett	8-21	40-55	1.35-1.60	<0.06	0.08-0.14	5.6-7.3	High---------	0.32		
	21-34	35-55	1.40-1.65	<0.06	0.08-0.14	6.1-8.4	High---------	0.32		
	34-45	20-50	1.50-1.70	<0.06	0.11-0.15	6.1-8.4	Moderate-----	0.32		
	45-80	30-60	1.50-1.70	<0.06	0.11-0.15	6.1-8.4	High---------	0.32		
CrB2----------	0-5	5-20	1.50-1.60	0.6-2.0	0.11-0.20	5.6-7.8	Low----------	0.43	5	.5-2
Crockett	5-16	40-55	1.35-1.60	<0.06	0.08-0.14	5.6-7.3	High---------	0.32		
	16-32	35-55	1.40-1.65	<0.06	0.08-0.14	6.1-8.4	High---------	0.32		
	32-45	20-50	1.50-1.70	<0.06	0.11-0.15	6.1-8.4	Moderate-----	0.32		
	45-65	30-60	1.50-1.70	<0.06	0.11-0.15	6.1-8.4	High---------	0.32		
DeA:										
Derly----------	0-6	8-20	1.40-1.60	0.6-2.0	0.13-0.24	4.5-6.5	Low----------	0.37	5	.5-2
	6-16	27-40	1.40-1.55	0.06-0.2	0.15-0.22	4.5-6.0	Moderate-----	0.37		
	16-44	35-50	1.45-1.60	<0.06	0.12-0.18	4.5-6.0	High---------	0.32		
	44-80	20-45	1.44-1.65	<0.06	0.12-0.18	5.6-7.3	High---------	0.32		
Rader----------	0-9	4-15	1.30-1.50	2.0-6.0	0.10-0.18	4.5-6.5	Low----------	0.37	5	.5-2
	9-19	4-15	1.35-1.55	2.0-6.0	0.10-0.18	4.5-6.5	Low----------	0.37		
	19-24	18-30	1.40-1.60	0.2-0.6	0.12-0.18	4.5-5.5	Moderate-----	0.32		
	24-65	35-50	1.45-1.65	<0.06	0.12-0.18	4.5-6.5	High---------	0.32		
DfC----------	0-8	2-12	1.30-1.60	6.0-20	0.05-0.08	5.1-7.3	Low----------	0.20	5	.3-1
Desan	8-52	2-12	1.30-1.60	6.0-20	0.05-0.08	5.1-7.3	Low----------	0.17		
	52-80	12-25	1.35-1.65	0.6-2.0	0.12-0.16	5.1-6.5	Low----------	0.24		
DmA----------	0-11	40-60	1.25-1.40	<0.06	0.12-0.18	4.5-7.3	Very high----	0.32	5	1-5
Dimebox	11-37	40-60	1.25-1.40	<0.06	0.12-0.18	4.5-7.3	Very high----	0.32		
	37-80	40-60	1.25-1.40	<0.06	0.12-0.18	5.1-8.4	Very high----	0.32		
DuC----------	0-6	3-12	1.30-1.60	6.0-20	0.05-0.10	5.6-7.3	Low----------	0.20	5	<1
Dutek	6-35	3-12	1.30-1.60	6.0-20	0.05-0.10	5.6-7.3	Low----------	0.20		
	35-55	18-35	1.30-1.65	0.6-2.0	0.12-0.17	4.5-6.5	Low----------	0.24		
	55-85	10-30	1.30-1.65	0.6-6.0	0.10-0.16	4.5-6.5	Low----------	0.24		
EuB----------	0-62	2-10	1.35-1.50	6.0-20	0.07-0.11	5.1-7.3	Low----------	0.17	5	.5-1
Eufaula	62-82	2-12	1.50-1.70	6.0-20	0.07-0.13	5.1-7.3	Low----------	0.17		
FaB----------	0-7	10-20	1.45-1.60	0.6-2.0	0.11-0.15	4.5-5.5	Low----------	0.32	3	.5-2
Falba	7-13	35-50	1.25-1.45	<0.06	0.14-0.18	4.5-5.5	High---------	0.28		
	13-36	35-50	1.25-1.45	<0.06	0.10-0.14	4.5-7.3	High---------	0.28		
	36-50	---	---	0.2-2.0	---	---	----------	----		
Gd----------	0-8	50-75	1.20-1.40	0.06-0.2	0.15-0.20	5.6-7.3	Very high----	0.32	5	1-3
Gladewater	8-80	60-75	1.20-1.40	<0.06	0.15-0.18	4.5-6.5	Very high----	0.32		
GrC----------	0-7	7-15	1.30-1.55	0.6-2.0	0.11-0.15	4.5-6.5	Low----------	0.43	5	<1
Gredge	7-21	40-55	1.30-1.50	<0.06	0.07-0.16	4.5-6.5	High---------	0.37		
	21-40	25-40	1.35-1.55	0.06-0.2	0.07-0.16	5.1-7.8	Moderate-----	0.37		
	40-57	20-35	1.40-1.60	0.2-0.6	0.07-0.16	5.6-8.4	Moderate-----	0.37		
	57-68	15-35	1.30-1.60	0.2-0.6	0.07-0.14	5.6-8.4	Moderate-----	0.37		

Table 16.--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
GrC2----------	0-3	7-15	1.30-1.55	0.6-2.0	0.11-0.15	4.5-6.5	Low----------	0.43	5	<1
Gredge	3-15	40-55	1.30-1.50	<0.06	0.07-0.16	4.5-6.5	High----------	0.37		
	15-25	25-40	1.35-1.55	0.06-0.2	0.07-0.16	5.1-7.8	Moderate-----	0.37		
	25-62	20-35	1.40-1.60	0.2-0.6	0.07-0.16	5.6-8.4	Moderate-----	0.37		
	62-80	15-35	1.30-1.60	0.2-0.6	0.07-0.14	5.6-8.4	Moderate-----	0.37		
GrD----------	0-7	7-15	1.30-1.55	0.6-2.0	0.11-0.15	4.5-6.5	Low----------	0.43	5	<1
Gredge	7-28	40-55	1.30-1.50	<0.06	0.07-0.16	4.5-6.5	High----------	0.37		
	28-35	25-40	1.35-1.55	0.06-0.2	0.07-0.16	5.1-7.8	Moderate-----	0.37		
	35-65	20-35	1.40-1.60	0.2-0.6	0.07-0.16	5.6-8.4	Moderate-----	0.37		
	65-75	15-35	1.30-1.60	0.2-0.6	0.07-0.14	5.6-8.4	Moderate-----	0.37		
GvC----------	0-8	7-15	1.30-1.55	0.6-2.0	0.08-0.12	4.5-6.5	Low----------	0.10	5	<1
Gredge	8-26	40-55	1.30-1.50	<0.06	0.07-0.16	4.5-6.5	High----------	0.37		
	26-61	25-40	1.35-1.55	0.06-0.2	0.07-0.16	5.1-7.8	Moderate-----	0.37		
	61-70	20-35	1.40-1.60	0.2-0.6	0.07-0.16	5.6-8.4	Moderate-----	0.37		
GyC----------	0-7	40-60	1.10-1.30	<0.06	0.12-0.18	5.1-8.4	Very high----	0.32	3	1-4
Greenvine	7-24	40-60	1.20-1.40	<0.06	0.12-0.18	5.1-8.4	Very high----	0.32		
	24-35	40-60	1.20-1.40	<0.06	0.12-0.18	6.6-8.4	Very high----	0.32		
	35-60	---	---	0.01-0.6	---	---	----------	----		
HbA----------	0-8	20-40	1.40-1.50	0.6-2.0	0.17-0.22	7.9-8.4	Moderate-----	0.32	5	1-3
Highbank	8-19	30-45	1.35-1.50	0.2-0.6	0.14-0.20	7.9-8.4	Moderate-----	0.32		
	19-80	40-50	1.25-1.40	0.06-0.2	0.14-0.20	7.9-8.4	High----------	0.32		
Ka----------	0-10	50-86	1.20-1.45	<0.06	0.12-0.18	5.6-8.4	Very high----	0.32	5	1-4
Kaufman	10-31	60-86	1.25-1.45	<0.06	0.12-0.18	5.6-8.4	Very high----	0.32		
	31-80	60-86	1.25-1.45	<0.06	0.12-0.18	5.6-8.4	Very high----	0.32		
KrD:										
Koether----------	0-12	5-10	1.30-1.65	6.0-20	0.04-0.09	4.5-6.0	Low----------	0.05	1	<1
	12-20	---	---	0.01-0.6	---	---	----------	----		
Rock outcrop.										
KuC----------	0-4	7-18	1.45-1.60	0.6-2.0	0.11-0.15	5.6-7.3	Low----------	0.43	5	.5-1
Kurten	4-33	40-60	1.25-1.45	<0.06	0.07-0.16	4.5-7.3	High----------	0.37		
	33-45	40-65	1.25-1.45	<0.06	0.07-0.16	4.5-7.8	High----------	0.37		
	45-80	30-55	1.35-1.60	<0.06	0.07-0.12	4.5-7.8	High----------	0.37		
KuD----------	0-3	7-18	1.45-1.60	0.6-2.0	0.11-0.15	5.6-7.3	Low----------	0.43	5	.5-1
Kurten	3-26	40-60	1.25-1.45	<0.06	0.07-0.16	4.5-7.3	High----------	0.37		
	26-42	40-65	1.25-1.45	<0.06	0.07-0.16	4.5-7.8	High----------	0.37		
	42-60	30-55	1.35-1.60	<0.06	0.07-0.12	4.5-7.8	High----------	0.37		
LfA----------	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
Lufkin	9-25	35-45	1.40-1.60	<0.06	0.12-0.18	4.5-7.8	Very high----	0.32		
	25-80	20-40	1.40-1.68	<0.06	0.10-0.14	6.1-8.4	High----------	0.37		
LuB----------	0-5	40-55	1.20-1.35	<0.06	0.12-0.18	6.6-8.4	High----------	0.32	5	1-3
Luling	5-31	40-55	1.25-1.40	<0.06	0.12-0.18	6.6-8.4	Very high----	0.32		
	31-62	40-55	1.30-1.45	<0.06	0.12-0.18	6.6-8.4	Very high----	0.32		
	62-75	40-55	1.45-1.60	<0.06	0.07-0.12	6.6-8.4	Very high----	0.32		
LuD----------	0-11	40-55	1.20-1.35	<0.06	0.12-0.18	6.6-8.4	High----------	0.32	5	1-3
Luling	11-65	40-55	1.30-1.45	<0.06	0.12-0.18	6.6-8.4	Very high----	0.32		
	65-75	40-55	1.45-1.60	<0.06	0.07-0.12	6.6-8.4	Very high----	0.32		
MaA----------	0-8	10-25	1.50-1.65	0.6-2.0	0.11-0.15	5.6-7.3	Low----------	0.43	5	1-2
Mabank	8-65	35-50	1.45-1.65	<0.06	0.12-0.18	5.6-8.4	High----------	0.32		
	65-80	35-50	1.45-1.65	<0.06	0.12-0.18	5.6-8.4	High----------	0.32		

Table 16.--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
MrA:										
Mabank	0-5	10-25	1.50-1.65	0.6-2.0	0.11-0.15	5.6-7.3	Low	0.43	5	1-2
	5-65	35-50	1.45-1.65	<0.06	0.12-0.18	5.6-8.4	High	0.32		
	65-70	35-50	1.45-1.65	<0.06	0.12-0.18	5.6-8.4	High	0.32		
Rader	0-17	4-15	1.30-1.50	2.0-6.0	0.10-0.18	4.5-6.5	Low	0.37	5	.5-2
	17-23	4-15	1.35-1.55	2.0-6.0	0.10-0.18	4.5-6.5	Low	0.37		
	23-27	18-30	1.40-1.60	0.2-0.6	0.12-0.18	4.5-5.5	Moderate	0.32		
	27-35	35-50	1.45-1.65	<0.06	0.12-0.18	4.5-6.5	High	0.32		
	35-70	24-45	1.45-1.65	0.06-0.2	0.12-0.18	4.5-8.4	Moderate	0.32		
NvB	0-4	2-10	1.40-1.60	6.0-20	0.07-0.11	5.1-7.3	Low	0.17	5	.5-1
Navasan	4-51	2-10	1.40-1.60	6.0-20	0.07-0.11	5.1-7.3	Low	0.17		
	51-66	5-15	1.40-1.60	0.2-0.6	0.10-0.15	4.5-7.3	Low	0.24		
	66-90	12-35	1.40-1.65	0.2-0.6	0.13-0.18	5.1-6.0	Moderate	0.24		
PaC	0-8	2-10	1.20-1.50	6.0-20	0.07-0.11	5.6-7.3	Low	0.17	5	.5-1
Padina	8-62	2-10	1.20-1.50	6.0-20	0.05-0.08	5.6-7.3	Low	0.17		
	62-82	18-30	1.40-1.60	0.6-2.0	0.14-0.18	5.1-6.5	Low	0.24		
Pt.										
Pits										
RaB	0-11	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	11-17	4-15	1.35-1.55	2.0-6.0	0.10-0.18	4.5-6.5	Low	0.37		
	17-28	18-30	1.40-1.60	0.2-0.6	0.12-0.18	4.5-5.5	Moderate	0.32		
	28-65	35-50	1.45-1.65	<0.06	0.12-0.18	4.5-6.5	High	0.32		
RbA:										
Rader	0-11	4-15	1.30-1.50	2.0-6.0	0.10-0.18	4.5-6.5	Low	0.37	5	.5-2
	11-28	4-15	1.35-1.55	2.0-6.0	0.10-0.18	4.5-6.5	Low	0.37		
	28-35	18-30	1.40-1.60	0.2-0.6	0.12-0.18	4.5-5.5	Moderate	0.32		
	35-65	35-50	1.45-1.65	<0.06	0.12-0.18	4.5-6.5	High	0.32		
Tabor	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
	12-70	40-55	1.35-1.55	<0.06	0.09-0.12	4.5-7.3	High	0.32		
ReC	0-12	4-10	1.35-1.55	6.0-20	0.06-0.10	5.1-7.3	Low	0.20	4	.5-1
Rehburg	12-24	2-10	1.40-1.60	6.0-20	0.05-0.10	5.1-7.3	Low	0.20		
	24-46	30-45	1.35-1.60	<0.06	0.10-0.15	4.5-6.5	Moderate	0.37		
	46-60	---	---	0.01-0.2	---	---				
RoB	0-15	2-10	1.40-1.60	6.0-20	0.04-0.10	5.1-6.5	Low	0.24	5	<1
Robco	15-28	2-10	1.40-1.60	6.0-20	0.04-0.10	5.1-6.5	Low	0.24		
	28-33	27-35	1.50-1.65	0.2-0.6	0.12-0.18	4.5-6.0	Moderate	0.32		
	33-65	20-35	1.55-1.70	0.06-0.2	0.12-0.18	4.5-6.0	High	0.37		
	65-82	25-45	1.55-1.70	0.06-0.2	0.10-0.18	4.5-7.3	Moderate	0.37		
Rr	0-15	55-75	1.10-1.25	<0.06	0.12-0.18	7.4-8.4	Very high	0.32	5	1-3
Roetex	15-56	60-75	1.20-1.35	<0.06	0.12-0.18	7.4-8.4	Very high	0.32		
	56-75	35-60	1.25-1.40	<0.06	0.12-0.18	7.4-8.4	Very high	0.32		
RsC	0-8	5-18	1.20-1.40	0.6-2.0	0.10-0.14	5.1-6.5	Low	0.28	5	.5-2
Rosanky	8-41	35-50	1.40-1.60	0.2-0.6	0.11-0.17	5.1-6.0	Moderate	0.32		
	41-65	15-35	1.40-1.65	0.2-0.6	0.10-0.16	5.1-6.0	Low	0.37		
	65-80	---	---	0.2-2.0	---	---				
RsD	0-6	5-18	1.20-1.40	0.6-2.0	0.10-0.14	5.1-6.5	Low	0.28	5	.5-2
Rosanky	6-58	35-50	1.40-1.60	0.2-0.6	0.11-0.17	5.1-6.0	Moderate	0.32		
	58-70	---	---	0.2-2.0	---	---				

Table 16.--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
RtC--------------	0-2	5-18	1.20-1.40	0.6-2.0	0.10-0.14	5.1-6.5	Low----------	0.28	5	.5-1
Rosanky	2-65	35-50	1.40-1.60	0.2-0.6	0.11-0.16	5.1-6.0	Moderate-----	0.32		
	65-80	---	---	0.2-2.0	---	---	----------	----		
RuC:										
Rosanky---------	0-8	5-18	1.20-1.40	0.6-2.0	0.10-0.14	5.1-6.5	Low----------	0.28	5	.5-2
	8-65	35-50	1.40-1.60	0.2-0.6	0.11-0.17	5.1-6.0	Moderate-----	0.32		
	65-80	---	---	0.2-2.0	---	---	----------	----		
Urban land.										
Sa---------------	0-6	15-25	1.25-1.35	0.6-2.0	0.12-0.18	5.6-7.3	Low----------	0.37	5	1-4
Sandow	6-80	15-35	1.30-1.60	0.2-0.6	0.12-0.17	5.6-7.8	Moderate-----	0.32		
Sb:										
Sandow----------	0-6	15-25	1.25-1.35	0.6-2.0	0.12-0.18	5.6-7.3	Low----------	0.37	5	1-4
	6-80	15-35	1.30-1.60	0.2-0.6	0.12-0.17	5.6-7.8	Moderate-----	0.32		
Urban land.										
ScC:										
Shalba----------	0-4	5-15	1.40-1.60	0.6-2.0	0.11-0.15	4.5-6.5	Low----------	0.43	2	.1-1
	4-18	40-60	1.40-1.60	<0.06	0.14-0.18	4.5-6.0	High---------	0.32		
	18-30	---	---	0.01-0.6	---	---	----------	----		
Rock outcrop.										
ShA---------------	0-8	60-80	1.20-1.40	<0.06	0.12-0.18	7.9-8.4	Very high----	0.32	5	.5-3
Ships	8-47	60-80	1.20-1.40	<0.06	0.12-0.18	7.9-8.4	Very high----	0.32		
	47-80	35-80	1.25-1.50	<0.06	0.12-0.18	7.9-8.4	Very high----	0.32		
ShC---------------	0-7	60-80	1.20-1.40	<0.06	0.12-0.18	7.9-8.4	Very high----	0.32	5	.5-3
Ships	7-62	60-80	1.20-1.40	<0.06	0.12-0.18	7.9-8.4	Very high----	0.32		
	62-65	35-80	1.25-1.50	<0.06	0.12-0.18	7.9-8.4	Very high----	0.32		
SkB---------------	0-15	5-12	1.35-1.55	2.0-6.0	0.08-0.11	5.1-6.5	Low----------	0.32	3	.5-1
Shiro	15-24	35-45	1.30-1.50	0.06-0.2	0.10-0.16	4.5-5.5	High---------	0.32		
	24-34	35-45	1.30-1.50	0.06-0.2	0.10-0.16	4.5-7.3	High---------	0.32		
	34-50	---	---	0.01-0.6	---	---	----------	----		
SmC---------------	0-9	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	9-51	18-35	1.35-1.60	0.6-2.0	0.12-0.17	4.5-6.0	Low----------	0.32		
	51-80	2-15	1.40-1.70	6.0-20	0.05-0.11	4.5-6.5	Low----------	0.20		
SmD---------------	0-15	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	15-40	18-35	1.35-1.60	0.6-2.0	0.12-0.17	4.5-6.0	Low----------	0.32		
	40-50	12-30	1.40-1.65	2.0-6.0	0.08-0.15	4.5-6.0	Low----------	0.32		
	50-60	2-15	1.40-1.70	6.0-20	0.05-0.11	4.5-6.5	Low----------	0.20		
SnB---------------	0-9	5-20	1.40-1.70	0.6-2.0	0.11-0.18	5.1-6.5	Low----------	0.43	3	.5-1
Singleton	9-17	35-50	1.40-1.60	<0.06	0.09-0.16	4.5-6.0	High---------	0.32		
	17-28	35-45	1.35-1.50	<0.06	0.07-0.16	4.5-6.0	High---------	0.32		
	28-60	---	---	0.01-0.6	---	---	----------	----		
SpB---------------	0-18	5-15	1.40-1.60	6.0-20	0.06-0.10	5.6-7.3	Low----------	0.17	5	.5-1
Spiller	18-43	35-45	1.40-1.65	0.06-0.2	0.12-0.18	5.1-6.5	Moderate-----	0.32		
	43-54	20-40	1.40-1.65	0.2-0.6	0.12-0.18	5.1-7.3	Moderate-----	0.32		
	54-85	10-40	1.35-1.65	0.06-0.2	0.10-0.18	5.1-8.4	Low----------	0.32		
SxB---------------	0-8	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	8-24	3-15	1.40-1.60	2.0-6.0	0.05-0.10	5.1-7.3	Low----------	0.17		
	24-68	25-35	1.30-1.65	0.6-2.0	0.12-0.16	4.5-6.5	Low----------	0.24		

Table 16.--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
TaA----------	0-14	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	14-42	40-55	1.35-1.55	<0.06	0.09-0.12	4.5-7.3	High----------	0.32		
	42-80	25-45	1.45-1.65	<0.06	0.14-0.18	5.1-8.4	High----------	0.32		
TgB----------	0-18	8-20	1.50-1.60	0.6-2.0	0.04-0.10	5.1-6.5	Low----------	0.28	5	.5-1
Tabor	18-38	40-55	1.35-1.55	<0.06	0.09-0.12	4.5-7.3	High----------	0.32		
	38-80	25-45	1.45-1.65	<0.06	0.14-0.18	5.1-8.4	High----------	0.32		
TuA:										
Tabor----------	0-15	8-20	1.50-1.60	0.6-2.0	0.11-0.15	5.1-6.5	Low----------	0.43	5	.5-1
	15-28	40-55	1.35-1.55	<0.06	0.09-0.12	4.5-7.3	High----------	0.32		
	28-80	25-45	1.45-1.65	<0.06	0.14-0.18	5.1-8.4	High----------	0.32		
Urban land.										
Uh----------	0-7	10-20	1.25-1.40	0.6-2.0	0.10-0.16	5.6-7.8	Low----------	0.37	5	.5-2
Uhland	7-65	10-18	1.25-1.55	0.6-2.0	0.10-0.16	5.6-7.8	Low----------	0.37		
Ur.										
Urban land										
Us----------	0-80	40-60	1.40-1.70	<0.06	0.08-0.14	7.4-8.4	Very high----	0.32	5	<1
Ustarents										
WeA----------	0-8	8-26	1.20-1.35	0.6-2.0	0.12-0.20	7.4-8.4	Low----------	0.43	5	1-4
Weswood	8-80	10-20	1.30-1.55	0.6-2.0	0.12-0.20	7.4-8.4	Low----------	0.43		
WeC----------	0-8	8-26	1.20-1.35	0.6-2.0	0.12-0.20	7.4-8.4	Low----------	0.43	5	1-4
Weswood	8-22	27-35	1.20-1.35	0.6-2.0	0.12-0.20	7.4-8.4	Low----------	0.43		
	22-65	10-20	1.30-1.55	0.6-2.0	0.12-0.20	7.4-8.4	Low----------	0.43		
WwA----------	0-9	27-35	1.20-1.35	0.6-2.0	0.12-0.20	7.4-8.4	Low----------	0.43	5	1-4
Weswood	9-80	10-20	1.30-1.55	0.6-2.0	0.12-0.20	7.4-8.4	Low----------	0.43		
Wy:										
Weswood---------	0-6	8-26	1.20-1.35	0.6-2.0	0.12-0.20	7.4-8.4	Low----------	0.43	5	1-4
	6-65	10-20	1.30-1.55	0.6-2.0	0.12-0.20	7.4-8.4	Low----------	0.43		
Yahola----------	0-6	10-18	1.30-1.60	2.0-6.0	0.11-0.15	7.4-8.4	Low----------	0.20	5	.5-1
	6-12	5-18	1.40-1.70	2.0-6.0	0.11-0.20	7.9-8.4	Low----------	0.32		
	12-60	5-18	1.50-1.70	2.0-6.0	0.07-0.20	7.9-8.4	Low----------	0.32		
WzA----------	0-8	18-27	1.35-1.45	0.2-0.6	0.10-0.17	5.6-7.3	Low----------	0.43	5	.5-2
Wilson	8-34	35-50	1.50-1.60	<0.06	0.12-0.15	5.6-8.4	High----------	0.37		
	34-80	35-60	1.50-1.60	<0.06	0.12-0.15	6.6-8.4	High----------	0.37		
YaA----------	0-12	10-18	1.30-1.60	2.0-6.0	0.11-0.15	7.4-8.4	Low----------	0.20	5	.5-1
Yahola	12-42	5-18	1.40-1.70	2.0-6.0	0.11-0.20	7.9-8.4	Low----------	0.32		
	42-80	5-18	1.50-1.70	2.0-6.0	0.07-0.20	7.9-8.4	Low----------	0.32		
ZaB----------	0-7	7-15	1.15-1.30	0.6-2.0	0.11-0.15	5.1-6.5	Low----------	0.43	3	.3-1
Zack	7-18	40-60	1.30-1.45	<0.06	0.12-0.18	5.6-7.3	High----------	0.37		
	18-24	35-55	1.30-1.50	<0.06	0.12-0.20	5.6-8.4	High----------	0.37		
	24-36	20-35	1.35-1.60	0.06-0.2	0.12-0.18	6.6-8.4	Moderate-----	0.37		
	36-60	15-35	1.35-1.60	0.06-0.2	0.07-0.12	7.4-8.4	Low----------	0.37		
ZaC2----------	0-2	7-15	1.15-1.30	0.6-2.0	0.11-0.15	5.1-6.5	Low----------	0.43	3	.3-1
Zack	2-12	40-60	1.30-1.45	<0.06	0.12-0.18	5.6-7.3	High----------	0.37		
	12-38	35-55	1.30-1.50	<0.06	0.12-0.20	5.6-8.4	High----------	0.37		
	38-60	15-35	1.35-1.60	0.06-0.2	0.07-0.12	7.4-8.4	Low----------	0.37		

Table 16.--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
ZaD----------	0-3	7-15	1.15-1.30	0.6-2.0	0.11-0.15	5.1-6.5	Low----------	0.43	3	.3-1
Zack	3-17	40-60	1.30-1.45	<0.06	0.12-0.18	5.6-7.3	High----------	0.37		
	17-30	35-55	1.30-1.50	<0.06	0.12-0.20	5.6-8.4	High----------	0.37		
	30-45	15-35	1.35-1.60	0.06-0.2	0.07-0.12	7.4-8.4	Low----------	0.37		
ZaE3----------	0-3	7-15	1.15-1.30	0.6-2.0	0.11-0.15	5.1-6.5	Low----------	0.43	3	.3-1
Zack	3-25	40-60	1.30-1.45	<0.06	0.12-0.18	5.6-7.3	High----------	0.37		
	25-30	35-55	1.30-1.50	<0.06	0.12-0.20	5.6-8.4	High----------	0.37		
	30-45	15-35	1.35-1.60	0.06-0.2	0.07-0.12	7.4-8.4	Low----------	0.37		
ZcB:										
Zack----------	0-7	7-15	1.15-1.30	0.6-2.0	0.11-0.15	5.1-6.5	Low----------	0.43	3	.3-1
	7-24	40-60	1.30-1.45	<0.06	0.12-0.18	5.6-7.3	High----------	0.37		
	24-36	35-55	1.30-1.50	<0.06	0.12-0.20	5.6-8.4	High----------	0.37		
	36-60	15-35	1.35-1.60	0.06-0.2	0.07-0.12	7.4-8.4	Low----------	0.37		
Urban land.										
ZcD:										
Zack----------	0-3	7-15	1.15-1.30	0.6-2.0	0.11-0.15	5.1-6.5	Low----------	0.43	3	.3-1
	3-17	40-60	1.30-1.45	<0.06	0.12-0.18	5.6-7.3	High----------	0.37		
	17-30	35-55	1.30-1.50	<0.06	0.12-0.20	5.6-8.4	High----------	0.37		
	30-45	15-35	1.35-1.60	0.06-0.2	0.07-0.12	7.4-8.4	Low----------	0.37		
Urban land.										
ZuB----------	0-5	4-12	1.50-1.70	0.6-2.0	0.11-0.15	5.6-7.3	Low----------	0.43	4	.5-2
Zulch	5-13	35-50	1.40-1.60	<0.06	0.13-0.18	5.6-7.8	High----------	0.32		
	13-36	35-55	1.40-1.60	<0.06	0.13-0.18	6.1-7.8	High----------	0.32		
	36-60	35-50	1.40-1.70	<0.06	0.10-0.18	6.6-8.4	High----------	0.37		

Table 17.--Soil and Water Features

(See text for definitions of terms used in this table. 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			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					Ft			In			
AxB--Axtell	D	None	---	---	>6.0	---	---	>60	---	High	Moderate.
BeA, BeB--Benchley	D	None	---	---	>6.0	---	---	>60	---	High	Moderate.
BoA, BoB--Boonville	D	None	---	---	0.5-1.0	Perched	Dec-Feb	>60	---	High	Low.
BrB:											
Boonville	D	None	---	---	0.5-1.0	Perched	Dec-Feb	>60	---	High	Low.
Urban land.											
BuA, BuB, BuC--Burleson	D	None	---	---	>6.0	---	---	>60	---	High	Moderate.
BwC, BwD--Burlewash	D	None	---	---	>6.0	---	---	20-40	Soft	High	High.
ChC, ChD--Chazos	C	None	---	---	>6.0	---	---	>60	---	High	Moderate.
CoA--Coarsewood	B	Rare	---	---	>6.0	---	---	>60	---	Low	Low.
CrB, CrB2--Crockett	D	None	---	---	>6.0	---	---	>60	---	High	Low.
DeA:											
Derly	D	None	---	---	0-1.5	Perched	Dec-Apr	>60	---	High	High.
Rader	D	None	---	---	2.0-5.0	Perched	Dec-Mar	>60	---	High	Moderate.
DfC--Desan	A	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
DmA--Dimebox	D	None	---	---	>6.0	---	---	>60	---	High	High.
DuC--Dutek	A	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
EuB--Eufaula	A	None	---	---	>6.0	---	---	>60	---	Low	Moderate.
FaB--Falba	D	None	---	---	0.5-1.5	Perched	Oct-May	20-40	Soft	High	Moderate.
Gd--Gladewater	D	Frequent	Long or very long.	Nov-May	1.5-3.5	Perched	Nov-May	>60	---	High	Moderate.
GrC, GrC2, GrD, GvC--Gredge	D	None	---	---	>6.0	---	---	>60	---	High	Low.

Table 17.--Soil and Water Features--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					Ft			In			
GyC--Greenvine	D	None	---	---	>6.0	---	---	20-40	Soft	High	Low.
HbA--Highbank	C	Rare	---	---	>6.0	---	---	>60	---	High	Low.
Ka--Kaufman	D	Frequent	Very brief or brief.	Feb-May	1.5-3.5	Perched	Nov-Apr	>60	---	High	Low.
KrD:											
Koether	D	None	---	---	>6.0	---	---	7-20	Hard	Low	High.
Rock outcrop.											
KuC, KuD--Kurten	D	None	---	---	>6.0	---	---	>60	---	High	Moderate.
LfA--Lufkin	D	None	---	---	>6.0	---	---	>60	---	High	Moderate.
LuB, LuD--Luling	D	None	---	---	>6.0	---	---	>60	---	High	Low.
MaA--Mabank	D	None	---	---	>6.0	---	---	>60	---	High	Moderate.
MrA:											
Mabank	D	None	---	---	>6.0	---	---	>60	---	High	Moderate.
Rader	D	None	---	---	2.0-4.0	Perched	Dec-Mar	>60	---	High	Moderate.
NvB--Navasan	A	None	---	---	4.0-6.0	Perched	Jan-Dec	>60	---	High	High.
PaC--Padina	B	None	---	---	>6.0	---	---	>60	---	High	Moderate.
Pt. Pits											
RaB--Rader	D	None	---	---	2.0-4.0	Perched	Dec-Mar	>60	---	High	Moderate.
RbA:											
Rader	D	None	---	---	2.0-4.0	Perched	Dec-Mar	>60	---	High	Moderate.
Tabor	D	None	---	---	>6.0	---	---	>60	---	High	High.
ReC--Rehburg	C	None	---	---	3.0-4.0	Perched	Dec-Apr	40-60	Soft	High	High.
RoB--Robco	C	None	---	---	1.5-3.5	Perched	Jan-Apr	>60	---	High	High.
Rr--Roetex	D	Frequent	Long or very long.	Oct-May	+.5-2.0	Apparent	Oct-May	>60	---	Low	Low.
RsC, RsD, RtC--Rosanky	C	None	---	---	>6.0	---	---	>60	---	High	Low.

Table 17.--Soil and Water Features--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					Ft			In			
RuC:											
Rosanky	C	None	---	---	>6.0	---	---	>60	---	High	Low.
Urban land.											
Sa	C	Frequent	Brief	Dec-May	3.5-6.0	Perched	Dec-Apr	>60	---	High	Low.
Sandow											
Sb:											
Sandow	C	Frequent	Brief	Dec-May	3.5-6.0	Perched	Dec-Apr	>60	---	High	Low.
Urban land.											
ScC:											
Shalba	D	None	---	---	>6.0	---	---	7-20	Soft	High	Moderate.
Rock outcrop.											
ShA, ShC	D	Rare	---	---	>6.0	---	---	>60	---	High	Low.
Ships											
SkB	C	None	---	---	>6.0	---	---	20-40	Soft	High	Moderate.
Shiro											
SmC, SmD	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
Silawa											
SnB	D	None	---	---	>6.0	---	---	20-40	Soft	High	Moderate.
Singleton											
SpB	C	None	---	---	>6.0	---	---	>60	---	High	Moderate.
Spiller											
SxB	B	None	---	---	3.5-4.5	Perched	Dec-May	>60	---	Moderate	Moderate.
Styx											
TaA, TgB	D	None	---	---	>6.0	---	---	>60	---	High	High.
Tabor											
TuA:											
Tabor	D	None	---	---	>6.0	---	---	>60	---	High	High.
Urban land.											
Uh	B	Frequent	Brief	Feb-Jun	2.0-3.5	Perched	Mar-May	>60	---	High	Low.
Uhland											
Ur.											
Urban land											
Us	D	None	---	---	>6.0	---	---	>60	---	High	Low.
Ustarents											
WeA, WeC, WwA	B	Rare	---	---	>6.0	---	---	>60	---	High	Low.
Weswood											
Wy:											
Weswood	B	Frequent	Brief	Mar-Sep	>6.0	---	---	>60	---	High	Low.
Yahola	B	Frequent	Very brief	Apr-Oct	>6.0	---	---	>80	---	Low	Low.

Table 17.--Soil and Water Features--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					Ft			In			
WzA---------- Wilson	D	None--------	---	---	>6.0	---	---	>60	---	High-----	High.
YaA---------- Yahola	B	Rare--------	---	---	>6.0	---	---	>60	---	Low------	Low.
ZaB, ZaC2, ZaD, ZaE3---------- Zack	D	None--------	---	---	>6.0	---	---	>60	---	High-----	Low.
ZcB, ZcD:											
Zack----------	D	None--------	---	---	>6.0	---	---	>60	---	High-----	Low.
Urban land.											
ZuB---------- Zulch	D	None--------	---	---	>6.0	---	---	>60	---	High-----	Moderate.

Table 18.--Physical Analyses of Selected Soils

(The abbreviation "COLE" means coefficient of linear extensibility. Analyses by the Soil Characterization Laboratory, Texas Agricultural Experiment Station, College Station, Texas. Dashes indicate that data were not available)

Soil name and sample number	Depth	Horizon	Particle-size distribution (percentage by weight)								COLE	Bulk density (1/3 bar)	Water content (1/3 bar)
			Sand						Silt (0.05-0.002 mm)	Clay (<0.002 mm)			
			Very coarse (2-1 mm)	Coarse (1-0.5 mm)	Medium (0.5-0.25 mm)	Fine (0.25-0.10 mm)	Very fine (0.10-0.05 mm)	Total Sand (2.0-0.05 mm					
	In		Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Cm/cm	g/cc	Pct (wt)
Benchley[1]	0-10	A	---	---	---	---	---	44.6	30.4	24.9	---	---	---
(S62TX-21-90)	10-16	Bt	---	---	---	---	---	35.1	27.8	37.2	---	---	---
	16-30	Btss1	0.8	1.3	0.5	15.6	12.1	30.3	25.6	44.1	---	---	---
	30-44	Btss2	2.7	2.1	0.7	15.0	12.4	32.7	27.5	39.8	---	---	---
	44-54	Btss3	1.3	1.2	0.6	15.0	12.5	30.6	29.1	40.4	---	---	---
	54-70	BCt	15.9	6.6	1.5	11.8	7.1	42.8	22.8	34.4	---	---	---
	70-80	Ck	2.8	2.8	0.8	8.8	5.3	20.3	27.2	52.4	---	---	---

Boonville[2]	0-8	A	---	---	---	---	---	47.5	39.5	13.1	---	---	---
(S53TX-21-90)	8-11	Btg1	---	---	---	---	---	30.9	26.2	42.9	---	---	---
	11-23	Btg2	---	---	---	---	---	32.7	27.1	40.3	---	---	---
	23-35	Btg3	---	---	---	---	---	35.7	31.1	33.2	---	---	---
	35-47	BCg	---	---	---	---	---	39.3	30.8	30.0	---	---	---
	47-64	Cg1	---	---	---	---	---	38.0	32.9	29.2	---	---	---
	64-74	Cg2	---	---	---	---	---	27.6	33.6	38.9	---	---	---
Boonville[3]	0-6	A	0.6	0.5	2.9	24.3	22.3	50.6	40.5	8.9	0.03	1.43	27.8
(S83TX-041-001)	6-9	E	0.1	0.2	2.6	25.6	22.4	50.9	40.0	9.1	0.02	1.56	19.6
	9-15	Btg1	0.4	0.3	1.6	15.1	12.6	30.0	28.8	41.2	---	---	---
	15-24	Btg2	0.2	0.2	1.9	18.8	14.9	36.0	27.3	36.7	---	---	---
	24-31	Btg3	0.3	0.1	2.0	19.0	16.5	37.9	30.1	32.0	---	---	---
	31-40	Btgk1	0.5	0.5	2.0	20.4	15.6	39.0	28.4	32.7	---	---	---
	40-50	Btgk2	2.1	1.6	2.3	17.1	14.0	37.1	31.9	31.0	---	---	---
	50-67	Btgk3	1.2	1.3	3.7	17.3	13.9	37.4	21.8	40.8	---	---	---
	67-81	2BC	0.0	0.1	1.1	29.5	17.2	47.9	25.0	27.1	---	---	---
	81-123	2CB1	0.0	0.0	0.5	10.3	12.4	23.2	37.9	38.9	---	---	---
	123-142	2CB2	0.0	0.0	0.1	3.8	18.0	21.9	37.3	40.8	---	---	---
	142-151	3CB3	0.0	0.2	0.5	3.6	4.8	9.1	41.4	49.5	---	---	---
	151-173	4C1	0.0	0.1	0.1	1.3	3.2	4.7	44.3	51.0	---	---	---
	173-197	4C2	0.1	0.1	0.2	1.1	4.0	5.5	52.9	41.6	---	---	---

See footnotes at end of table.

Table 18.--Physical Analyses of Selected Soils--Continued

Soil name and sample number	Depth	Horizon	Particle-size distribution (percentage by weight)								COLE	Bulk density (1/3 bar)	Water content (1/3 bar)
			Sand						Silt (0.05-0.002 mm)	Clay (<0.002 mm)			
			Very coarse (2-1 mm)	Coarse (1-0.5 mm)	Medium (0.5-0.25 mm)	Fine (0.25-0.10 mm)	Very fine (0.10-0.05 mm)	Total Sand (2.0-0.05 mm					
	In		Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Cm/cm	g/cc	Pct (wt)
Boonville[4]	0-10	Ap	0.0	0.0	2.1	35.1	29.1	66.3	27.4	6.3	0.01	1.47	17.6
(S84TX-041-001)	10-15	E	0.1	0.1	1.9	34.7	26.4	63.2	31.8	5.0	0.00	1.52	14.0
	15-20	Bt1	0.0	0.0	0.8	19.5	12.1	32.4	16.3	51.3	0.12	1.28	37.2
	20-30	Bt2	0.0	0.1	1.4	24.5	18.6	44.6	15.2	40.2	0.08	1.50	26.4
	30-37	Bt3	0.0	0.1	1.4	27.2	19.0	47.7	23.8	28.5	0.03	1.68	18.7
	37-47	Bt4	0.0	0.1	1.4	28.0	18.1	48.4	24.0	27.6	0.02	1.72	17.3
	47-61	2Bt5	0.0	0.1	0.9	20.4	17.7	39.1	24.9	36.0	0.04	1.53	23.7
	61-83	2C/Bt	0.6	0.4	1.2	11.2	9.2	22.6	24.9	52.5	0.04	1.27	35.1
	83-102	2C	0.0	0.0	0.2	55.7	14.3	70.2	9.8	20.0	0.00	1.37	17.7
Boonville[1]	0-4	Ap	1.1	0.9	3.7	36.6	27.8	70.1	23.6	6.3	---	---	---
(S85TX-041-004)	4-10	A	0.6	0.7	3.1	31.4	27.3	63.1	28.6	8.3	0.03	1.55	21.6
	10-17	Eg	1.0	0.6	3.1	32.2	27.8	64.7	30.0	5.3	0.03	1.59	17.8
	17-24	Btssg1	0.4	0.2	1.7	17.9	16.5	36.7	22.0	41.3	0.11	1.29	37.4
	24-36	Btssg2	0.8	0.3	1.4	16.3	15.8	34.6	25.4	40.0	0.12	1.38	36.4
	36-41	Btg	1.6	0.7	1.6	16.7	16.7	37.3	27.5	35.2	0.10	1.48	28.5
	41-56	Btk	1.2	0.7	1.8	21.3	18.1	43.1	27.1	29.8	0.09	1.48	28.7
	56-64	BCt1	0.6	0.4	1.3	23.3	18.9	44.5	27.6	27.9	---	---	---
	64-73	BCt2	0.2	0.5	0.9	18.8	17.6	38.0	28.4	33.6	0.07	1.42	29.5
	73-80	2CB	1.5	2.1	1.8	13.3	18.5	37.2	29.4	33.4	---	---	---
	80-98	2Cr	0.1	0.1	0.2	7.0	8.8	16.2	25.2	58.6	---	---	---
Burlewash[5]	0-4	A	0.8	1.1	0.8	2.2	37.7	42.6	47.7	9.7	0.02	1.35	15.8
(S88TX-041-003)	4-7	E	1.1	1.2	0.9	2.3	35.9	41.4	43.6	15.0	0.03	1.32	28.2
	7-13	Bt1	0.2	0.2	0.2	0.3	5.3	6.2	14.6	79.2	0.17	1.07	46.1
	13-23	Bt2	0.2	0.4	0.2	0.4	3.6	4.8	19.6	75.6	0.17	1.13	41.1
	23-33	Bt3	0.3	0.4	0.2	0.3	3.6	4.8	25.1	70.1	0.16	1.17	39.3
	33-39	BCt	0.2	0.1	0.1	0.2	1.9	2.5	22.8	74.7	0.14	1.23	33.7
	39-51	CB	0.0	0.0	0.0	0.0	3.6	3.6	21.0	75.5	0.16	1.17	39.8
	51-65	C	0.0	0.0	0.0	0.2	2.7	2.9	20.6	76.5	0.15	1.20	38.4
Coarsewood[1]	0-7	Ap	0.1	0.1	0.1	0.7	33.0	34.0	58.4	7.6	0.07	1.33	29.4
(S88TX-041-001)	7-25	Bw1	0.0	0.1	0.1	0.8	33.4	34.4	57.6	8.0	0.05	1.38	24.5
	25-48	Bw2	0.0	0.1	0.2	1.6	29.6	31.5	56.4	12.1	0.02	1.18	26.9
	48-65	C1	0.0	0.0	0.1	0.7	31.8	32.6	57.9	9.5	0.03	1.31	32.6
	65-80	C2	0.0	0.0	0.1	0.8	46.5	46.5	45.7	7.8	0.02	1.26	35.0

See footnotes at end of table.

Table 18.--Physical Analyses of Selected Soils--Continued

Soil name and sample number	Depth	Horizon	Particle-size distribution (percentage by weight)								COLE	Bulk density (1/3 bar)	Water content (1/3 bar)
			Sand						Silt (0.05-0.002 mm)	Clay (<0.002 mm)			
			Very coarse (2-1 mm)	Coarse (1-0.5 mm)	Medium (0.5-0.25 mm)	Fine (0.25-0.10 mm)	Very fine (0.10-0.05 mm)	Total Sand (2.0-0.05 mm					
	In		Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Cm/cm	g/cc	Pct (wt)
Gredge[1]	0-7	A	1.1	0.4	2.1	31.4	26.7	61.7	28.7	9.6	---	---	---
(S84TX-041-005)	7-13	Bt1	0.3	0.2	2.1	20.6	11.7	34.9	17.9	47.2	0.07	1.37	27.2
	13-21	Bt2	0.2	0.1	1.8	19.2	12.0	33.3	25.4	41.3	0.05	1.42	27.2
	21-27	Bt3	0.0	0.1	1.2	21.8	16.2	39.3	30.1	30.6	0.06	1.52	24.2
	27-40	Bt4	0.0	0.0	0.5	26.1	16.2	42.8	29.1	28.1	---	---	---
	40-57	BCt1	0.0	0.0	1.4	26.4	15.6	43.4	30.7	25.9	---	---	---
	57-68	BCt2	0.0	0.2	5.4	26.7	10.5	42.8	25.4	31.8	---	---	---
Kurten[1]	0-4	Ap	0.9	0.7	1.0	10.6	18.1	31.3	56.0	12.7	0.04	1.50	25.3
(S88TX-041-005)	4-11	Bt	0.9	0.9	0.7	5.8	6.7	15.0	24.9	60.1	0.09	1.46	20.2
	11-20	Btss1	0.6	0.9	0.9	2.8	5.1	10.3	28.5	61.2	0.11	1.42	23.9
	20-33	Btss2	0.8	1.0	0.9	1.9	4.4	9.0	30.8	60.2	0.11	1.41	27.4
	33-45	BCtss	0.6	1.2	1.1	1.8	4.8	9.5	30.7	59.8	0.14	1.24	36.9
	45-58	C1	1.0	2.4	2.0	2.7	5.9	14.0	27.8	58.2	0.14	1.20	38.1
	58-80	C2	0.7	2.2	2.1	2.3	4.8	12.1	27.9	60.0	0.15	1.25	36.2
Mabank[6]	0-4	Ap	0.0	0.0	1.5	62.8	12.9	77.2	6.3	16.5	0.02	1.28	29.8
(S87TX-041-002)	4-7	E	0.0	0.0	1.5	62.4	11.8	75.7	4.9	19.4	0.02	1.49	23.2
	7-11	BE	0.1	0.2	1.3	14.8	15.9	32.3	44.5	23.2	0.04	1.47	22.1
	11-24	Btg1	0.1	0.1	1.0	9.3	10.2	20.7	40.4	38.9	0.08	1.52	23.5
	24-34	Btg2	0.1	0.1	1.0	9.6	10.7	22.2	40.0	37.8	0.08	1.55	23.9
	34-44	Bgy1	0.3	0.3	1.2	11.6	13.4	26.8	28.0	45.2	0.04	1.72	16.8
	44-53	Bgy2	0.2	0.4	1.4	12.8	15.7	30.5	26.3	43.2	0.05	1.63	19.8
	53-63	2BCy	0.5	0.6	1.1	8.4	12.4	23.0	27.7	49.3	0.06	1.61	21.7
	63-75	2CB	0.1	0.2	0.6	2.5	4.0	7.4	29.2	63.4	0.12	1.33	35.0
	75-87	2C	0.5	1.0	0.9	1.6	4.6	8.6	38.1	53.3	0.12	1.26	39.6
Rader[6]	0-7	A	0.1	0.2	2.7	40.7	26.9	70.6	26.6	2.8	0.02	1.42	23.8
(S86TX-041-004)	7-22	E1	0.1	0.2	2.7	40.9	26.2	70.1	26.3	3.6	0.02	1.52	19.6
	22-26	E2	0.1	0.2	2.8	41.2	27.1	71.4	26.3	2.3	0.00	1.56	17.3
	26-31	B/E1	0.2	0.2	2.8	40.5	23.4	67.1	26.8	6.1	0.03	1.55	19.3
	31-34	B/E2	0.1	0.2	2.4	37.5	20.7	60.9	23.7	15.4	0.05	1.39	29.5
	34-42	Btg1	0.1	0.1	1.7	22.6	13.4	37.9	17.7	44.4	0.09	1.30	34.5
	42-52	Btg2	0.0	0.1	1.6	25.4	16.9	44.0	24.3	31.7	0.02	1.77	14.9
	52-65	Btg3	0.1	0.1	1.8	32.6	17.7	52.3	21.8	25.9	0.02	1.85	12.9
	65-88	Btg4	0.0	0.0	1.6	37.9	16.5	56.0	18.6	25.4	0.02	1.75	17.5
	88-100	CB	0.0	0.0	0.5	37.2	20.2	57.9	17.6	24.5	0.04	1.66	19.8

See footnotes at end of table.

Table 18.--Physical Analyses of Selected Soils--Continued

Soil name and sample number	Depth	Horizon	Particle-size distribution (percentage by weight)								COLE	Bulk density (1/3 bar)	Water content (1/3 bar)
			Sand						Silt (0.05-0.002 mm)	Clay (<0.002 mm)			
			Very coarse (2-1 mm)	Coarse (1-0.5 mm)	Medium (0.5-0.25 mm)	Fine (0.25-0.10 mm)	Very fine (0.10-0.05 mm)	Total Sand (2.0-0.05 mm					
	In		Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Cm/cm	g/cc	Pct (wt)
Sandow[1]	0-6	A1	0.0	0.0	0.4	9.8	16.4	26.6	45.1	28.3	0.08	1.36	28.2
(S88TX-041-002)	6-15	A2	0.0	0.0	0.4	15.5	24.0	39.9	41.7	18.4	0.06	1.31	31.3
	15-20	Bw	0.0	0.1	0.8	23.6	27.6	52.1	34.3	13.6	0.04	1.31	29.7
	20-28	Ab	0.0	0.0	0.7	21.2	25.3	47.2	27.0	25.8	0.08	1.39	28.4
	28-34	Bwb1	0.1	0.1	1.0	26.1	23.8	51.1	27.0	21.9	0.07	1.42	27.8
	34-41	Bwb2	0.0	0.1	1.5	34.7	25.8	62.1	21.8	16.1	0.06	1.45	27.3
	41-46	BCb	0.0	0.1	2.5	45.9	25.7	74.2	14.3	11.5	0.05	1.54	23.7
	46-54	A'b	0.0	0.1	5.8	49.1	19.1	74.1	11.5	14.4	0.05	1.57	23.1
	54-80	Btgb	0.0	0.1	3.5	44.3	19.0	66.9	17.5	15.6	0.06	1.54	22.6
Singleton[8]	0-5	A	---	---	---	---	---	49.9	43.3	6.8	---	---	---
(S54TX-21-91)	5-7	E	---	---	---	---	---	50.5	42.8	6.7	---	---	---
	7-21	Btg1	---	---	---	---	---	22.0	29.7	48.3	---	---	---
	21-35	Btg2	---	---	---	---	---	19.4	33.8	46.8	---	---	---
	35-46	BCg	---	---	---	---	---	9.1	47.3	43.6	---	---	---
	46-70	C	---	---	---	---	---	2.4	43.6	54.0	---	---	---
Singleton[9]	0-7	A	0.2	0.3	2.4	21.7	47.5	72.1	17.6	10.3	0.02	1.44	30.7
(S88TX-041-004)	7-13	Bt1	0.0	0.0	1.2	13.8	24.8	39.8	10.6	49.6	0.15	1.25	37.0
	13-22	Bt2	0.0	0.1	1.0	24.1	17.8	43.0	11.9	45.1	0.13	1.29	36.5
	22-28	B/C	0.0	0.2	1.1	29.8	18.2	49.0	11.5	39.5	0.11	1.25	37.0
	28-35	C	0.1	0.2	0.7	27.3	14.2	42.5	14.3	43.2	0.08	1.21	42.9
	35-59	Cr	0.0	0.0	0.9	49.1	9.5	59.5	6.4	34.1	0.08	1.20	42.4
Tabor[1]	0-6	Ap	1.4	5.0	11.4	33.6	20.6	72.0	22.2	5.8	0.02	1.49	24.9
(S87TX-041-001)	6-14	E	1.4	5.1	11.8	30.3	19.7	68.3	24.7	7.0	0.01	1.49	21.6
	14-23	Btss1	1.5	3.9	8.2	25.4	17.4	56.4	22.7	20.9	0.03	1.46	24.6
	23-33	Btss2	0.6	2.1	5.5	14.7	9.1	32.0	14.7	53.3	0.11	1.36	29.5
	33-42	Btss2	0.9	2.4	5.3	14.6	11.5	34.7	21.2	44.1	0.10	1.48	29.0
	42-57	Btss3	0.6	2.6	6.3	17.2	12.3	39.0	24.4	36.6	0.05	1.62	19.9
	57-67	Btg	0.9	3.4	9.0	21.6	11.6	46.5	21.2	32.3	0.07	1.55	23.8
	67-72	BCtg1	1.7	4.6	10.5	23.7	12.6	53.1	22.4	24.5	---	---	---
	72-80	BCtg2	0.9	4.4	11.5	28.2	13.3	58.3	19.4	22.3	0.09	1.47	28.8

See footnotes at end of table.

Table 18.--Physical Analyses of Selected Soils--Continued

Soil name and sample number	Depth	Horizon	Particle-size distribution (percentage by weight)								COLE	Bulk density (1/3 bar)	Water content (1/3 bar)
			Sand						Silt (0.05-0.002 mm)	Clay (<0.002 mm)			
			Very coarse (2-1 mm)	Coarse (1-0.5 mm)	Medium (0.5-0.25 mm)	Fine (0.25-0.10 mm)	Very fine (0.10-0.05 mm)	Total Sand (2.0-0.05 mm					
	In		Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Cm/cm	g/cc	Pct (wt)
Zack[1]	0-7	Ap	0.8	0.6	0.8	6.2	39.0	63.8	23.7	12.5	---	---	---
(S84TX-041-002)	7-18	Bt1	0.1	0.0	0.2	6.8	20.7	27.5	17.9	54.6	0.16	1.20	42.2
	18-24	Bt2	0.0	0.1	0.1	13.5	22.7	27.3	23.5	49.2	0.10	1.32	32.6
	24-36	2BCk	0.5	0.2	0.1	8.8	42.6	46.6	25.1	28.3	0.03	1.41	26.5
	36-60	2Ck	0.0	0.0	0.1	10.0	41.7	43.7	29.4	26.9	0.01	1.36	25.3

[1] Location of pedon sample is the same as the location given for the series in the section "Soil Series and Their Morphology."

[2] Location of pedon sample: From the intersection of Farm Road 2818 and Farm Road 60 on the west side of College Station, Texas, 0.7 mile north on Farm Road 2818, 1.1 miles east on F&B Road, 200 feet north.

[3] Location of pedon sample: From the intersection of Farm Road 2154 and Joe Routt Boulevard on TAMU Campus, 0.5 mile west on Joe Routt Boulevard, 300 feet southwest, in a pasture.

[4] Location of pedon sample: From the intersection of Texas Highway 21 and Farm Road 60 on the east side of Bryan, east on Farm Road 60 to intersection with Farm Road 158, then 4,100 feet north.

[5] Location of pedon sample: From the intersection of Texas Highway 6 and Greens Prairie Road, 0.4 mile east on Greens Prairie Road to a wire gate, 300 feet northeast of gate.

[6] Location of pedon sample: From the intersection of Texas Highway 6 and North Texas Avenue on the north side of Bryan, 0.45 mile south on Texas Avenue, 500 feet east in old field.

[7] Location of pedon sample: From the intersection of Texas Highway 21 and Farm Road 2038 near Kurten, 3.8 miles east on Farm Road 2038, 1.0 mile north on Clear Lake Road, 0.4 mile on pasture road, 200 feet northwest, on mound.

[8] Location of pedon sample: From Wellborn, 1.2 miles south on Farm Road 2154, cross railroad on county road; site 100 feet north of road and 100 feet west of railroad.

[9] Location of pedon sample: From the intersection of Texas Highway 6 and Rock Prairie Road, 1.2 miles south on Texas Highway 6, 0.2 mile west on subdivision road, 300 feet south along drainage ditch.

Table 19.--Chemical Analyses of Selected Soils

(The abbreviation "CEC" means cation-exchange capacity. Analyses by the Soil Characterization Laboratory, Texas Agricultural Experiment Station, College Station, Texas. Dashes indicate that data were not available)

Soil name and sample number	Depth	Horizon	Extractable bases				CEC	Base saturation	Organic carbon	pH (H_2O 1:1)	Exchangeable sodium	Sodium adsorption ratio
			Ca	Mg	Na	K						
	In		Meq/100 grams					Pct	Pct	pH	Pct	
Benchley[1]	0-10	A	13.2	3.9	0.2	0.2	24.1	73	1.60	5.9	---	---
(S62TX-21-90)	10-16	Bt	17.2	5.3	0.3	0.3	31.6	73	1.50	5.7	---	---
	16-30	Btss1	16.7	5.2	0.2	0.4	29.4	77	0.80	5.8	---	---
	30-44	Btss2	17.4	4.3	0.2	0.3	28.4	78	0.40	5.6	---	---
	44-54	Btss3	18.5	4.2	0.3	0.3	29.2	80	0.30	5.7	---	---
	54-70	BCt	22.9	4.3	0.3	0.4	29.9	90	0.20	6.2	---	---
	70-80	Ck	---	4.4	0.4	0.5	43.9	---	0.20	7.7	---	---
Boonville[2]	0-8	A	6.0	1.6	0.1	0.4	11.5	71	1.04	6.3	---	---
(S53TX-21-90)	8-11	Btg1	15.8	6.0	0.2	0.2	29.8	74	0.87	5.3	---	---
	11-23	Btg2	17.9	5.2	0.2	2.5	29.0	89	0.52	5.6	---	---
	23-35	Btg3	17.4	5.0	0.2	3.3	26.9	97	0.41	7.0	---	---
	35-47	BCg	---	5.1	0.2	3.7	24.6	---	0.17	7.9	---	---
	47-64	Cg1	---	4.9	0.2	3.9	22.7	---	0.06	8.0	---	---
	64-74	Cg2	---	5.9	0.2	5.2	28.9	---	0.06	7.7	---	---
Boonville[3]	0-6	Ap	4.8	0.8	0.1	0.2	7.6	78	0.91	6.1	1	1
(S83TX-041-001)	6-9	E	2.9	0.8	0.1	0.1	5.5	71	0.27	5.8	2	1
	9-15	Btg1	12.4	6.5	0.4	0.2	31.0	63	0.44	4.6	1	1
	15-24	Btg2	14.2	6.2	0.7	0.2	26.2	82	0.32	4.8	3	2
	24-31	Btg3	14.6	6.0	1.0	0.2	24.6	89	0.27	5.4	4	4
	31-40	Btgk1	26.6	6.6	1.3	0.2	26.1	100	0.21	7.8	4	4
	40-50	Btgk2	75.8	6.4	1.7	0.1	24.9	100	0.18	7.6	4	3
	50-67	Btgk3	41.6	8.3	3.4	0.3	29.0	100	0.14	7.6	7	4
	67-81	2CB	14.8	5.4	2.8	0.3	23.5	99	0.07	7.1	8	5
	81-123	2CB1	19.7	7.2	2.9	0.4	30.8	98	0.06	6.7	7	5
	123-142	2CB2	19.5	6.9	2.9	0.4	29.0	100	0.08	6.8	8	4
	142-151	3CB3	21.1	7.4	3.8	0.6	34.4	96	0.21	7.1	8	7
	151-173	4C1	19.7	9.1	3.2	0.5	37.8	86	0.11	6.9	8	5
	173-197	4C2	18.7	7.9	2.9	0.4	33.3	90	0.12	6.7	7	5
Boonville[4]	0-10	Ap	1.6	0.8	0.1	0.1	3.8	68	0.53	5.4	3	---
(S84TX-041-001)	10-15	E	1.2	0.6	0.2	0.0	2.6	77	0.22	5.9	8	---
	15-20	Bt1	13.6	8.2	2.1	0.4	29.4	83	1.06	6.7	7	---
	20-30	Bt2	12.4	6.9	2.1	0.3	24.3	90	0.33	7.8	7	6
	30-37	Bt3	8.6	4.7	1.8	0.2	16.3	94	0.15	8.2	9	7
	37-47	Bt4	10.9	4.9	2.0	0.2	16.6	100	0.10	8.5	10	7
	47-61	2Bt5	12.4	6.7	2.8	0.3	22.9	97	0.14	8.5	10	8
	61-83	2C/Bt	27.1	9.1	4.0	0.4	32.3	100	0.16	8.3	10	8
	83-102	2C	8.6	3.9	1.4	0.2	14.1	100	0.01	8.0	8	8
Boonville[1]	0-4	Ap	4.8	0.3	0.0	0.1	6.5	80	0.63	6.1	0	---
(S85TX-041-004)	4-10	A	3.9	0.5	0.0	0.0	5.7	77	0.49	6.0	0	---
	10-17	Eg	1.7	0.1	0.0	0.0	3.0	60	0.24	6.1	0	---
	17-24	Btssg1	14.8	5.8	1.5	0.3	27.6	81	0.66	6.2	5	---
	24-36	Btssg2	15.0	6.5	2.2	0.6	33.7	72	0.30	6.9	7	---
	36-41	Btg	31.6	7.8	2.2	0.3	30.8	100	0.38	8.1	6	6
	41-56	Btk	45.4	6.7	2.3	0.3	25.9	100	0.59	8.4	7	7
	56-64	BCt1	23.8	6.2	2.4	0.3	24.3	100	0.22	8.3	8	7
	64-73	BCt2	16.9	6.3	2.6	0.3	26.9	97	0.09	8.0	8	7
	73-80	2CB	17.6	6.3	2.7	0.3	26.6	100	0.08	7.8	9	7
	80-98	2Cr	40.7	12.6	3.7	0.7	57.7	100	0.08	7.7	6	---

See footnotes at end of table.

Table 19.--Chemical Analyses of Selected Soils--Continued

Soil name and sample number	Depth	Horizon	Extractable bases				CEC	Base saturation	Organic carbon	pH (H_2O 1:1)	Exchangeable sodium	Sodium adsorption ratio
			Ca	Mg	Na	K						
	In		Meq/100 grams					Pct	Pct	pH	Pct	
Burlewash[5]	0-4	A	2.7	1.1	0.1	0.5	10.2	44	1.72	4.6	1	---
(S88TX-041-003)	4-7	E	0.9	1.2	0.2	0.4	7.8	35	0.53	4.7	3	---
	7-13	Bt1	2.4	5.5	2.2	1.0	40.2	28	0.86	4.2	5	7
	13-23	Bt2	5.3	5.9	3.1	0.8	38.5	39	0.67	4.1	7	9
	23-33	Bt3	5.9	6.4	3.8	0.8	36.3	47	0.60	4.0	9	12
	33-39	BCt	8.9	8.2	4.5	0.9	37.3	61	0.39	3.7	9	13
	39-51	CB	10.8	8.8	5.1	1.0	38.6	67	0.33	3.6	8	13
	51-65	C	27.7	9.2	4.9	1.1	38.9	100	0.32	3.5	5	7
Coarsewood[1]	0-7	Ap	41.1	2.4	0.1	0.8	8.1	100	0.47	8.3	1	---
(S88TX-041-001)	7-25	Bw1	41.6	1.7	0.2	0.2	4.9	100	0.22	8.4	4	---
	25-48	Bw2	41.7	1.9	0.3	0.3	6.7	100	0.34	8.4	5	---
	48-65	C1	42.0	2.0	0.2	0.2	5.3	100	0.23	8.5	4	---
	65-80	C2	40.6	1.8	0.1	0.2	4.7	100	0.31	8.4	2	---
Gredge[1]	0-7	A	0.9	1.0	0.1	0.1	8.0	27	1.02	4.8	1	---
(S84TX-041-005)	7-13	Bt1	3.0	4.2	0.5	0.3	25.6	31	0.87	4.5	2	---
	13-21	Bt2	2.7	4.1	0.7	0.2	23.9	32	0.53	4.5	3	---
	21-27	Bt3	3.1	4.1	0.9	0.2	19.0	44	0.47	4.6	5	---
	27-40	Bt4	3.6	4.4	1.0	0.2	17.4	53	0.33	4.7	6	---
	40-57	BCt1	5.3	5.1	1.8	0.2	17.3	72	0.26	5.2	9	9
	57-68	BCt2	7.8	6.4	2.8	0.2	18.4	93	0.23	6.3	10	9
Kurten[1]	0-4	Ap	12.1	3.7	0.1	1.7	25.1	70	5.02	5.6	0	1
(S88TX-041-005)	4-11	Bt	3.9	4.6	0.5	1.0	30.8	33	0.77	3.9	1	3
	11-20	Btss1	7.4	6.6	1.4	0.7	34.8	46	0.46	3.8	3	5
	20-33	Btss2	9.9	7.5	2.5	0.7	33.9	61	0.41	3.7	5	8
	33-45	BCtss	11.7	8.9	4.5	0.7	34.0	76	0.33	3.6	9	8
	45-58	C1	54.6	7.9	4.7	0.8	32.3	100	0.42	3.4	8	6
	58-80	C2	24.2	10.1	4.9	0.8	33.1	100	0.46	3.5	8	5
Mabank[6]	0-4	Ap	6.6	1.8	0.3	0.1	7.8	100	0.99	7.2	3	2
(S87TX-041-002)	4-7	E	4.2	1.9	0.3	0.1	6.6	98	0.64	6.7	4	3
	7-11	BE	10.1	5.4	1.1	0.1	14.8	100	0.96	6.5	7	5
	11-24	Btg1	15.2	11.2	3.5	0.2	28.8	100	0.93	6.3	11	8
	24-34	Btg2	14.9	12.7	3.8	0.2	26.8	100	0.90	6.5	10	7
	34-44	Bgy1	183.5	9.7	3.6	0.2	15.8	100	0.27	6.3	15	5
	44-53	Bgy2	182.7	11.1	4.1	0.2	---	---	0.17	6.0	---	5
	53-63	2BCy	142.3	11.2	4.4	0.2	18.3	100	0.17	5.3	14	5
	63-75	2CB	99.0	13.4	5.5	0.4	25.8	100	0.14	5.1	12	5
	75-87	2C	41.8	14.9	5.3	0.4	25.6	100	0.15	4.8	11	5
Rader[7]	0-7	A	0.8	0.6	0.0	0.0	3.0	47	0.25	5.3	0	---
(S86TX-041-004)	7-22	E1	0.5	0.8	0.0	0.0	2.0	65	0.15	5.1	0	---
	22-26	E2	0.2	0.8	0.0	0.0	1.3	77	0.08	4.8	0	---
	26-31	B/E1	0.5	1.0	0.1	0.0	2.5	69	0.11	4.6	4	---
	31-34	B/E2	1.6	1.2	0.4	0.1	8.3	40	0.19	4.7	5	---
	34-42	Btg1	7.0	4.0	1.6	0.3	25.4	55	0.31	4.5	7	---
	42-52	Btg2	6.9	3.9	1.4	0.2	18.1	69	0.22	4.6	8	---
	52-65	Btg3	7.7	4.0	1.8	0.2	16.2	85	0.12	4.9	11	---
	65-88	Btg4	8.0	4.0	2.4	0.2	16.2	90	0.09	5.6	15	---
	88-100	CB	9.4	4.3	3.2	0.2	16.8	100	0.08	6.2	19	---

See footnotes at end of table.

Table 19.--Chemical Analyses of Selected Soils--Continued

Soil name and sample number	Depth	Horizon	Extractable bases				CEC	Base saturation	Organic carbon	pH (H_2O 1:1)	Exchangeable sodium	Sodium adsorption ratio
			Ca	Mg	Na	K						
	In		Meq/100 grams					Pct	Pct	pH	Pct	
Sandow[1]	0-6	A1	19.2	3.6	0.1	0.4	25.8	90	2.17	5.9	0	---
(S88TX-041-002)	6-15	A2	11.4	2.2	0.1	0.2	14.1	99	0.73	6.3	1	---
	15-20	Bw	7.4	1.9	0.1	0.2	8.8	100	0.44	6.6	1	---
	20-28	Ab	12.9	4.7	0.4	0.3	19.0	97	0.32	6.1	2	---
	28-34	Bwb1	9.0	3.6	0.6	0.2	14.3	94	0.21	5.5	4	---
	34-41	Bwb2	5.5	2.7	0.5	0.2	10.4	85	0.17	5.7	5	---
	41-46	BCb	4.1	2.2	0.7	0.1	7.2	99	0.11	6.0	10	---
	46-54	A'b	6.0	3.0	1.8	0.2	9.7	100	0.08	7.1	12	9
	54-80	Btgb	8.4	4.2	2.2	0.2	11.5	100	0.10	7.6	11	7
Singleton[8]	0-5	A	3.7	0.6	0.2	0.4	6.9	71	1.28	5.8	---	---
(S54TX-21-91)	5-7	E	2.3	0.7	0.2	0.2	6.1	56	0.52	5.3	---	---
	7-21	Btg1	16.1	6.7	3.3	0.3	35.4	75	0.70	4.6	---	---
	21-35	Btg2	---	8.0	4.7	0.3	37.6	---	0.52	4.6	---	---
	35-46	BCg	---	4.4	7.4	0.5	34.1	---	0.29	4.7	---	---
	46-70	C	---	12.0	8.7	0.5	44.9	---	0.23	4.7	---	---
Singleton[9]	0-7	A	3.9	1.3	0.2	0.1	7.9	71	0.50	5.4	3	---
(S88TX-041-004)	7-13	Bt1	17.8	7.1	1.8	0.3	37.2	73	0.63	4.9	5	---
	13-22	Bt2	21.3	8.4	3.6	0.4	35.7	94	0.47	4.7	8	8
	22-28	B/C	18.5	7.3	3.2	0.3	31.7	92	0.33	4.7	8	8
	28-35	C	21.8	8.5	3.9	0.4	35.7	97	0.24	5.4	8	9
	35-59	Cr	19.0	6.3	3.7	0.3	29.8	99	0.13	6.6	8	11
Tabor[1]	0-6	Ap	1.3	0.5	0.0	0.0	3.3	55	0.43	5.3	0	---
(S87TX-041-001)	6-14	E	1.3	0.6	0.1	0.0	2.9	69	0.31	5.2	3	---
	14-23	Btss1	2.9	1.5	0.4	0.0	6.7	73	0.43	5.6	6	---
	23-33	Btss2	9.6	5.3	1.8	0.2	21.0	81	0.60	5.4	9	---
	33-42	Btss2	10.8	6.1	2.7	0.2	18.1	100	0.25	5.9	15	---
	42-57	Btss3	10.6	5.6	2.9	0.2	18.0	100	0.28	6.7	14	10
	57-67	Btg	9.0	5.3	3.0	0.2	15.2	100	0.18	7.1	16	12
	67-72	BCtg1	7.8	4.4	2.5	0.1	12.0	100	0.08	7.2	17	12
	72-80	BCtg2	6.8	3.8	2.0	0.1	10.1	100	0.07	7.3	16	13
Zack[1]	0-7	Ap	2.9	1.3	0.2	0.2	7.7	61	0.67	5.2	3	---
(S84TX-041-002)	7-18	Bt1	19.2	9.9	2.3	0.4	31.9	82	0.87	6.4	6	---
	18-24	Bt2	22.5	11.4	3.1	0.4	39.1	96	0.73	7.3	7	6
	24-36	2BCk	17.0	7.7	2.5	0.3	25.1	100	0.49	8.0	8	7
	36-60	2Ck	12.6	7.3	3.5	0.3	22.9	100	0.17	7.7	11	9

[1] Location of pedon sample is the same as the location given for the series in the section "Soil Series and Their Morphology."

[2] Location of pedon sample: From the intersection of Farm Road 2818 and Farm Road 60 on the west side of College Station, Texas, 0.7 mile north on Farm Road 2818, 1.1 miles east on F&B Road, 200 feet north.

[3] Location of pedon sample: From the intersection of Farm Road 2154 and Joe Routt Boulevard on TAMU Campus, 0.5 mile west on Joe Routt Boulevard, 300 feet southwest, in a pasture.

[4] Location of pedon sample: From the intersection of Texas Highway 21 and Farm Road 60 on the east side of Bryan, east on Farm Road 60 to intersection with Farm Road 158, then 4,100 feet north.

[5] Location of pedon sample: From the intersection of Texas Highway 6 and Greens Prairie Road, 0.4 mile east on Greens Prairie Road to a wire gate, 300 feet northeast of gate.

[6] Location of pedon sample: From the intersection of Texas Highway 6 and North Texas Avenue on the north side of Bryan, 0.45 mile south on Texas Avenue, 500 feet east in old field.

[7] Location of pedon sample: From the intersection of Texas Highway 21 and Farm Road 2038 near Kurten, 3.8 miles east on Farm Road 2038, 1.0 mile north on Clear Lake Road, 0.4 mile on pasture road, 200 feet northwest, on mound.

[8] Location of pedon sample: From Wellborn, 1.2 miles south on Farm Road 2154, cross railroad on county road; site 100 feet north of road and 100 feet west of railroad.

[9] Location of pedon sample: From the intersection of Texas Highway 6 and Rock Prairie Road, 1.2 miles south on Texas Highway 6, 0.2 mile west on subdivision road, 300 feet south along drainage ditch.

Table 20.--Engineering Index Test Data

(Dashes indicate that data were not available. LL means liquid limit; PI, plasticity index; and NP, nonplastic)

Soil name, sample number, horizon, and depth in inches	Classification		Grain-size distribution									LL	PI
			Percentage passing sieve--						Percentage smaller than--				
	AASHTO	Unified	No. 4	No. 10	No. 20	No. 40	No. 140	No. 200	.05 mm	.005 mm	.002 mm		
												Pct	
Burlewash*													
(S88TX-041-003)													
A------ 0 to 4	A-4	ML	100	100	96	94	88	76	52	14	7	---	NP
E------ 4 to 7	A-4	ML	100	100	97	96	93	52	52	18	10	---	NP
Bt1---- 7 to 13	A-7-5(43)	CH	100	100	100	100	100	90	84	78	48	73	40
Bt2---- 13 to 23	A-7-5(46)	CH	100	100	100	100	100	91	86	79	48	75	43
Bt3---- 23 to 33	A-7-6(45)	CH	100	100	100	100	100	90	84	71	48	72	43
BCt---- 33 to 39	A-7-6(49)	CH	100	100	100	100	100	91	89	78	48	74	47
CB----- 39 to 51	A-7-6(57)	CH	100	100	100	100	100	98	96	79	48	78	49
C------ 51 to 65	A-7-6(57)	CH	100	100	100	100	100	92	91	76	47	82	54
Coarsewood**													
(S88TX-041-001)													
Ap----- 0 to 7	A-4	ML	100	100	100	99	98	93	75	19	13	---	NP
Bw1---- 7 to 25	A-4	ML	100	100	100	100	99	66	60	10	8	---	NP
Bw2---- 25 to 48	A-4	ML	100	100	100	100	99	78	68	20	15	---	NP
C1----- 48 to 65	A-4	ML	100	100	100	100	99	64	60	12	8	---	NP
C2----- 65 to 80	A-4	ML	100	100	100	100	100	66	64	15	11	---	NP
Kurten**													
(S88TX-041-005)													
Ap----- 0 to 4	A-4	ML	100	100	92	89	73	65	52	16	9	---	NP
Bt----- 4 to 11	A-7-6(33)	CH	100	100	100	100	100	81	78	65	47	63	38
Btss1-- 11 to 20	A-7-6(42)	CH	100	100	100	100	100	88	83	68	47	66	43
Btss2-- 20 to 33	A-7-6(42)	CH	100	100	100	100	100	84	81	66	47	69	47
BCtss-- 33 to 45	A-7-6(43)	CH	100	100	100	100	100	88	84	68	47	67	44
C1----- 45 to 58	A-7-6(41)	CH	100	100	100	100	100	84	79	70	47	67	46
C2----- 58 to 80	A-7-6(58)	CH	100	100	100	100	100	91	89	78	47	81	57
Navasan**													
(S88TX-041-006)													
A------ 0 to 4	A-2-4	SM	100	100	99	96	18	14	10	8	4	---	NP
E1----- 4 to 15	A-3	SP-SM	100	100	100	98	13	6	3	3	2	---	NP
E2----- 15 to 31	A-3	SP-SM	100	100	100	97	10	6	0	0	0	---	NP
E3----- 31 to 51	A-3	SP-SM	100	100	100	98	10	6	0	0	0	---	NP
B/E---- 51 to 61	A-2-4	SM	100	100	100	99	26	18	13	12	10	---	NP
Bt----- 61 to 66	A-2-4	SM	100	100	100	98	21	14	7	6	6	---	NP
Btg1--- 66 to 74	A-2-4	SM	100	100	100	100	39	26	16	16	14	---	NP
Btg2--- 74 to 90	A-2-4	SM	100	100	100	100	58	34	24	14	13	---	NP
C------ 90 to 100	A-2-4	SM	100	100	100	99	43	56	12	6	5	---	NP
Sandow**													
(S88TX-041-002)													
A1----- 0 to 6	A-7-6(17)	CL	100	100	99	98	90	78	71	37	27	43	23
A2----- 6 to 15	A-4(3)	CL	100	100	100	100	84	59	53	24	17	28	10
Bw----- 15 to 20	---	---	100	100	100	100	73	49	39	16	11	---	---
Ab----- 20 to 28	A-6(6)	CL	100	100	100	100	78	57	45	28	23	35	16
Bwb1--- 28 to 34	A-6(3)	SC	100	100	100	100	74	49	41	25	21	31	13
Bwb2--- 34 to 41	---	---	100	100	100	100	62	38	28	16	13	---	---
BCb---- 41 to 46	A-2-4	SM	100	100	100	100	53	29	23	12	11	---	NP
A'b---- 46 to 54	A-2-4	SM	100	100	100	100	45	28	19	13	13	---	NP
Btgb--- 54 to 80	A-2-4	SM	100	100	100	100	43	28	18	12	12	---	NP

See footnotes at end of table.

Table 20.--Engineering Index Test Data--Continued

Soil name, sample number, horizon, and depth in inches	Classification		Grain-size distribution									LL	PI
			Percentage passing sieve--						Percentage smaller than--				
	AASHTO	Unified	No. 4	No. 10	No. 20	No. 40	No. 140	No. 200	.05 mm	.005 mm	.002 mm		
												Pct	
Singleton***													
(S88TX-041-004)													
A------ 0 to 7	A-4	SM	100	100	100	99	73	42	27	11	8	---	NP
Bt1---- 7 to 13	A-7-6(22)	CH	100	100	100	100	84	66	53	47	45	57	36
Bt2---- 13 to 22	A-7-6(19)	CH	100	100	100	100	77	59	45	44	39	57	38
B/C---- 22 to 28	A-7-6(18)	CH	100	100	100	100	71	57	46	46	40	59	38
C------ 28 to 35	A-7-6(29)	CH	100	100	100	100	67	55	46	39	33	51	69
Cr----- 35 to 59	A-7-6(4)	SC	100	100	100	99	52	43	38	32	31	40	20
Tabor**													
(S87TX-041-001)													
Ap----- 0 to 6	A-4	SM	91	89	87	82	44	36	23	9	3	---	NP
E------ 6 to 14	A-4	SM	93	90	88	81	45	36	25	9	5	---	NP
Btss1-- 14 to 23	A-4(0)	SC	81	75	72	69	45	37	29	18	14	23	8
Btss2-- 23 to 33	A-7-6(33)	CH	96	94	93	91	75	68	61	53	45	73	49
Btss2-- 33 to 42	A-7-6	CL	94	92	91	89	72	67	60	43	38	---	---
Btss3-- 42 to 57	A-7-6(15)	CL	100	100	99	96	72	62	53	39	33	44	29
Btg---- 57 to 67	A-7-6(15)	CL	100	100	99	95	67	58	46	32	31	47	33
BCtg--- 67 to 72	A-6(10)	CL	98	97	96	91	59	53	44	29	24	40	26
Weswood**													
(S88TX-041-008)													
Ap----- 0 to 8	A-4	ML	100	100	100	99	98	75	70	17	11	---	NP
Bw----- 8 to 18	A-4	ML	100	100	100	100	99	87	73	18	13	---	NP
Bw----- 18 to 24	A-4	ML	100	100	100	100	100	99	89	19	13	---	NP
C1----- 24 to 30	A-4	CL	100	100	100	100	100	98	91	28	20	30	10
C2----- 30 to 34	A-4(9)	ML	100	100	100	100	99	83	77	17	12	---	NP
C3----- 34 to 40	A-4	ML	100	100	100	100	99	97	84	18	12	---	NP
C4----- 40 to 80	A-4	ML	100	100	100	100	100	97	78	18	13	---	NP
Zack**													
(S88TX-041-002)													
Ap----- 0 to 7	A-4	ML	---	100	99	99	80	56	32	12	7	---	NP
Bt1---- 7 to 18	A-7-6(25)	CH	---	100	100	100	100	72	64	53	45	57	35
Bt2---- 18 to 24	A-7-6(29)	CH	---	100	---	100	95	74	56	43	36	59	40
2BCk--- 24 to 36	A-7-6(52)	CH	---	100	100	100	100	84	76	60	47	78	57
2Ck---- 36 to 60	A-7-6(11)	CL	---	---	---	100	98	69	46	25	20	41	17

* Location of pedon sample: From the intersection of Texas Highway 6 and Greens Prairie Road, 0.4 mile east on Greens Prairie Road to a wire gate, 300 feet northeast of gate.

** Location of pedon sample is the same as that given for the series in the section "Soil Series and Their Morphology."

*** Location of pedon sample: From the intersection of Texas Highway 6 and Rock Prairie Road, 1.2 miles south on Texas Highway 6, 0.2 mile west on subdivision road, 300 feet south along drainage ditch.

Table 21.--Classification of the Soils

Soil name	Family or higher taxonomic class
Axtell	Fine, smectitic, thermic Udertic Paleustalfs
Benchley	Fine, smectitic, thermic Udertic Argiustolls
Boonville	Fine, smectitic, thermic Chromic Vertic Albaqualfs
Burleson	Fine, smectitic, thermic Udic Haplusterts
Burlewash	Fine, smectitic, thermic Ultic Paleustalfs
Chazos	Fine, smectitic, thermic Udic Paleustalfs
Coarsewood	Coarse-silty, mixed, superactive, calcareous, thermic Udic Ustifluvents
Crockett	Fine, smectitic, thermic Udertic Paleustalfs
Derly	Fine, smectitic, thermic Typic Glossaqualfs
Desan	Loamy, siliceous, active, thermic Grossarenic Paleustalfs
Dimebox	Fine, smectitic, thermic Udic Haplusterts
Dutek	Loamy, siliceous, active, thermic Arenic Haplustalfs
Eufaula	Siliceous, thermic Psammentic Paleustalfs
Falba	Fine, smectitic, thermic Aquic Paleustalfs
Gladewater	Very fine, smectitic, thermic Chromic Endoaquerts
Gredge	Fine, smectitic, thermic Udic Paleustalfs
Greenvine	Fine, smectitic, thermic Leptic Udic Haplusterts
Highbank	Fine, mixed, active, thermic Udertic Haplustepts
Kaufman	Very fine, smectitic, thermic Typic Hapluderts
Koether	Sandy-skeletal, siliceous, thermic Lithic Ustorthents
Kurten	Fine, smectitic, thermic Udertic Paleustalfs
Lufkin	Fine, smectitic, thermic Oxyaquic Vertic Paleustalfs
Luling	Fine, smectitic, thermic Udic Haplusterts
Mabank	Fine, smectitic, thermic Oxyaquic Vertic Paleustalfs
Navasan	Loamy, siliceous, active, thermic Grossarenic Paleustalfs
Padina	Loamy, siliceous, active, thermic Grossarenic Paleustalfs
Rader	Fine-loamy, mixed, semiactive, thermic Aquic Paleustalfs
Rehburg	Loamy, mixed, active, thermic Aquic Arenic Paleustalfs
Robco	Loamy, siliceous, active, thermic Aquic Arenic Paleustalfs
Roetex	Very fine, mixed, active, thermic Aquic Hapluderts
Rosanky	Fine, mixed, semiactive, thermic Ultic Paleustalfs
Sandow	Fine-loamy, siliceous, superactive, thermic Udifluventic Haplustepts
Shalba	Clayey, smectitic, thermic, shallow Udic Haplustalfs
Ships	Very fine, mixed, active, thermic Chromic Hapluderts
Shiro	Fine, mixed, active, thermic Udic Paleustalfs
Silawa	Fine-loamy, siliceous, semiactive, thermic Ultic Haplustalfs
Singleton	Fine, smectitic, thermic Udic Paleustalfs
Spiller	Fine, mixed, semiactive, thermic Ultic Paleustalfs
Styx	Loamy, siliceous, active, thermic Arenic Paleustalfs
Tabor	Fine, smectitic, thermic Oxyaquic Vertic Paleustalfs
Uhland	Coarse-loamy, siliceous, superactive, thermic Aquic Haplustepts
Weswood	Fine-silty, mixed, superactive, thermic Udifluventic Haplustepts
Wilson	Fine, smectitic, thermic Oxyaquic Vertic Haplustalfs
Yahola	Coarse-loamy, mixed, superactive, calcareous, thermic Udic Ustifluvents
Zack	Fine, smectitic, thermic Udertic Paleustalfs
Zulch	Fine, smectitic, thermic Udertic Paleustalfs

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