United States Department of Agriculture

Natural Resources Conservation Service

In cooperation with Texas Agricultural Experiment Station

Soil Survey of Lee 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.

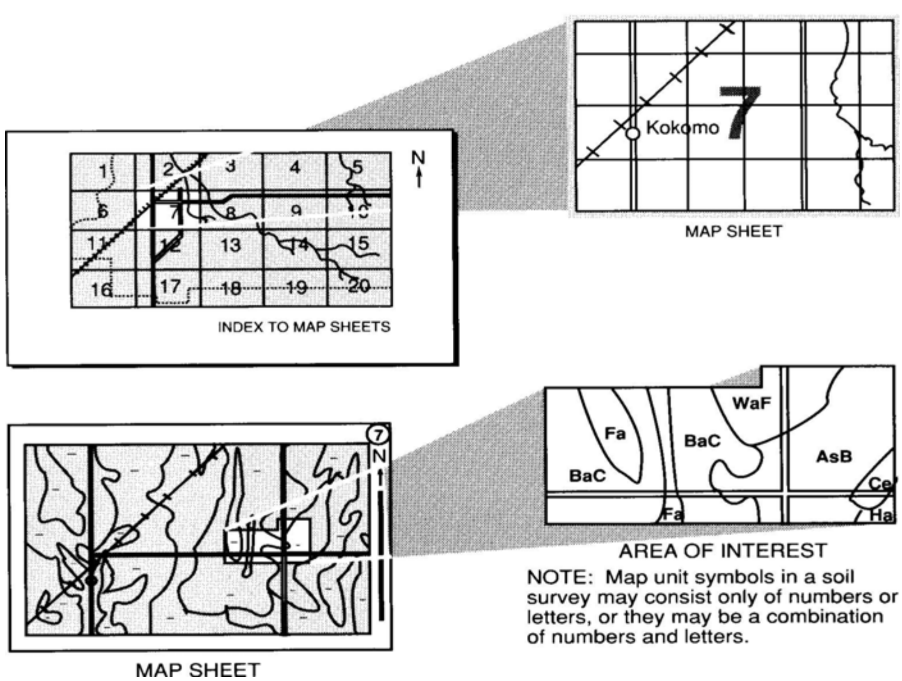
Detailed Soil Maps

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 go to that sheet.

Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Go 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 Station, and local agencies. The Natural Resources Conservation Service has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 2002. Soil names and descriptions were approved in 2002. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 2002. This survey was made cooperatively by the Natural Resources Conservation Service, and the Texas Agricultural Experiment Station. The survey is part of the technical assistance furnished to the Lee County Soil and Water Conservation District.

Cover: Grain sorghum and peanuts on an area of Rader fine sandy loam, 1 to 3 percent slopes.

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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September 2007

Foreword

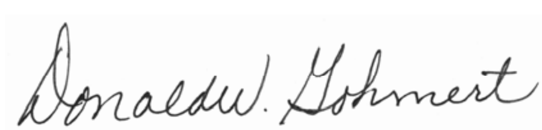
This soil survey contains information that affects land use planning in this survey area. It contains predictions of soil behavior for selected land uses. The survey also highlights soil limitations, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

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 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.



DON W. GOHMERT
State Conservationist
Natural Resources Conservation Service

Soil Survey of Lee County, Texas

By Maurice R. Jurena, USDA-Natural Resources Conservation Service

Fieldwork by: Dennis N. Brezina, Nathan I. Haile, Stacey A. Kloesel, Harold W. Hyde, and Maurice R. Jurena, USDA-Natural Resources Conservation Service

United States Department of Agriculture, Natural Resources Conservation Service, in cooperation with Texas Agricultural Experiment Station

Lee County is in the southeastern part of Central Texas (fig. 1). The total area, which includes water areas, is 404,755 acres or 631 square miles. The county is about 31 miles long and 22 miles wide. The topography is mostly nearly level to rolling and generally slopes to the southeast. The elevation ranges from about 770 feet above sea level in the northwestern part to about 270 feet above sea level in the southern part. The county is drained by numerous creeks and streams. The East, Middle, and West Yegua creeks drain the northern and central part of the county and combine to flow into Somerville Lake. Much of the southern third of the county is drained by Knobbs, Rabbs, and Nails creeks.

Parts of two Major Land Resource Areas are in Lee County. The Texas Blackland Prairie extends through the central portion of the county in a southeasterly direction. It follows the Old Spanish Road which is Texas Highway 21. The Texas Claypan Area occupies the areas north and south of the Texas Blackland Prairie. Major land resource areas are geographic areas of the United States that have particular patterns of soils, potential natural vegetation, water resources, climate, and land uses. The Texas Blackland Prairie consists mainly of dark colored loamy and clayey soils that formed under native grassland vegetation of mid and tall grasses. The dominantly light colored loamy and sandy soils of the Texas Claypan Area formed under native savannah vegetation of oak trees and mid and tall grasses.

About 55 percent of the county is used as rangeland, about 30 percent is used as pasture or hayland, about 10 percent is used as cropland and about 5 percent is used for purposes other than agriculture such as urban development, transportation facilities, recreation and wildlife habitat.

General Nature of the Survey Area

This section gives general information concerning settlement and population, agriculture, natural resources, and climate of the Lee County.

Settlement and Population

The earliest known historical inhabitants of Lee County were the Tonkawa Indians. They were hunter-gathers and were generally friendly toward European settlers. By the mid 1800's they had met their demise by European diseases and by the Comanche and Cherokee Indian tribes.

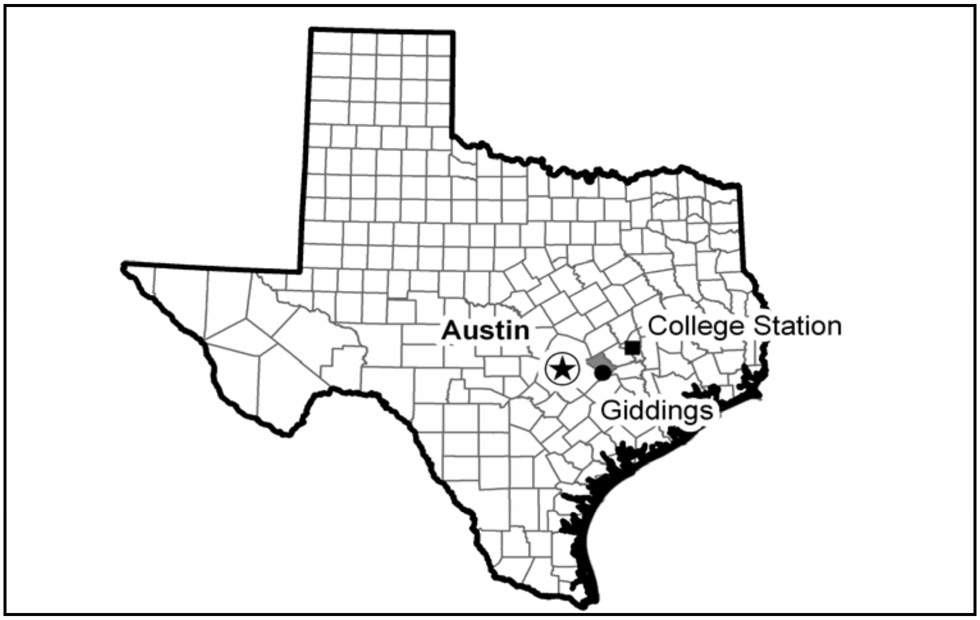


Figure 1.—Location of Lee County, Texas.

This area was presumably explored by Europeans around 1691, when Domingo Teran de los Rios tried to find a direct route between San Antonio de Bexar and the Spanish missions in East Texas. The route he laid out, later became known as the Old San Antonio Road. It passed through the present site of Lincoln along Texas Highway 21 in central Lee County.

The first known white settler was James Gotier, who settled on Rabbs Creek in southern Lee County in 1835. Settlement in this area remained sparse until after the Texas Revolution. Then immigrants from other southern states began settling the area. At the same time, slaves were introduced into the area. Between 1850 and 1860, the population increased with a large influx of German immigrants. In 1854, a large group of Wends bought a league of land along Rabbs Creek in southern Lee County and settled in and around Serbin.

In 1871, the town of Giddings was founded in what was then Washington County. Soon residents wanted to form their own county because of the distance from the county seat. In 1874, Lee County was created from Burleson, Washington, Bastrop, and Fayette counties. It was named in honor of Robert E. Lee. Soon thereafter, a heated dispute began between the towns of Giddings and Lexington over the location of the county seat. Even though Lexington was surrounded by better farmland, Giddings was selected because it was a railroad town. The Houston and Texas Central Railway extended its rail lines from Brenham through Giddings to Austin in 1871. Giddings became a major shipping point for county farmers and businesses.

The county experienced another growth in population between 1874 and 1900. Large numbers of Germans and Czechs, as well as smaller numbers of Moravians and Danes settled into the county during the 1880s and 1890s.

Agriculture was the main economic activity in Lee County. Cotton was the main cash crop grown with corn and other grain crops being produced in lesser amounts. By 1940, cotton production had decreased dramatically because of overproduction, soil erosion, the boll weevil, and the effects of the Great Depression. After World War II, cropland steadily decreased, and cattle ranching, swine production, and poultry production became important parts of the agricultural economy. Manufacturing plants of furniture and boats were established after World War II. In the early 1980s, Lee County experienced an oil and natural gas boom. This created a significant increase in the economy due to oil and natural gas production. With this activity, many oil field related businesses settled into the area creating jobs for many local citizens.

In the 1990s, Giddings and areas in the northwestern portion of Lee County, notably in the Blue Community, have experienced population growth due to their proximity to Austin. Other small communities in the county are also increasing in population. Giddings, the county seat had a population of 5,105 in 2000. Other towns and communities in the county are Adina, Blue, Dime Box, Fedor, Hills, Lexington, Lincoln, Loebau, Manheim, Northrup, Post Oak, Serbin, Tanglewood, and The Knobbs. The county population in 1999 was 14,871.

Agriculture

Livestock, hay, and crops are the main agricultural enterprises in Lee County. Crop production, mainly cotton and corn, were once the primary land use. However, a significant conversion of land from cultivation of crops to production of forage grasses has greatly increased the importance of the livestock industry in the county. This conversion of land use has been mostly on the less productive, cultivated soils in the northern and southern parts of the county.

Beef cattle, poultry, and swine are important sources of agricultural income in Lee County. The most important of these is the production of beef cattle, primarily from cow-calf operations. Livestock are pastured year-round but require hay and feed supplements in winter. Improved cool-season grasses and legumes may be provided for grazing in the winter and spring.

Corn, grain sorghum, and small grains are still produced on the Blackland Prairie soils that parallel Texas Highway 21 through Lee County. Small areas of peanuts are grown on loamy and sandy soils in upland and terrace positions. Water erosion is still a major concern when these soils are cultivated because it reduces much of the productivity of the land.

Natural Resources

Soil is the most important natural resource in Lee County. It supports all the agricultural production, which is the major source of income.

Numerous oil and natural gas wells provide a source of income for some landowners. Drilling and servicing of these wells provide jobs for many people.

Deposits of lignite coal are in the northwestern part of Lee County. Some of the land has been leased or purchased for lignite mining. Mining operations, power generation, and mined land reclamation are activities expected to continue well into the future.

Gravel deposits, located in the southern part of Lee County, are mined for road and highway materials.

Water is also an important natural resource in the county. Somerville Lake, in the southeastern part, supplies flood control, municipal water, fishing, and other recreational activities. The Yegua Creek, Nails Creek, and many smaller streams and lakes provide abundant water supplies for the county. Farm ponds, which are numerous, provide water for livestock and fishing. Most areas in the county have ample supplies of good quality underground water.

Fish and wildlife are other important natural resources in Lee County. They provide opportunities for recreation and for added income for some landowners. Some areas in the county are leased for deer hunting.

Climate

Prepared by the Natural Resources Conservation Service National Water and Climate Center, Portland, Oregon

Lee County is hot in summer and cool in winter, when an occasional surge of cold air causes a sharp drop in otherwise mild temperatures. Rainfall is distributed mostly in the fall, winter, and spring months, being less frequent during the summer months. Snowfall is infrequent. Annual total precipitation is normally adequate for the production of corn, grain sorghum, peanuts, small grains, and improved grasses for hay production.

Thunderstorm days, relative humidity, percent sunshine, and wind information are estimated from First Order Station, Austin, Texas.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Smithville in the period 1971 to 2000. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on the length of the growing season.

In winter, the average temperature is 51 degrees F and the average daily minimum temperature is 38 degrees. The lowest temperature on record, which occurred at Smithville on January 18, 1930, was -1 degree. In summer, the average temperature is 82 degrees and the average daily maximum temperature is 95 degrees. The highest temperature, which occurred at Smithville on September 5, 2000, was 111 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 average annual total precipitation is about 38 inches. Of this, about 30 inches, or 78 percent, usually falls in March through November. The growing season for most crops falls within this period. The heaviest 1-day rainfall during the period of record was 6.05 inches at Smithville on June 30, 1940. Thunderstorms occur on about 41 days each year, and most occur in between April and September.

The average seasonal snowfall is less than 1 inch. The greatest snow depth at any one time during the period of record was 7 inches recorded on December 21, 1929. On an average, less than 1 day each year has at least 1 inch of snow on the ground.

The average relative humidity in mid-afternoon is about 45 percent in the summer and around 55 percent in the winter. Humidity is higher at night, and the average at dawn is around 80 percent in the winter and 90 percent in the summer. The sun shines 73 percent of the time in summer and 50 percent in winter. The prevailing wind is from the south. Average wind speed is highest, around 11 miles per hour, in March and April.

How This Survey Was Made

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

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

Commonly, individual soils are 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.

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

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.

The soils in Lee County are grouped into 12 general soil map units. They make up about 99 percent of the total acres. The rest is covered by water.

Sandy and Loamy Savannah Soils on Uplands

This group of soils makes up about 48 percent of Lee County. Burlewash, Crockett, Edge, Gasil, Jedd, Kurten, Padina, Robco, Silstid, Singleton, Spiller, Tabor, and Winedale are the major soils. They developed in shale, siltstones, and sandstones.

They are very gently sloping to steep and they are moderately well drained or well drained. Permeability is moderate to very slow.

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 suited to crops, although they were farmed in the past. Peanuts, watermelons, and small grains are grown in a few areas. The soils in this group are used mainly as improved pasture and hayland or as rangeland. Pasture grasses include improved bermudagrass and bahiagrass. Native grasses include bluestem, indiangrass, paspalum, and panicum. Trees are dominantly post oak and blackjack oak with an understory of yaupon. Some areas are strip mined for lignite.

These soils have some limitations for most urban uses, mainly a high shrink-swell potential, restricted permeability, low soil strength, seepage, and hazard of erosion during construction.

1. Padina-Robco-Silstid

Sandy, very deep, very gently sloping to moderately steep, well drained and moderately well drained soils

This map unit makes up about 23 percent of the county. It is 34 percent Padina soils, 22 percent Robco soils, 14 percent Silstid soils, and 30 percent soils of minor extent (fig. 2).

The Padina and Silstid soils are on summits, shoulders, and upper backslopes of broad ridges. The Robco soils are on footslopes and toeslopes of ridges. Slope ranges from 1 to 15 percent. The underlying material is sandy residuum. Areas of this map unit are an important aquifer recharge source.

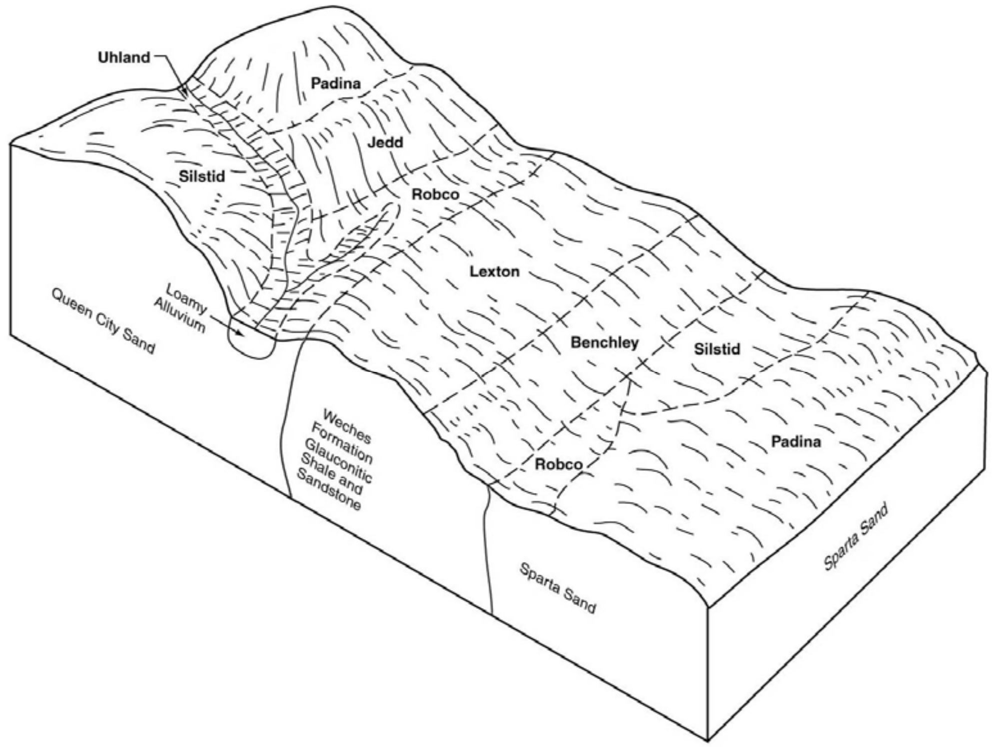


Figure 2.—Landscape and parent material of the Padina-Robco-Silstid general soil map unit.

The Padina soils are very deep and moderately permeable. Typically, the surface layer is slightly acid, brown loamy fine sand. The subsurface layer is neutral, very pale brown loamy fine sand. The upper part of the subsoil is very strongly acid, very pale brown sandy clay loam with red and strong brown iron concentrations. The lower part is very strongly acid, reddish yellow sandy clay loam with light brownish gray iron depletions.

The Robco soils are very deep and slowly permeable. Typically, the surface layer is moderately acid, brown loamy fine sand. The subsurface layer is strongly acid, loamy fine sand. It is pale brown in the upper part and light gray in the lower part. The upper part of the subsoil is strongly acid, brownish yellow sandy clay loam with streaks and pockets of light gray loamy fine sand. The middle part of the subsoil is very strongly acid, light brownish gray sandy clay loam with red, strong brown, and brownish yellow iron concentrations. The lower part is very strongly acid, light gray sandy clay loam with red and brownish yellow iron concentrations.

The Silstid soils are very deep and moderately permeable. Typically, the surface layer is slightly acid, brown loamy fine sand. The subsurface layer is slightly acid, very pale brown loamy fine sand. The upper part of the subsoil is moderately acid, brownish yellow sandy clay loam with red iron concentrations. The middle part of the subsoil is strongly acid, yellow and light red sandy clay loam with red and brownish yellow iron concentrations, and light brownish gray iron depletions. The lower part is strongly acid, light red sandy clay loam with brownish yellow and strong brown iron concentrations and light brownish gray iron depletions.

Of minor extent in this map unit are Arenosa, Gasil, Jedd, Rader, Rosanky, Silawa, Tabor, and Uhland soils. Arenosa soils are on broad, smooth ridges. Gasil soils are on summit and backslopes of ridges. Jedd soils are on summit, shoulder, and upper backslopes of narrow ridgetops. Rader and Tabor soils are on very gently sloping toeslopes and low ridges of local stream terraces. Rosanky soils are on summit and shoulder of ridges. Silawa soils are on convex ridges of local stream terraces. Uhland soils are on flood plains of local streams.

The soils of this map unit are used mainly as rangeland. Many areas are used as pasture and hayland, and a few areas are planted in peanuts.

Native grasses include bluestem, indiangrass, dropseed, and panicum. Most areas have a post oak and blackjack oak canopy with a dense yaupon understory that greatly decreases native plant growth.

Areas of pasture and hayland are planted mainly to improved bermudagrass. Applying lime and fertilizer increases yields.

The major soils in this map unit have some limitations for most urban uses, mainly steepness of slope and seepage. Proper design and careful installation of building foundations, septic tank absorption fields, roads, and streets can overcome these limitations.

2. Edge-Crockett-Tabor

Loamy, deep and very deep, very gently sloping to moderately sloping, well drained and moderately well drained

This map unit makes up about 11 percent of the county. It is 48 percent Edge soils, 6 percent Crockett soils, 6 percent Tabor soils, and 40 percent soils of minor extent (fig. 3).

The Edge and Crockett soils are on summit, shoulder, and upper backslopes positions on broad ridges. The underlying material is weakly consolidated siltstone and shale. The Tabor soils are on stream terraces.

The Edge soils are deep and very slowly permeable. Typically, the surface layer is strongly acid, brown fine sandy loam. The subsurface layer is strongly acid, light brown fine sandy loam. The upper part of the subsoil is very strongly acid and strongly acid, red clay with brown iron concentrations. The lower part is strongly acid, reddish yellow clay loam with red and yellowish brown iron concentrations. The underlying material is brownish yellow weakly consolidated siltstone with strata of fine sandy loam.

The Crockett soils are very deep and very slowly permeable. Typically, the surface layer is moderately acid, brown fine sandy loam. The upper part of the subsoil is moderately acid, reddish brown and yellow clay with brown, brownish yellow, and yellowish red iron concentrations. The lower part is moderately alkaline, light yellowish brown and pale yellow clay with brownish yellow and red iron concentrations. The underlying material is moderately alkaline, light gray shale.

The Tabor soils are very deep and very slowly permeable. Typically, the surface layer is pale moderately acid, brown fine sandy loam. The subsurface layer is slightly acid, very pale brown fine sandy loam. The upper part of the subsoil is strongly acid, light brownish gray clay with yellowish brown and red iron concentrations. The middle part is neutral, light yellowish brown and light gray clay loam with yellow iron concentrations. The lower part is slightly alkaline, light gray sandy clay loam.

Of minor extent in this map unit are Chazos, Dutek, Gasil, Jedd, Lufkin, Padina, Rader, Robco, Sandow, Silawa, Silstid, and Uhland soils. Chazos, Dutek, and Silawa soils are on convex ridges of local terraces. Gasil soils are on lower backslopes of ridges. Jedd soils are on summit and shoulder of ridges. Lufkin, Rader, and Robco soils are on nearly level or very gently sloping toeslopes and flats. Padina and Silstid soils are on summit and shoulder of ridges. Sandow and Uhland soils are on flood plains of local streams.

The soils in this map unit are used mainly as rangeland or pasture and hayland. Some areas are strip mined for lignite. Some areas are planted in small grains for winter grazing.

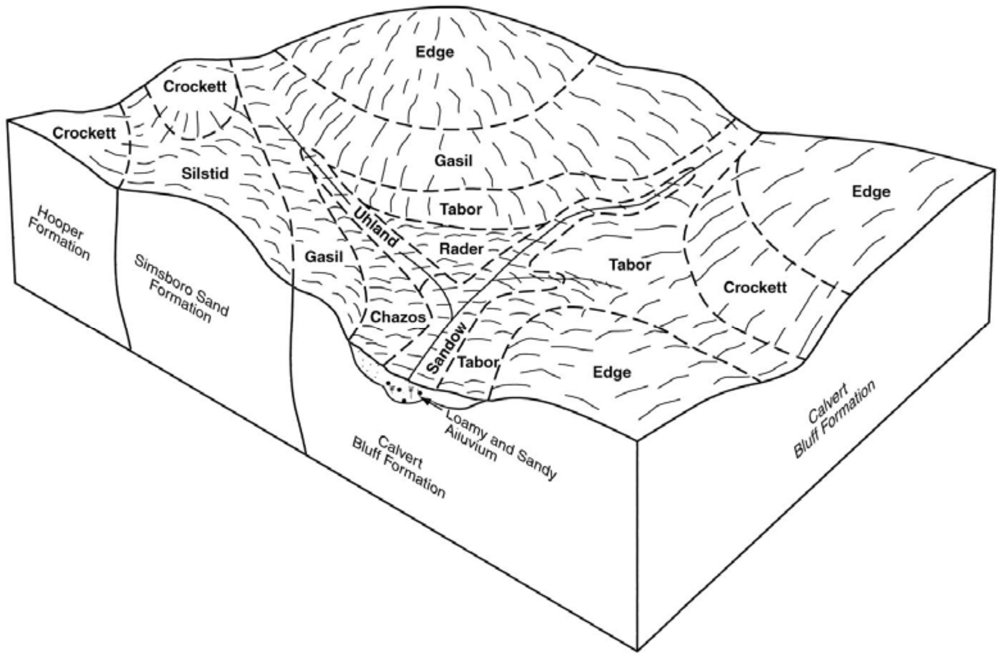


Figure 3.—Landscape and parent material of the Edge-Crockett-Tabor general soil map unit.

Much of the pasture and hayland supports improved bermudagrass or bahiagrass. Droughtiness is the main limitation in the areas used for pasture and hay. Applying lime and fertilizer increases yields.

The areas of rangeland support mid and tall grasses. Areas not properly managed have been invaded by weeds and less palatable grasses. Post oak, elm and other trees are common on Edge soils and they have invaded some areas of Crockett soils. Mesquite has invaded many fields that are no longer cultivated. Droughtiness and the hazard of erosion are the main limitation in the areas used as rangeland.

The very slow permeability and high potential for shrinking and swelling limit the use of these soils for urban development. Properly designed structures can compensate for the shrinking and swelling of the clayey subsoil. Properly designed septic tank absorption fields can help overcome the restricted permeability. Low strength is a limitation for local roads and streets.

3. Singleton-Winedale-Burlewash

Loamy, moderately deep, very gently sloping to steep, moderately well drained and well drained soils

This map unit makes up about 6 percent of the county. It is 37 percent Singleton soils, 21 percent Winedale soils, 20 percent Burlewash soils, and 22 percent soils of minor extent (fig. 4).

The Singleton soils are on toeslopes and footslopes of broad ridges. The Winedale and Burlewash soils are on summit, shoulder, and upper backslopes of ridges. The underlying material is residuum weathered from the tuffaceous sandstones, shale, and siltstones.

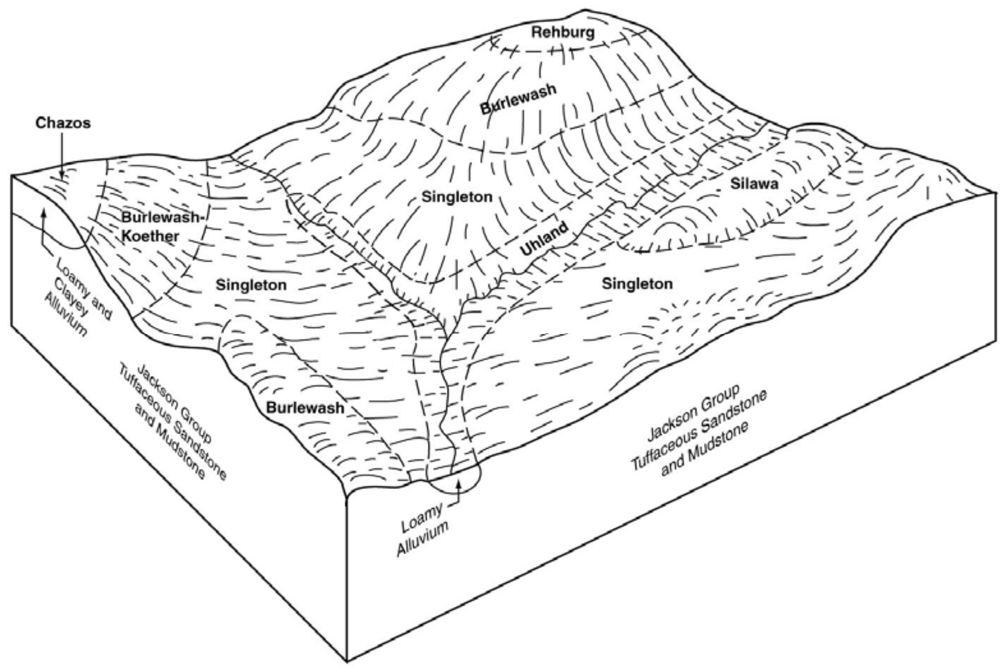


Figure 4.—Landscape and parent material of the Singleton-Winedale-Burlewash general soil map unit.

The Singleton soils are moderately deep to weakly cemented, tuffaceous sandstone and very slowly permeable. Typically, the surface layer is moderately acid, pale brown fine sandy loam. The upper part of the subsoil is very strongly acid, brown clay strong brown iron concentrations. The middle part is very strongly acid, dark grayish brown clay with dark yellowish brown iron concentrations. The lower part is moderately acid, dark grayish brown clay with dark yellowish brown iron concentrations. The underlying material is pale yellow, weakly cemented, tuffaceous sandstone.

The Winedale soils are moderately deep and are very slowly permeable. Typically, the surface layer is strongly acid, brown very gravelly fine sandy loam. The upper part of the subsoil is strongly acid, dark reddish brown clay. The middle part is strongly acid, red clay with light brownish gray iron depletions. The lower part is strongly acid, reddish yellow clay loam with light brownish gray iron depletions. The underlying material is strongly acid, light brownish gray clay with fragments of shale.

The Burlewash soils are moderately deep to weakly cemented, tuffaceous sandstone and siltstones. They are very slowly permeable. Typically, the surface layer is strongly acid, pale brown fine sandy loam. The subsurface layer is strongly acid, very pale brown fine sandy loam. The upper part of the subsoil is very strongly acid, reddish brown clay. The lower part of the subsoil is very strongly acid, brown clay and weakly cemented tuffaceous sandstone with strong brown iron concentrations. The underlying material is weakly cemented, tuffaceous sandstone, siltstone, and clay.

Of minor extent in this map unit are Chazos, Koether, Lufkin, Rehburg, Sandow, Tabor, and Uhland soils. Chazos soils are on convex ridgetops on stream terraces. Koether soils are on summit, shoulder, and upper backslopes of steep, narrow ridges. Lufkin and Tabor soils are on nearly level and very gently sloping toeslopes and flats. Rehburg soils are on summit and shoulder of ridges. Sandow and Uhland soils are on flood plains of local streams.

The soils of this map unit are used mainly as rangeland. In some areas, they are used as pasture and hayland. These soils generally are not used as cropland.

Bluestem, indiangrass, and paspalum are the main native plants. Most areas have a post oak and blackjack canopy with a yaupon understory. Overgrazing by livestock increases undesirable plant growth, and creates the hazard of water erosion in sloping areas.

Areas of pasture and hayland are planted to improved bermudagrass and bahiagrass. Applying lime and fertilizer increases yields.

The major soils in this map unit have some limitations for most urban uses, including high potential for shrinking and swelling, very slow permeability, depth to rock, slope, and low soil strength. Proper design and careful installation of building foundations, septic tank absorption fields, roads, and streets can overcome these limitations.

4. Kurten-Tabor-Spiller

Loamy, deep and very deep, very gently sloping to moderately sloping, well drained and moderately well drained soils

This map unit makes up about 4 percent of the county. It is 51 percent Kurten soils, 14 percent Tabor soils, 6 percent Spiller soils, and 29 percent soils of minor extent.

The Kurten and Spiller soils are on summit, shoulder, and upper backslopes of ridges. The underlying material is stratified shale, weakly cemented sandstone, and loamy materials. The Tabor soils are on toeslopes and flats in valley fill areas.

The Kurten soils are deep and very slowly permeable. Typically, the surface layer is slightly acid, brown fine sandy loam. The subsurface layer is moderately acid, brown fine sandy loam. The upper part of the subsoil is moderately acid, reddish brown clay. The lower part is strongly acid, red clay with grayish brown relict iron depletions. The underlying material is very strongly acid, brown shale.

The Tabor soils are very deep and very slowly permeable. Typically, the surface layer is pale moderately acid, brown fine sandy loam. The subsurface layer is slightly acid, very pale brown fine sandy loam. The upper part of the subsoil is strongly acid, light brownish gray clay with yellowish brown and red iron concentrations. The middle part is neutral, light yellowish brown and light gray clay loam with yellow iron concentrations. The lower part is slightly alkaline, light gray sandy clay loam.

The Spiller soils are very deep and slowly permeable. Typically, the surface layer is slightly acid, light yellowish brown fine sandy loam. The upper part of the subsoil is slightly acid, yellowish brown clay with red and brownish yellow iron concentrations. The middle part is brownish yellow slightly acid, clay with red iron concentrations. The lower part is moderately acid and slightly acid, light yellowish brown clay and clay loam with red iron concentrations. The underlying material is shale and stratified loamy materials.

Of minor extent in this map unit are Benchley, Chazos, Crockett, Gasil, Jedd, Luling, Rader, Rosanky, Sandow, Silawa, Silstid, and Uhland soils. Benchley, Crockett, and Luling soils are on summit, shoulder, and backslope of ridges of adjoining geologic formations. Chazos and Silawa soils are on convex ridgetops of stream terraces. Gasil, Jedd, and Rosanky soils are on summit, shoulder, and upper backslopes of ridges. Sandow and Uhland soils are on flood plains of local streams.

The soils of this map unit are used mainly as rangeland. Some areas are used as pasture and hayland. These soils generally are not used as cropland.

Bluestem, indiangrass, and paspalum are the main native plants. Most areas have a post oak canopy with a yaupon understory. Overgrazing by livestock increases undesirable plant growth, and creates the hazard of water erosion in sloping areas.

Areas of pasture and hayland are planted to improved bermudagrass and bahiagrass. Low natural fertility requires the use of fertilizer and lime for sustained yields.

The major soils in this map unit have some limitations for most urban uses, including high potential for shrinking and swelling, very slow permeability, and low soil strength. Proper design and careful installation of building foundations, septic tank absorption fields, roads, and streets can overcome these limitations.

5. Jedd-Gasil

Loamy, moderately deep and very deep, very gently sloping to moderately steep, well drained soils

This map unit makes up 4 percent of the county. It is 41 percent Jedd soils, 24 percent Gasil soils, and 35 percent soils of minor extent.

The Jedd soils are on summit, shoulder, and upper backslopes on narrow ridges. The ridges and upper backslopes often have exposed sandstone and ironstone that occur as cobbles and boulders on the surface or as rock outcrops. The Gasil soils are on summit, shoulder, and upper and lower backslopes of ridges. These soils formed in loamy and clayey sediments, sandstone, and shale.

The Jedd soils are moderately deep to weakly cemented sandstone and are moderately slowly permeable. Typically, the surface layer is strongly acid, brown fine sandy loam. The subsurface layer is strongly acid, light brown fine sandy loam. The subsoil is strongly acid, red clay. The underlying material is stratified weakly cemented sandstone and shale.

The Gasil soils are very deep and moderately permeable. Typically, the surface layer is moderately acid, yellowish brown fine sandy loam. The subsurface layer is moderately acid, very pale brown fine sandy loam. The upper part of the subsoil is moderately acid, brownish yellow and yellow sandy clay loam with red and yellowish red iron concentrations. The middle part is moderately acid, red sandy clay loam with brownish yellow iron concentrations and light brownish gray iron depletions. The lower part of the subsoil is moderately acid, reddish yellow sandy clay loam with pockets of light gray loamy fine sand.

Of minor extent in this map unit are Dutek, Faula, Padina, Rader, Robco, Rosanky, Sandow, Silstid, Tabor, and Uhland soils. Dutek and Faula soils are on convex areas on stream terraces. Rader, Robco, and Tabor soils are on broad flats and toeslopes. Padina and Silstid soils are on summit, shoulder, and upper backslopes of ridges. Sandow and Uhland soils are on flood plains of local streams.

The soils of this map unit are used mainly as rangeland and pasture or hayland. These soils generally are not used as cropland except for small grains. The graded areas of Jedd soils have had the gravelly surface layer removed for road-building materials.

Rangeland vegetation includes tall grasses in an oak savannah. The strongly sloping to moderately steep areas or gravelly or stony areas are used as rangeland.

Most areas of pasture and hayland are established in improved bermudagrass or bahiagrass. Applying lime and fertilizer increases yields.

Limitations for urban development include steepness of slope, stoniness, potential for shrinking and swelling, and restricted permeability. These limitations can be overcome by properly designing and installing building foundations, septic tank absorption fields, roads, and streets.

Loamy and Clayey Prairie Soils on Uplands

This group of soils makes up about 32 percent of Lee County. Benchley, Boonville, Crockett, Gasil, Lexton, Luling, Zack, and Zulch are the major soils. Most of these soils have a loamy surface layer and clayey subsoil. The Luling soil is clayey throughout. These soils developed mainly in loamy sediments, shale, and weathered glauconitic material.

They are very gently sloping to moderately sloping. All are moderately well drained or well drained. Permeability is moderate to very slow.

The soils in this group are used mainly as pasture and hayland or as rangeland. Some areas are used as cropland. Pasture grasses include improved bermudagrass, bahiagrass, and kleingrass. Native grasses are bluestem, indiangrass, paspalum, sideoats grama, and Texas wintergrass. The most dominant trees are scattered elm, oak, and hackberry. The main crops grown are corn, grain sorghum, soybeans, and small grains. When used for crops, these soils need proper conservation practices, such as contour farming, terraces, or minimum tillage, to reduce the hazard of water erosion.

These soils have some limitations as sites for most urban uses, mainly high and very high potential for shrinking and swelling, restricted permeability and low soil strength.

6. Zack-Boonville-Zulch

Loamy, moderately deep and very deep, very gently sloping to moderately sloping, moderately well drained and somewhat poorly drained soils

This map unit makes up about 17 percent of the county. It is 36 percent Zack soils, 16 percent Boonville soils, 15 percent Zulch soils, and 33 percent soils of minor extent (fig. 5).

The Zack soils are on summit, shoulder, and upper backslopes of broad ridges. The Boonville soils are on footslopes and toeslopes of ridges. The Zulch soils are on lower backslopes of ridges. Slope ranges from 1 to 3 percent. The underlying material is mainly siltstone and shale.

The Zack soils are moderately deep and are very slowly permeable. Typically, the surface layer is moderately acid, brown fine sandy loam. The upper part of the subsoil is moderately acid, reddish brown clay with yellowish red iron concentrations. The middle part is neutral, brown clay with yellowish red iron concentrations. The lower part is slightly alkaline, light gray sandy clay loam. The underlying material is thinly bedded mudstone.

The Boonville soils are very deep and are very slowly permeable. Typically, the surface layer is moderately acid, brown fine sandy loam. The subsurface layer is moderately acid, light gray fine sandy loam. The upper part of the subsoil is strongly acid and neutral, light brownish gray clay with olive brown, strong brown, and red iron concentrations. The middle part is slightly alkaline, light yellowish brown clay. The lower part is moderately alkaline, light gray clay loam with olive yellow iron concentrations. The underlying material is shale.

The Zulch soils are moderately deep and are very slowly permeable. Typically, the surface layer is dark grayish brown, moderately acid fine sandy loam. The upper part of the subsoil is neutral dark gray clay. The middle part is dark gray, slightly alkaline clay with yellowish brown iron concentrations. The lower part is light gray, moderately alkaline clay loam with strong brown iron concentrations. The underlying material is weakly consolidated siltstone and shale.

Of minor extent in this map unit are Chazos, Gredge, Mabank, Rader, Sandow, Tabor, Uhland, and Winedale soils. Chazos and Gredge soils are on summits and backslopes of relict Pleistocene stream terraces. Mabank, Rader, and Tabor are on flats and toeslopes. Sandow and Uhland soils are on flood plains of local streams. Winedale soils are on summits, shoulder, and upper backslopes of ridges that are on adjacent geological formations.

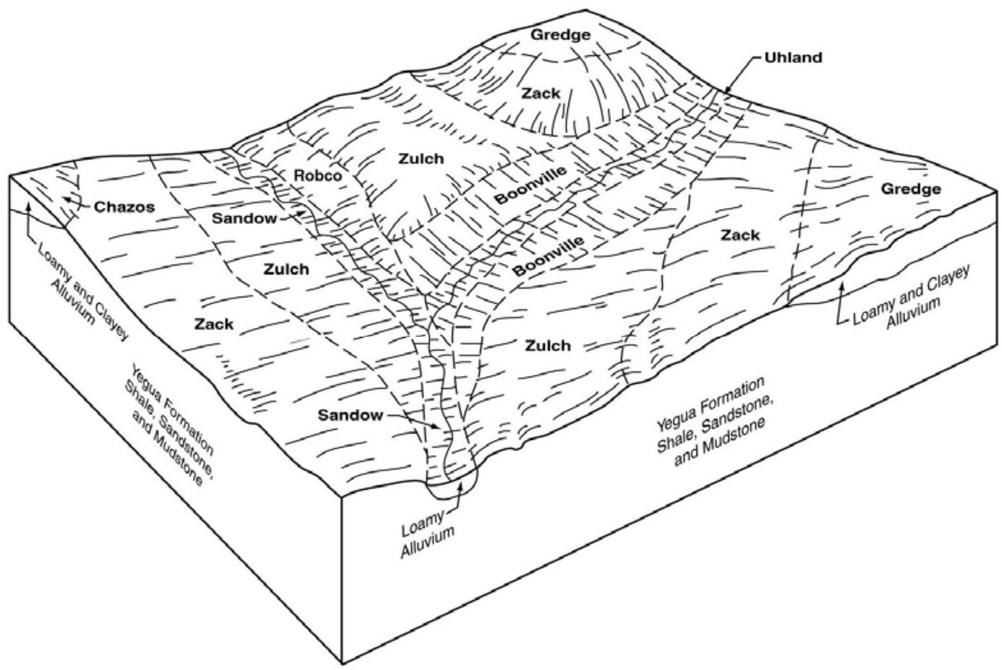


Figure 5.—Landscape and parent material of the Zack-Boonville-Zulch general soil map unit.

The soils of this map unit are used mainly as pasture and hayland. Some areas are used as rangeland. These soils generally are not used as cropland, although early settlers farmed them extensively. Most of the fields are either idle and invaded by mesquite or used for improved pasture or hayland. Most of the pasture and hayland is improved bermudagrass and bahiagrass.

Some small areas of rangeland are in climax condition; however, most are heavily grazed. Bluestem, indiangrass, and paspalum are the dominant native plants along with scattered post oak and blackjack oak trees.

The major soils in this map unit have several limitations for most urban uses, including high potential for shrinking and swelling, restricted permeability, and low soil strength. Proper design and careful installation of building foundations, septic tank absorption fields, roads, and streets can overcome these limitations.

7. Luling-Benchley-Crockett

Clayey and loamy, very deep, Very gently sloping and gently sloping, well drained and moderately well drained soils

This map unit makes up about 10 percent of the county. It is 26 percent Luling soils, 22 percent Benchley soils, 22 percent Crockett soils, and 30 percent soils of minor extent (fig. 6).

The Luling soils are on summit, shoulder, and upper backslopes of ridges. The Benchley soils are on lower backslopes and footslopes of ridges. The Crockett soils are on summit and shoulder positions on ridges. The underlying material is shale with thin strata of sandstone.

The Luling soils are very deep and are very slowly permeable. Typically, the surface layer is neutral, dark grayish brown clay. The subsoil is moderately alkaline, grayish brown clay in the upper part. The lower part is moderately alkaline, olive

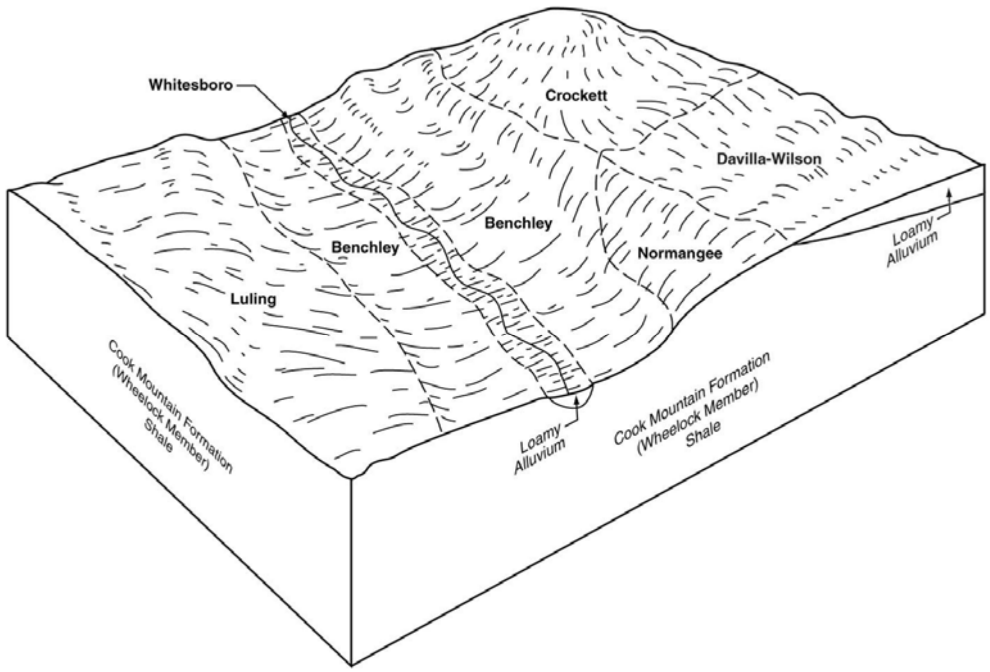


Figure 6.—Landscape and parent material of the Luling-Benchley-Crockett general soil map unit.

yellow clay. The underlying material is moderately alkaline, light gray shale with thin strata of sandstone.

The Benchley soils are very deep and are slowly permeable. Typically, the surface layer is slightly acid, dark gray clay loam. The upper part of the subsoil is slightly acid, dark grayish brown clay with yellowish brown and yellowish red iron concentrations. The middle part of the subsoil is slightly acid and neutral clay in shades of yellow, brown, and olive. The lower part is moderately alkaline, yellowish brown clay.

The Crockett soils are very deep and very slowly permeable. Typically, the surface layer is moderately acid, brown fine sandy loam. The upper part of the subsoil is moderately acid, reddish brown clay with brown and brownish yellow iron concentrations. The middle part is moderately acid, yellow clay with yellowish red iron concentrations. The lower part is moderately alkaline, light yellowish brown and pale yellow clay with brownish yellow and red iron concentrations. The underlying material is moderately alkaline, light gray shale.

Of minor extent in this map unit are Davilla, Gasil, Kurten, Normangee, Sandow, Spiller, Tabor, Whitesboro, and Wilson soils. Davilla and Wilson soils are on nearly level to very gently sloping stream terraces or remnants of terraces in the uplands. Gasil, Kurten, and Spiller soils are on summits, shoulder, and upper backslopes of adjacent geologic formations. Normangee soils are on upper and lower backslopes. Sandow and Whitesboro soils are on flood plains of local streams. Tabor soils are on footslopes and toeslopes near streams.

The soils of this map unit are used mainly as pasture and hayland. They are used as rangeland in some areas and as cropland in a few areas.

Most of the pasture and hayland is improved bermudagrass although a few areas are planted to kleingrass. Applying lime and fertilizer increases yields.

Areas of rangeland in climax vegetation are small and scattered. Bluestem, indiangrass, and paspalum are the main native plants. Hackberry and elm are the main trees. Some overgrazed areas have been invaded by mesquite. Overgrazing by livestock increases undesirable plant growth, and creates the hazard of water erosion in sloping areas.

Corn, grain sorghum, soybeans, and small grains are the main crops. Conservation practices, such as contour farming, terraces, and conservation tillage, are used to prevent water erosion.

The major soils in this map unit have several limitations for most urban uses. High potential for shrinking and swelling, restricted permeability, and low soil strength can be overcome by proper design and careful installation of building foundations, septic tank absorption fields, roads, and streets.

8. Benchley-Gasil-Lexton

Loamy and clayey, very deep, very gently sloping and gently sloping, moderately well drained and well drained soils

This map unit makes up about 5 percent of the county. It is 25 percent Benchley soils, 21 percent Gasil soils, 14 percent Lexton soils, and 40 percent soils of minor extent.

The Benchley soils are on lower backslope and footslope positions on ridges. The Gasil soils are on backslope of ridges of adjacent sandy formations. The Lexton soils are on summit, shoulder, and upper backslopes of ridges. The underlying material for the Benchley and Lexton soils is weathered glauconitic material and shale. The underlying material for the Gasil soils is sandy residuum.

The Benchley soils are very deep and are slowly permeable. Typically, the surface layer is slightly acid, dark gray clay loam. The upper part of the subsoil is slightly acid, dark grayish brown clay with yellowish brown and yellowish red iron concentrations. The middle part of the subsoil is slightly acid and neutral clay in shades of yellow, brown, and olive. The lower part is moderately alkaline, yellowish brown clay.

The Gasil soils are very deep and moderately permeable. Typically, the surface layer is moderately acid, yellowish brown fine sandy loam. The subsurface layer is moderately acid, very pale brown fine sandy loam. The upper part of the subsoil is moderately acid, brownish yellow and yellow sandy clay loam with red and yellowish red iron concentrations. The middle part is moderately acid, red sandy clay loam with brownish yellow iron concentrations and light brownish gray iron depletions. The lower part of the subsoil is moderately acid, reddish yellow sandy clay loam with pockets of light gray loamy fine sand.

The Lexton soils are very deep and moderately slowly permeable. Typically, the surface layer is moderately acid, brown clay. The subsurface layer is neutral, reddish brown clay with light yellowish brown iron concentrations. The upper part of the subsoil is neutral, reddish brown clay with light olive brown iron concentrations. The lower part of the subsoil is moderately alkaline, olive clay with reddish brown and red iron concentrations. The underlying material is moderately alkaline weathered glauconite, greensand, and shale.

Of minor extent in this map unit are Crockett, Luling, Margie, Normangee, Rader, Sandow, Silawa, Silstid, Tabor, and Uhland soils. Crockett, Luling, and Margie soils are on summits and shoulders of ridges. Normangee soils are on backslopes of ridges. Silstid soils are on summits and shoulders of ridges on adjacent sandy formations. Rader and Tabor soils are on very gently sloping toeslopes near streams. Silawa soils are on stream terraces. Sandow and Uhland soils are on flood plains of local streams.

The soils of this map unit are used mainly as pasture and hayland. They are used as rangeland in some areas and as cropland in a few areas.

Most of the pasture and hayland is improved bermudagrass and bahiagrass. Fertilization is necessary for optimum forage production.

A few areas of rangeland in climax condition exist; however, they are small and scattered. Bluestem, indiangrass, and paspalum are the main native plants. Hackberry, elm, and oak are the dominant trees. Overgrazing by livestock increases undesirable plant growth, and creates the hazard of water erosion in sloping areas.

Some areas of these soils are cropped, although not as extensively as in the past. Corn, grain sorghum, and small grains are the main crops. Some areas of cropland that have remained idle for years have been invaded by mesquite.

The major soils in this map unit have several limitations for most urban uses, mainly high potential for shrinking and swelling, restricted permeability, and low soil strength. Proper design and careful installation of building foundations, septic tank absorption fields, roads, and streets can overcome these limitations.

Loamy Soils on Stream Terraces

This group of soils makes up about 10 percent of Lee County. Davilla, Lufkin, Mabank, Tabor, and Wilson are the main soils. These soils developed in loamy and clayey alluvium.

These soils are in nearly level to very gently sloping areas of stream terraces. They are moderately well drained and slowly or very slowly permeable.

The soils in this group are used mainly as pasture and hayland. Improved bermudagrass and bahiagrass are the main pasture plants. Some areas are in rangeland where bluestem, indiangrass, paspalum, and panicum and areas of scattered post oak and yaupon are the main native plants. Some areas are used as cropland. The main crops grown are corn, grain sorghum, peanuts, and small grains.

These soils have some limitations for most urban uses, including high potential for shrinking and swelling, very slow permeability, and low soil strength.

9. Tabor-Lufkin-Mabank

Loamy, very deep, nearly level to very gently sloping, moderately well drained soils

This map unit makes up about 8 percent of the county. It is 52 percent Tabor soils, 14 percent Lufkin soils, 9 percent Mabank soils and 25 percent soils of minor extent.

These soils are on modern stream terraces and on relict Pleistocene terraces on uplands. The Tabor soils are on toeslopes and low ridges of local stream terraces. The Lufkin and Mabank soils are on broad flats and toeslopes. The underlying material is loamy and clayey alluvial sediments.

The Tabor soils are very deep and very slowly permeable. Typically, the surface layer is pale moderately acid, brown fine sandy loam. The subsurface layer is slightly acid, very pale brown fine sandy loam. The upper part of the subsoil is strongly acid, light brownish gray clay with yellowish brown and red iron concentrations. The middle part is neutral, light yellowish brown and light gray clay loam with yellow iron concentrations. The lower part is slightly alkaline, light gray sandy clay loam.

The Lufkin soils are very deep and very slowly permeable. Typically, the surface layer is strongly acid, light brownish gray fine sandy loam. The upper part of the subsoil is very strongly acid, gray clay. The middle part is slightly alkaline, gray clay. The lower part is slightly alkaline, light gray clay loam with yellowish brown iron concentrations.

The Mabank soils are very deep and very slowly permeable. Typically, the surface layer is moderately acid, light brownish gray fine sandy loam. The upper part of the subsoil is black, moderately acid clay. The middle part is very dark gray, slightly acid, clay. The underlying material is light yellowish brown, slightly acid sandy clay loam.

Of minor extent in this map unit are Chazos, Faula, Gredge, Rader, Robco, Sandow, Silawa, Uhland, and Wilson soils. Chazos, Faula, and Silawa soils are on summits and shoulders of ridges on local stream terraces. Gredge soils are on narrow summits and upper backslopes. Wilson soils are on broad flats. Rader and Robco soils are footslopes and toeslopes. Sandow and Uhland soils are on flood plains of local streams.

The soils of this map unit are used mainly as pasture and hayland. Some areas are used as rangeland. A few areas are used as cropland.

Most of the pasture and hayland is planted to improved bermudagrass and bahiagrass. Applying lime and fertilizer increases yields.

Bluestem, indiangrass, and paspalum are the main native plants. The main trees are post oak and blackjack oak with an understory of yaupon. Overgrazing by livestock increases undesirable plant growth, and creates the hazard of water erosion in sloping areas.

Corn, grain sorghum, peanuts, and small grains are grown in some areas. Applying lime and fertilizer increases yields.

The major soils in this map unit have some limitations for most urban uses, including high potential for shrinking and swelling, restricted permeability, and low soil strength. Proper design and careful installation of building foundations, septic tank absorption fields, roads, and streets can overcome these limitations.

10. Davilla-Wilson

Loamy, very deep, nearly level to very gently sloping, moderately well drained soils

This map unit makes up about 2 percent of the county. It is 45 percent Davilla soils, 28 percent Wilson soils, and 27 percent soils of minor extent.

These soils are on broad relict terraces. The Davilla soils are in broad, convex, smooth areas. The Wilson soils are in concave areas randomly occurring through out the Davilla soils. The underlying material is loamy and clayey alluvium.

The Davilla soils are very deep and very slowly permeable. Typically, the surface layer is moderately acid, pale brown fine sandy loam. The upper part of the subsoil is slightly acid, dark grayish brown clay loam with red and yellow iron concentrations. The middle part is neutral, dark grayish brown and grayish brown clay loam with red, brownish yellow, and yellow iron concentrations. The lower part is slightly alkaline, gray and light brownish gray clay loam with yellow, brownish yellow, and reddish yellow iron concentrations.

The Wilson soils are very deep and very slowly permeable. Typically, the surface layer is slightly acid, dark grayish brown loam. The upper part of the subsoil is slightly acid, very dark gray clay with brown iron concentrations. The middle part is dark grayish brown clay with light brownish gray iron depletions. The lower part is moderately alkaline, light brownish gray, moderately alkaline clay loam with olive yellow iron concentrations.

Of minor extent in this map unit are Benchley, Crockett, Mabank, Sandow, Tabor, Whitesboro, and Zilaboy soils. Benchley and Crockett soils are on shoulders and backslopes of ridges on adjacent uplands. Mabank and Tabor soils are on broad flats. Sandow, Whitesboro, and Zilaboy soils are on flood plains of local streams.

The soils of this map unit are used mainly as cropland (fig. 7). Some areas are used as pasture and hayland. A few areas are used as rangeland.

Figure 7.—Cultivated area of Davilla-Wilson complex, 0 to 2 percent slopes. The lighter areas in the photo are the remnants of the Davilla mounds that have been smoothed down by plowing.

Corn, grain sorghum, peanuts, and small grains are grown in some areas. Applying lime and fertilizer increases yields.

Most of the pasture and hayland is planted to improved bermudagrass and bahiagrass. Applying lime and fertilizer increases yields.

Bluestem, indiangrass, and paspalum are the main native plants. The main trees are post oak and blackjack oak with an understory of yaupon. Overgrazing by livestock increases undesirable plant growth, and creates the hazard of water erosion in sloping areas.

The major soils in this map unit have some limitations for most urban uses, including high potential for shrinking and swelling, restricted permeability, and low soil strength. Proper design and careful installation of building foundations, septic tank absorption fields, roads, and streets can overcome these limitations

Loamy and Clayey Soils on Flood Plains

This group of soils makes up about 10 percent of Lee County. The major soils are the Navasota, Sandow, Uhland, and Zilaboy soils. These soils developed in sandy, loamy, and clayey alluvium.

These nearly level soils are on flood plains of the Yegua Creek and its tributaries. They are somewhat poorly drained to moderately well drained and moderately slowly permeable to very slowly permeable.

The soils in this group are used mainly as rangeland. A few areas are in pasture and hayland. Bluestem, Virginia wildrye, broadleaf uniola, panicum, and sedges are the dominant native plants. Water oak, elm, cottonwood, and pecan are the dominant trees. Improved bermudagrass, common bermudagrass, bahiagrass, and dallisgrass are the main pasture and hayland plants.

These soils are not suited for most urban uses, because of the hazard of frequent flooding.

11. Uhland-Sandow

Loamy, very deep, nearly level, moderately well drained soils

This map unit makes up about 7 percent of the county. It is 48 percent Uhland soils, 28 percent Sandow soils, and 24 percent soils of minor extent.

The Uhland soils are on narrow flood plains of smaller streams and natural levees along the larger streams. The Sandow soils are on broad flood plains of larger streams. They are frequently flooded. The underlying material is sandy and loamy alluvium.

The Uhland soils are very deep and moderately slowly permeable. Typically, the surface layer is moderately acid, yellowish brown fine sandy loam. The upper part of the subsoil is slightly acid, light yellowish brown fine sandy loam with dark yellowish brown iron concentrations. The middle part is slightly acid, very pale brown fine sandy loam with dark yellowish brown iron concentrations and light brownish gray iron depletions. The lower part is moderately acid, light gray and yellow sandy clay loam and fine sandy loam with yellowish red and strong brown iron concentrations and light gray iron depletions.

The Sandow soils are very deep and moderately slowly permeable. Typically, the surface layer is slightly acid, dark grayish brown loam. The subsoil is stratified clay loam and sandy clay loam in shades of brown with iron concentrations in shades of brown and yellow in the lower part. These soils are slightly acid and neutral in the subsoil.

Of minor extent in this map unit are Dutek, Faula, Navasota, Silawa, Tabor, Whitesboro, and Zilaboy soils. Dutek, Faula, and Silawa soils are on summit, shoulder, and upper backslopes of stream terraces. Navasota and Zilaboy soils are in slightly lower positions on flood plains. Tabor soils are on broad flats and toeslopes of terraces. Whitesboro soils are on similar floodplain positions.

The soils of this map unit are used mainly as rangeland. Some areas are used as pasture. These soils generally are not used as cropland because of the hazard of flooding.

Virginia wildrye, bluestem, panicum, and eastern gamagrass are the main native plants. Elm, water oak, willow, and pecan are the dominant trees.

Common bermudagrass and dallisgrass are the main pasture plants. Some areas are planted to improved bermudagrass and bahiagrass. Applications of fertilizer and lime are necessary to sustain yields.

Areas of this unit are not suitable for urban development because of the flooding hazard.

12. Zilaboy-Sandow-Navasota

Clayey and loamy, very deep, nearly level, moderately well drained and somewhat poorly drained soils

This map unit makes up about 3 percent of the county. It is 45 percent Zilaboy soils, 18 percent Sandow soils, 13 percent Navasota soils, and 24 percent soils of minor extent.

These soils are on flood plains, mainly of Yegua Creeks. They are frequently flooded. The underlying material is loamy and clayey alluvium.

The Zilaboy soils are very deep and very slowly permeable. Typically, the surface layer is neutral, dark grayish brown clay with brown iron concentrations. The subsoil is clayey throughout. It is gray in the upper part, dark grayish brown in the middle part, and grayish brown in the lower part. It is slightly acid or moderately acid in the subsoil.

The Sandow soils are very deep and moderately slowly permeable. Typically, the surface layer is slightly acid, dark grayish brown loam. The subsoil is stratified clay loam and sandy clay loam in shades of brown with iron concentrations in shades of brown and yellow in the lower part. These soils are slightly acid and neutral in the subsoil.

The Navasota soils are very deep and very slowly permeable. Typically, the surface layer is moderately acid, dark gray clay with strong brown iron concentrations. The subsoil is gray, clay throughout with brown iron concentrations and brown and gray iron depletions. It is slightly acid in the upper part, moderately acid in the middle part, and slightly alkaline in the lower part.

Of minor extent in this map unit are Dutek, Faula, Mabank, Silawa, Tabor, and Uhland soils. Dutek, Faula, and Silawa soils are on summit, shoulder, and upper backslopes of convex ridges on stream terraces. Mabank and Tabor soils are on broad flats and toeslopes of stream terraces. Uhland soils are in slightly higher positions on flood plains.

The soils of this map unit are used mainly as rangeland although some areas are used as pasture. These soils generally are not used as cropland because of frequent flooding.

Virginia wildrye, broadleaf uniola, eastern gamagrass, and sedges are the main native plants. Elm, ash, and water oak are the dominant trees.

Common bermudagrass and dallisgrass are the main pasture plants. Applying lime and fertilizer increases yields.

Areas of this unit are not suitable for urban development because of the flooding hazard.

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 minor components that belong to taxonomic classes other than those of the major soils.

Most minor 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, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. 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 contrasting components are mentioned in the map unit descriptions. A few areas of minor components 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 minor components 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, Crockett fine sandy loam, 1 to 5 percent slopes is a phase of the Crockett series.

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

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. Davilla-Wilson complex, 0 to 2 percent slopes is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Burlewash-Koether soils, 8 to 45 percent slopes, very stony, is an undifferentiated group in this survey area.

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

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

ArD—Arenosa fine sand, 1 to 8 percent slopes

Setting

Landform: Interfluve and broad ridges
Landscape position: Coastal plain
Slope: Very gently sloping to moderately sloping with convex surfaces
Shape of areas: Irregular
Size of areas: 50 to 300 acres

Typical Profile

Surface layer:
0 to 5 inches—very strongly acid, yellowish brown fine sand

Underlying material:
5 to 30 inches—very strongly acid, light yellowish brown fine sand
30 to 80 inches—very strongly acid, very pale brown fine sand

Soil Properties

Depth: Very deep
Drainage class: Somewhat excessively drained
Water table: None within a depth of 6 feet
Flooding: None
Runoff: Very low
Permeability: Rapid
Available water capacity: Very low
Root zone: Very deep
Shrink-swell potential: Low
Water erosion hazard: Slight

Composition

Arenosa soil and similar inclusions: 85 percent
Contrasting inclusions: 15 percent

Contrasting Soils

- The well drained, moderately slowly permeable Jedd soils are on higher convex ridgetop positions.
- The moderately well drained, slowly permeable Robco soils are in lower concave footslope and toeslope positions.
- The well drained, moderately permeable Silstid soils are on similar landscape positions.

Land Uses

Major land use: Rangeland (fig. 8)
Other land uses: Pasture

Pasture
Major limitations:

- The very low available water capacity and rapid permeability restricts the yield potential for most improved grasses.
- Seepage of the soil limits the use for livestock ponds.
- The combination of very low fertility and rapid permeability promotes a high rate of leaching which may need a fertilization program.

Figure 8.—Native vegetation on an area of Arenosa fine sand, 1 to 8 percent slopes. The Arenosa soils are in the Very Deep Sandy pasture management group.

Management Concerns

Cropland

Major limitations:
- This soil is not suited for growing most crops because of the very low available water capacity and rapid permeability.

Minor limitations:
- The soil is loose when dry and offers poor traction for farm machinery.

Rangeland

Major limitations:
- The very low available water capacity and rapid permeability limits the species of native vegetation to those that are drought tolerant.
- The very low natural fertility limits the growth of native plants.
- Seepage of the soil limits the use for livestock ponds.

Urban development

Major limitations:
- The rapid permeability of the soil may cause seepage of effluents into the groundwater when this soil is used for septic tank absorption fields.
- Excavation sidewalls are unstable because of the sandy texture.
- Establishment and maintenance of lawn grasses and landscape plants is expensive because of the very low available water capacity and very low fertility.

Interpretive Groups

Land capability classification: 4s
Ecological site: Very Deep Sand PE 48-68
Pasture management group: Very Deep Sandy Group

BeB—Benchley clay loam, 1 to 3 percent slopes

Setting

Landform: Lower backslope and footslope on ridges
Landscape position: Coastal plain
Slope: Very gently sloping with concave surfaces
Shape of areas: Oblong to elongated
Size of areas: 50 to 200 acres

Typical Profile

Surface layer:
0 to 9 inches—slightly acid, dark gray clay loam

Subsoil:
9 to 15 inches—slightly acid, dark grayish brown clay with brown and red iron concentrations
15 to 26 inches—slightly acid, brownish yellow clay with red iron concentrations
26 to 49 inches—neutral, light olive brown clay with common brown iron concentrations
49 to 66 inches—moderately alkaline, olive yellow clay
66 to 80 inches—moderately alkaline, yellowish brown clay

Soil Properties

Depth: Very deep
Drainage class: Moderately well drained

Water table: None within a depth of 6 feet
Flooding: None
Runoff: High
Permeability: Slow
Available water capacity: High
Root zone: Very deep
Shrink-swell potential: High
Water erosion hazard: Moderate

Composition

Benchley soil and similar inclusions: 85 percent
Contrasting inclusions: 15 percent

Contrasting Soils

- Areas of Benchley soils that have more than 15 percent gravel in the surface layer; some small areas have had the gravel removed for road material.
- The very slowly permeable Crockett soils are on slightly higher landscape positions.
- The Davilla soils are on the smooth slightly lower terrace positions.
- The very slowly permeable Luling soils are on slightly higher convex positions.
- The very slowly permeable Wilson soils are on the smooth slightly lower terrace positions.

Land Uses

Major land use: Rangeland
Other land uses: Pasture and cropland (fig. 9)

Figure 9.—Soybeans on an area of Benchley clay loam, 1 to 3 percent slopes.

Management Concerns

Pasture
Major limitations:
- There are no major limitations.

Minor limitations:
- A moderate water erosion hazard exists when this soil is tilled prior to being established to improved grasses.
- The slow permeability of the clay subsoil restricts water movement and root development of improved grasses.

Cropland
Major limitations:
- There are no major limitations.

Minor limitations:
- A moderate water erosion hazard exists when this soil is cultivated.
- The slow permeability of the clay subsoil restricts water movement and root development of crops.

Rangeland
Major limitations:
- There are no major limitations.

Minor limitations:
- The slow permeability of the clay subsoil restricts water movement and root development of native plants.

Urban development
Major limitations:
- The high shrink-swell potential can cause structural damage to residential and small commercial buildings.
- Low soil strength is a limitation in the construction of local roads and streets.
- The slow permeability of the clay subsoil may interfere with the proper functioning of septic tank absorption fields.
- A high risk of corrosion exists for uncoated steel.

Minor limitations:
- A moderate risk of corrosion exists for concrete.

Interpretive Groups

Land capability classification: 2e
Ecological site: Clay Loam PE 44-64
Pasture management group: Loamy Upland Group

BeC—Benchley clay loam, 3 to 5 percent slopes

Setting

Landform: Lower backslope and footslope on ridges
Landscape position: Coastal plain
Slope: Gently sloping with concave surfaces
Shape of areas: Oblong to elongated
Size of areas: 50 to 150 acres

Typical Profile

Surface layer:
0 to 10 inches—moderately acid, dark grayish brown clay loam

Subsoil:
10 to 22 inches—slightly acid, brown clay with red and yellow iron concentrations
22 to 32 inches—slightly acid, olive yellow clay with red iron concentrations
32 to 61 inches—neutral, light olive brown clay with yellow iron concentrations
61 to 80 inches—slightly alkaline, yellow clay

Soil Properties

Depth: Very deep
Drainage class: Moderately well drained
Water table: None within a depth of 6 feet
Flooding: None
Runoff: High
Permeability: Slow
Available water capacity: High
Root zone: Very deep
Shrink-swell potential: High
Water erosion hazard: Severe

Composition

Benchley soil and similar inclusions: 90 percent
Contrasting inclusions: 10 percent

Contrasting Soils

- The very slowly permeable Crockett soils are on similar and slightly higher landscape positions.
- The very slowly permeable Luling soils are on similar side slope positions.
- The very slowly permeable Normangee soils are on similar and slightly higher landscape positions.

Land Uses

Major land use: Rangeland
Other land uses: Pasture and cropland

Management Concerns

Pasture
Major limitations:
- A severe water erosion hazard exists when this soil is tilled prior to being established to improved grasses.

Minor limitations:
- The slow permeability of the clay subsoil restricts water movement and root development of improved grasses.

Cropland
Major limitations:
- A severe water erosion hazard exists when this soil is cultivated.

Minor limitations:
- The slow permeability of the clay subsoil restricts water movement and root development of crops.

Rangeland
Major limitations:
- There are no major limitations.

Minor limitations:

- The slow permeability of the clay subsoil restricts water movement and root development of native plants.

Urban development
Major limitations:

- The high shrink-swell potential can cause structural damage to residential and small commercial buildings.
- Low soil strength is a limitation in the construction of local roads and streets.
- The slow permeability of the clay subsoil may interfere with the proper functioning of septic tank absorption fields.
- A high risk of corrosion exists for uncoated steel.

Minor limitations:

- A moderate risk of corrosion exists for concrete.

Interpretive Groups

Land capability classification: 3e
Ecological site: Clay Loam PE 44-64
Pasture management group: Loamy Upland Group

BgB—Boonville gravelly fine sandy loam, 1 to 3 percent slopes

Setting

Landform: Footslope and toeslope on ridges
Landscape position: Coastal plain
Slope: Very gently sloping with concave surfaces
Shape of areas: Oblong to elongated
Size of areas: 50 to 200 acres

Typical Profile

Surface layer:
0 to 7 inches—moderately acid, grayish brown gravelly fine sandy loam

Subsurface layer:
7 to 13 inches—moderately acid, dark grayish brown gravelly fine sandy loam

Subsoil:
13 to 23 inches—slightly acid, dark grayish brown gravelly clay with brown iron concentrations
23 to 45 inches—slightly alkaline, light brownish gray clay
45 to 72 inches—moderately alkaline, light gray clay

Underlying material:
72 to 80 inches—moderately alkaline, light gray shale with clay loam texture

Soil Properties

Depth: Very deep
Drainage class: Somewhat poorly drained
Water table: A seasonal water table is present at a depth of 0.5 to 2.0 feet mainly from December through February.
Flooding: None
Runoff: Very high
Permeability: Very slow
Available water capacity: Moderate
Root zone: Very deep

Shrink-swell potential: High
Water erosion hazard: Moderate

Composition

Boonville soil and similar inclusions: 90 percent
Contrasting inclusions: 10 percent

Contrasting Soils

- The Gredge soils are on higher convex positions.
- The moderately deep, moderately well drained Zack soils are on higher convex positions.
- The moderately deep, moderately well drained Zulch soils are in similar concave and on slightly higher convex positions.

Land Uses

Major land use: Rangeland
Other land uses: Pasture and cropland

Management Concerns

Pasture
Major limitations:
- The very slow permeability of the clay subsoil restricts water movement and root development of forage plants.

Minor limitations:
- A moderate water erosion hazard exists when this soil is tilled prior to being established to improved grasses.
- The moderate available water capacity restricts growth of improved grasses during periods of drought.

Cropland
Major limitations:
- The very slow permeability of the clay subsoil restricts water movement and root development of crops.

Minor limitations:
- A moderate water erosion hazard exists when this soil is cultivated.
- The moderate available water capacity limits plant growth during periods of drought.

Rangeland
Major limitations:
- The very slow permeability of the clay subsoil restricts water movement and root development of native plants.

Minor limitations:
- The moderate available water capacity restricts native plant growth during periods of drought.
- The moderate natural fertility limits yield potential of native forage plants.

Urban development
Major limitations:
- The high shrink-swell potential is a limitation that can cause structural damage to residential and small commercial buildings.
- Low soil strength and wetness are limitations in the construction of local roads and streets.
- The very slow permeability of the clay subsoil may interfere with the proper functioning of septic tank absorption fields.

- A high risk of corrosion exists for uncoated steel.

Interpretive Groups

Land capability classification: 6e
Ecological site: Claypan Prairie PE 44-64
Pasture management group: Poorly Suited Group

BoB—Boonville fine sandy loam, 0 to 2 percent slopes

Setting

Landform: Footslope and toeslope on ridges
Landscape position: Coastal plain
Slope: Nearly level and very gently sloping with plane and concave surfaces
Shape of areas: Oblong to elongated
Size of areas: 50 to 200 acres

Typical Profile

Surface layer:
0 to 10 inches—moderately acid, brown fine sandy loam

Subsurface layer:
10 to 18 inches—moderately acid, light gray fine sandy loam with brown iron concentrations

Subsoil:
18 to 24 inches—strongly acid, light brownish gray clay with brown and red iron concentrations
24 to 34 inches—neutral, light brownish gray clay with brown iron concentrations
34 to 49 inches—slightly alkaline, light yellowish brown clay
49 to 64 inches—moderately alkaline, light gray clay loam with yellow iron concentrations

Underlying material:
64 to 80 inches—moderately alkaline, light gray shale

Soil Properties

Depth: Very deep
Drainage class: Somewhat poorly drained
Water table: A seasonal water table is present at a depth of 0.5 to 2.0 feet mainly from December through February.
Flooding: None
Runoff: Very high
Permeability: Very slow
Available water capacity: Moderate
Root zone: Very deep
Shrink-swell potential: High
Water erosion hazard: Moderate

Composition

Boonville soil and similar inclusions: 90 percent
Contrasting inclusions: 10 percent

Contrasting Soils

- The Gredge soils are on higher convex positions.

- The moderately deep, moderately well drained Zack soils are on higher convex positions.
- The moderately deep, moderately well drained Zulch soils are in similar concave and on slightly higher convex positions.

Land Uses

Major land use: Rangeland
Other land uses: Pasture and cropland

Management Concerns

Pasture
Major limitations:

- The very slow permeability of the clay subsoil restricts water movement and root development of improved grasses.

Minor limitations:

- A moderate water erosion hazard exists when this soil is tilled prior to being established to improved grasses.
- The moderate available water capacity restricts plant growth during periods of drought.

Cropland
Major limitations:

- The very slow permeability of the clay subsoil restricts water movement and root development of crops.

Minor limitations:

- A moderate water erosion hazard exists when this soil is cultivated.
- The moderate available water capacity limits plant growth during periods of drought.

Rangeland
Major limitations:

- The very slow permeability of the clay subsoil restricts water movement and root development of native plants.

Minor limitations:

- The moderate available water capacity restricts growth of native plants during periods of drought.
- The moderate natural fertility limits yield potential of native forage plants.

Urban development
Major limitations:

- The high shrink-swell potential is a limitation that can cause structural damage to residential and small commercial buildings.
- Low soil strength and wetness are limitations in the construction of local roads and streets.
- The very slow permeability of the clay subsoil may interfere with the proper functioning of septic tank absorption fields.
- A high risk of corrosion exists for uncoated steel.

Interpretive Groups

Land capability classification: 3e
Ecological site: Claypan Prairie PE 44-64
Pasture management group: Seasonally Wet Loamy Claypan Group

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

Setting

Landform: Summit, shoulder, and upper backslopes on ridges
Landscape position: Coastal plain
Slope: Very gently sloping and gently sloping with convex surfaces
Shape of areas: Oblong to irregular
Size of areas: 50 to 300 acres

Typical Profile

Surface layer:
0 to 5 inches—strongly acid, pale brown fine sandy loam

Subsurface layer:
5 to 9 inches—strongly acid, very pale brown fine sandy loam

Subsoil:
9 to 27 inches—very strongly acid, reddish brown clay
27 to 32 inches—very strongly acid, brown clay stratified with weakly cemented tuffaceous sandstone and siltstone

Underlying material:
32 to 60 inches—brown weakly cemented tuffaceous sandstone, siltstone, and clay

Soil Properties

Depth: Moderately deep
Drainage class: Well drained
Water table: None within a depth of 6 feet
Flooding: None
Runoff: Very high
Permeability: Very slow
Available water capacity: Low
Root zone: Moderately deep
Shrink-swell potential: High
Water erosion hazard: Severe

Composition

Burlewash soil and similar inclusions: 85 percent
Contrasting inclusions: 15 percent

Contrasting Soils

- The shallow Koether soils are on similar landscape positions.
- The deep, moderately well drained Rehburg soil on similar convex positions.

Land Uses

Major land use: Rangeland
Other land uses: Pastureland, cropland

Management Concerns

Pasture
Major limitations:
- A severe erosion hazard exists when this soil is tilled prior to being established to improved grasses.
- The very slow permeability of the clay subsoil restricts water movement and root development of improved grasses.

- The low available water capacity limits plant growth during periods of drought.

Minor limitations:

- The moderately deep solum may inhibit root development of improved grasses

Cropland

Major limitations:

- A severe erosion hazard exists when this soil is cultivated.
- The very slow permeability of the clay subsoil restricts water movement and root development of crops.
- The low available water capacity limits crop growth during periods of drought.

Minor limitations:

- The moderately deep solum may inhibit root development of crops.

Rangeland

Major limitations:

- The very slow permeability of the clay subsoil restricts water movement and root development of native plants.
- The low available water capacity limits native plant growth during periods of drought.
- The low natural fertility limits yield potential of native plants.

Minor limitations:

- The moderately deep solum may inhibit root development of native plants.

Urban development

Major limitations:

- The high shrink-swell potential is a limitation that can cause structural damage to residential and small commercial buildings.
- The moderately deep solum and very slow permeability may interfere with the proper functioning of septic tank absorption fields.
- Low soil strength is a limitation in the construction of local roads and streets.
- A high risk of corrosion exists for uncoated steel and concrete.

Interpretive Groups

Land capability classification: 4e
Ecological site: Claypan Savannah PE 48-68
Pasture management group: Poorly Suited Group

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

Setting

Landform: Summit, shoulder, and upper backslopes on ridges
Landscape position: Coastal plain
Slope: Very gently sloping and gently sloping with convex surfaces
Shape of areas: Irregular
Size of areas: 50 to 200 acres

Typical Profile

Surface layer:

0 to 9 inches—strongly acid, grayish brown gravelly fine sandy loam

Subsoil:
9 to 15 inches—very strongly acid, brown clay with red iron concentrations
15 to 30 inches—very strongly acid, light brown clay with brown iron concentrations
30 to 36 inches—very strongly acid, light brown clay loam with yellow iron concentrations

Underlying material:
36 to 60 inches—pale yellow, weakly cemented tuffaceous siltstone and mudstone

Soil Properties

Depth: Moderately deep
Drainage class: Well drained
Water table: None within a depth of 6 feet
Flooding: None
Runoff: Very high
Permeability: Very slow
Available water capacity: Low
Root zone: Moderately deep
Shrink-swell potential: High
Water erosion hazard: Severe

Composition

Burlewash soil and similar inclusions: 85 percent
Contrasting inclusions: 15 percent

Contrasting Soils

- The shallow Koether soils are on similar landscape positions.
- The deep, moderately well drained Rehburg soils are on similar convex positions.

Land Uses

Major land use: Rangeland
Other land uses: Pasture and cropland

Management Concerns

Pasture
Major limitations:
- A severe erosion hazard exists when this soil is tilled prior to being established to improved grasses.
- The very slow permeability of the clay subsoil restricts water movement and root development of improved grasses.
- The low available water capacity limits plant growth during periods of drought.

Minor limitations:
- The moderately deep solum may inhibit root development of improved grasses.

Cropland
Major limitations:
- A severe erosion hazard exists when this soil is cultivated.
- The low available water capacity limits plant growth during periods of drought.
- The very slow permeability of the clay subsoil restricts water movement and root development of crops.

Minor limitations:
- The moderately deep solum may inhibit root development of crops.

Rangeland
Major limitations:
- The low natural fertility limits yield potential of native plants.
- The very slow permeability of the clay subsoil restricts water movement and root development of native forage plants.
- The low available water capacity limits native plant growth during periods of drought.

Minor limitations:
- The moderately deep solum may inhibit root development of native plants.

Urban development
Major limitations:
- The very slow permeability of the clay subsoil and the moderately deep solum may interfere with the proper functioning of septic tank absorption fields.
- The high shrink-swell potential is a limitation that can cause structural damage to residential and small commercial buildings.
- Low soil strength and the high shrink-swell potential are limitations in the construction of local roads and streets.
- A high risk of corrosion exists for uncoated steel and concrete.

Interpretive Groups

Land capability classification: 4e
Ecological site: Claypan Savannah PE 48-68
Pasture management group: Gravelly Loamy Claypan Group

BxG—Burlewash-Koether soils, 8 to 45 percent slopes, very stony

Setting

Landform: Burlewash soils—lower backslope and footslope on narrow ridges; Koether soils—summit, shoulder, and upper backslopes on narrow ridges
Distinctive surface features: Stones and boulders outcropping on the upper side slopes of steep escarpments
Landscape position: Coastal plain
Slope: Strongly sloping to steep convex surfaces with dominant slopes of 20 to 45 percent; Burlewash soils are on slopes mainly of 8 to 20 percent and Koether soils are on slopes mainly of 20 to 45 percent
Shape of areas: Oblong to elongated
Size of areas: 50 to 200 acres

Typical Profile

Burlewash

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

Subsoil:
7 to 16 inches—very strongly acid, reddish brown clay loam
16 to 25 inches—extremely acid, dark reddish gray clay loam stratified with brown weakly cemented tuffaceous sandstone and siltstone

Underlying material:
25 to 60 inches—weakly cemented tuffaceous sandstone and siltstone

Koether

Surface layer:
0 to 10 inches—strongly acid, brown very stony loamy fine sand

Subsurface layer:
10 to 16 inches—strongly acid, pale brown stony loamy fine sand

Underlying material:
16 to 20 inches—slightly fractured, strongly cemented tuffaceous sandstone

Soil Properties

Depth: Burlewash soil—moderately deep; Koether soil—very shallow or shallow
Drainage class: Burlewash soil—well drained; Koether soil—somewhat excessively drained
Water table: None within a depth of 6 feet
Flooding: None
Runoff: Burlewash soil—very high; Koether soil—low
Permeability: Burlewash soil—very slowly permeable; Koether soil—rapidly permeable
Available water capacity: Burlewash soil—low; Koether soil—very low
Root zone: Burlewash soil—moderately deep; Koether soil—very shallow or shallow
Soil reaction: Very strongly acid
Shrink-swell potential: Burlewash soil—high; Koether soil—low
Water erosion hazard: Severe

Composition

Burlewash soil and similar inclusions: 30 percent
Koether soil and similar inclusions: 55 percent
Contrasting inclusions: 15 percent

Contrasting Soils

- The deep, moderately well drained Rehburg soils are on similar and slightly lower side slope positions.
- The moderately deep, moderately well drained Singleton soils are on lower side slope positions.

Land Uses

Major land use: Rangeland
Other land uses: None

Management Concerns

Pasture
Major limitations:
- This soil is not suited for pasture because of large stones and steepness of slope.

Cropland
Major limitations:
- This soil is not suited for crops because of large stones, steepness of slope, and severe water erosion hazard.

Rangeland

Major limitations:

- Large stones and steepness of slope limit grazing of native forage plants by livestock.
- The very shallow to moderately deep solum inhibits root development of native plants.
- The low available water capacity limits native plant growth during periods of drought.
- The low natural fertility limits yield potential of native plants.

Urban development

Major limitations:

- Slope and the high shrink-swell potential is a limitation affecting the construction of residential and small commercial buildings.
- The very slow permeability, depth to bedrock, and slope may interfere with the proper functioning of septic tank absorption fields.
- Low soil strength and slope is a limitation in the construction of local roads and streets.
- A high risk of corrosion exists for uncoated steel and concrete.

Interpretive Groups

Land capability classification: Burlewash soil—6e; Koether soil—7s
Ecological site: Burlewash soil—Claypan Savannah PE 48-68; Koether soil—Claypan Savannah PE 48-68
Pasture management group: Not Suited Group

CgB—Crockett gravelly fine sandy loam, 1 to 5 percent slopes

Setting

Landform: Summit, shoulder, and upper backslopes of broad ridges
Landscape position: Coastal plain
Slope: Very gently sloping and gently sloping with convex surfaces
Shape of areas: Oblong to irregular
Size of areas: 50 to 200 acres***Typical Profile***

Surface layer:
0 to 12 inches—moderately acid, yellowish brown gravelly fine sandy loam

Subsoil:
12 to 20 inches—moderately acid, yellowish red clay with brown iron concentrations
20 to 46 inches—slightly acid, light olive brown clay
46 to 54 inches—moderately alkaline, olive yellow clay interbedded with light brownish gray shale

Underlying material:
54 to 80 inches—light brownish gray and brown weakly consolidated shale

Soil Properties

Depth: Very deep
Drainage class: Moderately well drained
Water table: None within a depth of 6 feet
Flooding: None
Runoff: Very high
Permeability: Very slow
Available water capacity: Moderate

Root zone: Deep
Shrink-swell potential: High
Water erosion hazard: Severe

Composition

Crockett soil and similar inclusions: 90 percent
Contrasting inclusions: 10 percent

Contrasting Soils

- Areas of Crockett soils that have had the gravelly surface layer removed for road material.
- The clayey Luling soils are on slightly higher convex positions.
- The Wilson soils are on similar and slightly lower positions.

Land Uses

Major land use: Rangeland
Other land uses: Pasture and cropland

Management Concerns

Pasture
Major limitations:
- A severe water erosion hazard exists when this soil is tilled prior to being established to improved grasses.
- The gravelly surface layer makes tillage difficult when establishing improved grasses.
- The very slow permeability of the clay subsoil restricts water movement and root development of improved grasses.

Minor limitations:
- The moderate available water capacity limits growth of improved grasses during periods of drought.

Cropland
Major limitations:
- A severe water erosion hazard exists when this soil is cultivated.
- The very slow permeability of the clay subsoil restricts water movement and root development of crops.
- The gravelly surface layer makes tillage operations difficult.

Minor limitations:
- The moderate available water capacity limits growth of crops during periods of drought.

Rangeland
Major limitations:
- The very slow permeability of the clay subsoil restricts water movement and root development of native plants.

Minor limitations:
- The moderate available water capacity limits growth of native plants during periods of drought.

Urban development
Major limitations:
- The high shrink-swell potential is a limitation that can cause structural damage to residential and small commercial buildings.
- Low soil strength is a limitation in the construction of local roads and streets.

- The very slow permeability of the clay subsoil may interfere with the proper functioning of septic tank absorption fields.
- The gravelly surface layer makes establishment and maintenance of lawns difficult.
- A high risk of corrosion exists for uncoated steel.

Interpretive Groups

Land capability classification: 4e
Ecological site: Claypan Prairie
Pasture management group: Gravelly Loamy Claypan Group

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

Setting

Landform: Stream terrace
Landscape position: Coastal plain
Slope: Very gently sloping and gently sloping with convex surfaces
Shape of areas: Oblong to irregular
Size of areas: 10 to 50 acres

Typical Profile

Surface layer:
0 to 8 inches—slightly acid, brown loamy fine sand

Subsurface layer:
8 to 17 inches—slightly acid, pale brown loamy fine sand

Subsoil:
17 to 27 inches—slightly acid, yellowish brown clay with red and brown iron concentrations and brown iron depletions
27 to 56 inches—slightly acid, light gray clay with yellow and red iron concentrations
56 to 68 inches—slightly alkaline, light gray clay loam with red and yellow iron concentrations
68 to 80 inches—slightly alkaline, light yellowish brown sandy clay loam with grayish brown iron concentrations and iron depletions

Soil Properties

Depth: Very deep
Drainage class: Moderately well drained
Water table: None within a depth of 6 feet
Flooding: None
Runoff: High
Permeability: Slow
Available water capacity: Moderate
Root zone: Very deep
Shrink-swell potential: Medium
Water erosion hazard: Moderate

Composition

Chazos soil and similar inclusions: 90 percent
Contrasting inclusions: 10 percent

Contrasting Soils

- The well drained Dutek soils are on similar and slightly higher convex positions.
- The somewhat excessively drained Faula soils are on similar and slightly higher convex positions.
- The very slowly permeable Lufkin soils are on slightly lower terrace positions.
- The very slowly permeable Rader soils are in lower concave positions.

Land Uses

Major land use: Pasture
Other land uses: Rangeland and cropland

Management Concerns

Pasture
Major limitations:
- There are no major limitations.

Minor limitations:
- A moderate water erosion hazard exists when this soil is tilled prior to being established to improved grasses.
- The slow permeability of the clay subsoil restricts water movement and root development of improved grasses.
- The moderate available water capacity limits growth of improved grasses during periods of drought.

Cropland
Major limitations:
- There are no major limitations.

Minor limitations:
- A moderate erosion hazard exists when this soil is cultivated.
- The slow permeability of the clay subsoil restricts water movement and root development of crops.
- The moderate available water capacity limits plant growth during periods of drought.

Rangeland
Major limitations:
- There are no major limitations.

Minor limitations:
- The slow permeability of the clay subsoil restricts water movement and root development of native plants.
- The moderate available water capacity limits native plant growth during periods of drought.

Urban development
Major limitations:
- The slow permeability of the clay subsoil may interfere with the proper functioning of septic tank absorption fields.
- Low soil strength is a limitation in the construction of local roads and streets.
- A high risk of corrosion exists for uncoated steel.

Minor limitations:
- The high shrink-swell potential is a limitation for the construction of residential and small commercial buildings.
- A moderate risk of corrosion exists for concrete.

Interpretive Groups

Land capability classification: 3e
Ecological site: Sandy Loam PE 48-68
Pasture management group: Sandy Upland Group

CrC—Crockett fine sandy loam, 1 to 5 percent slopes

Setting

Landform: Summit, shoulder, and upper backslopes on broad ridges
Landscape position: Coastal plain
Slope: Very gently sloping and gently sloping with convex surfaces
Shape of areas: Oblong to irregular
Size of areas: 20 to 200 acres

Typical Profile

Surface layer:
0 to 10 inches—moderately acid, brown fine sandy loam

Subsoil:
10 to 21 inches—moderately acid, reddish brown clay with brown and yellow iron concentrations
21 to 29 inches—moderately acid, yellow clay with red iron concentrations
29 to 49 inches—moderately alkaline, light yellowish brown clay
49 to 58 inches—moderately alkaline, pale yellow clay and about 25 percent light gray weathered shale fragments; with yellow and red iron concentrations

Underlying material:
58 to 80 inches—moderately alkaline, light gray weathered shale

Soil Properties

Depth: Very deep
Drainage class: Moderately well drained
Water table: None within a depth of 6 feet
Flooding: None
Runoff: Very high
Permeability: Very slow
Available water capacity: Moderate
Root zone: Deep
Shrink-swell potential: High
Water erosion hazard: Severe

Composition

Crockett soil and similar inclusions: 90 percent
Contrasting inclusions: 10 percent

Contrasting Soils

- The Davilla soils are on smooth slightly lower terrace positions.
- The moderately slowly permeable Lexton soils are on similar and slightly higher convex positions.
- The clayey Luling soils are on slightly higher convex positions.
- The Mabank soils are on smooth slightly lower terrace positions.
- The Wilson soils are on smooth slightly lower terrace positions.

Land Uses

Major land use: Rangeland
Other land uses: Pasture (fig. 10) and cropland

Management Concerns

Pasture
Major limitations:

- A severe water erosion hazard exists when this soil is tilled prior to being established to improved grasses.
- The very slow permeability of the clay subsoil restricts water movement and root development of improved grasses.

Minor limitations:

- The moderate available water capacity limits plant growth during periods of drought.

Cropland
Major limitations:

- A severe water erosion hazard exists when this soil is cultivated.
- The very slow permeability of the clay subsoil restricts water movement and root development of crops.

Minor limitations:

- The moderate available water capacity limits plant growth during periods of drought.

Rangeland
Major limitations:

- The very slow permeability of the clay subsoil restricts water movement and root development of native plants.

Minor limitations:

- The moderate available water capacity limits native plant growth during periods of drought.

Figure 10.—Oats cut for hay on an area of Crockett fine sandy loam, 1 to 5 percent slopes.

Urban development
Major limitations:
- The high shrink-swell potential is a limitation that can cause structural damage to residential and small commercial buildings.
- Low soil strength is a limitation in the construction of local roads and streets.
- The very slow permeability of the clay subsoil may interfere with the proper functioning of septic tank absorption fields.
- A high risk of corrosion exists for uncoated steel.

Interpretive Groups

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

CrC2—Crockett fine sandy loam, 2 to 5 percent slopes, eroded

Setting

Landform: Shoulder and upper backslopes on broad ridges
Distinctive surface features: In most areas of this soil, sheet erosion has reduced the thickness of the surface layer to 5 inches or less. Rills and a few shallow gullies are in some areas. The gullies are about 2 to 5 feet wide and 75 to 300 feet apart. Most are 1 foot or less deep and can be crossed with farm machinery.
Landscape position: Coastal plain
Slope: Very gently sloping and gently sloping with convex surfaces
Shape of areas: Elongated or irregular
Size of areas: 25 to 100 acres

Typical Profile

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

Subsoil:
3 to 13 inches—moderately acid, reddish brown clay
13 to 22 inches—moderately alkaline, brown clay with brown iron concentrations
22 to 43 inches—moderately alkaline, light yellowish brown clay with yellow iron concentrations

Underlying material:
43 to 80 inches—stratified light brownish gray weakly consolidated shale and yellow loamy materials

Soil Properties

Depth: Very deep
Drainage class: Moderately well drained
Water table: None within a depth of 6 feet
Flooding: None
Runoff: Very high
Permeability: Very slow
Available water capacity: Moderate
Root zone: Very deep
Shrink-swell potential: High
Water erosion hazard: Severe

Composition

Crockett soil and similar inclusions: 90 percent
Contrasting inclusions: 10 percent

Contrasting Soils

- The Benchley soils are on slightly lower positions.
- The moderately slowly permeable Lexton soils are on similar and slightly higher convex positions.
- The clayey Luling soils are on slightly higher convex positions.

Land Uses

Major land use: Rangeland
Other land uses: Pasture

Management Concerns

Pasture
Major limitations:
- A severe water erosion hazard exists when this soil is tilled prior to being established to improved grasses; some areas may require mechanical treatment before establishing to improved grasses.
- The very slow permeability of the clay subsoil restricts water movement and root development of improved grasses.

Minor limitations:
- The moderate available water capacity limits growth of improved grasses during periods of drought.

Cropland
Major limitations:
- A severe water erosion hazard exists when this soil is cultivated; conservation practices such as contour farming and minimum tillage may need to be implemented to decrease the risk of erosion.
- The very slow permeability of the clay subsoil restricts water movement and root development of crops.

Minor limitations:
- The moderate available water capacity limits plant growth during periods of drought.

Rangeland
Major limitations:
- The very slow permeability of the clay subsoil restricts water movement and root development of native plants.

Minor limitations:
- The moderate available water capacity limits growth of native plants during periods of drought.

Urban development
Major limitations:
- The high shrink-swell potential is a limitation that can cause structural damage to residential and small commercial buildings.
- Low soil strength is a limitation in the construction of local roads and streets.
- The very slow permeability of the clay subsoil may interfere with the proper functioning of septic tank absorption fields.
- A high risk of corrosion exists for uncoated steel.

Interpretive Groups

Land capability classification: 4e
Ecological site: Claypan Prairie
Pasture management group: Poorly Suited Group

DuC—Dutek loamy fine sand, 1 to 5 percent slopes

Setting

Landform: Stream terrace
Landscape position: Coastal plain
Slope: Very gently sloping and gently sloping with convex surfaces
Shape of areas: Oblong or elongated
Size of areas: 25 to 75 acres

Typical Profile

Surface layer:
0 to 8 inches—slightly acid, brown loamy fine sand

Subsurface layer:
8 to 24 inches—slightly acid loamy fine sand, brown in the upper part and pale brown in the lower part

Subsoil:
24 to 44 inches—moderately acid, red sandy clay loam
44 to 56 inches—moderately acid, yellowish red fine sandy loam

Underlying material:
56 to 80 inches—slightly acid, reddish yellow sandy loam

Soil Properties

Depth: Very deep
Drainage class: Well drained
Water table: None within a depth of 6 feet
Flooding: None
Runoff: Low
Permeability: Moderate
Available water capacity: Low
Root zone: Very deep
Shrink-swell potential: Low
Water erosion hazard: Moderate

Composition

Dutek soil and similar inclusions: 85 percent
Contrasting inclusions: 15 percent

Contrasting Soils

- The slowly permeable Chazos soils are on similar convex terrace positions.
- The rapidly permeable Faula soils are on similar and slightly lower convex terrace positions.
- The moderately slowly permeable Uhland soils are on flood plain positions.

Land Uses

Major land use: Pasture
Other land uses: Rangeland and cropland

Management Concerns

Pasture
Major limitations:
- The low available water capacity limits plant growth during periods of drought.
- Seepage of the soil limits the use for livestock ponds.

Minor limitations:
- A moderate water erosion hazard exists when this soil is tilled prior to being established to improved grasses.

Cropland
Major limitations:
- The low available water capacity limits crop growth during periods of drought.

Minor limitations:
- A moderate erosion hazard exists when this soil is cultivated.
- The thick sandy surface layer is loose when dry and may make operation of tillage equipment difficult.

Rangeland
Major limitations:
- The low available water capacity limits native plant growth during periods of drought.
- The low natural fertility limits yield potential of native plants.
- Seepage of the soil limits the use for livestock ponds.

Urban development
Major limitations:
- The sandy texture of the soil may cause seepage of effluents into groundwater when this soil is used for septic tank absorption fields.
- Excavation sidewalls are unstable because of the sandy soil texture.
- The establishment and maintenance of lawn grasses and landscape plants is expensive because of the low available water capacity.

Minor limitations:
- Slope is a limitation for construction of small commercial buildings.
- A moderate risk of corrosion exists for uncoated steel and concrete.

Interpretive Groups

Land capability classification: 3e
Ecological site: Sandy PE 48-68
Pasture management group: Sandy Upland Group

DwB—Davilla-Wilson complex, 0 to 2 percent slopes

Setting

Landform: Broad relict stream terrace
Distinctive surface features: In undisturbed areas, the microrelief consists of anastomosing mounds and intermounds. The Davilla soil is on convex mounds. It is 5 to 12 inches higher than the Wilson soil, which is in the concave intermounds. The mounds average 15 to 30 feet across and extend 50 to 100 feet in length. Intermounds are oval to elongated in shape and average 15 to 50 feet across. In areas that have been cropped, the mounds are not noticeable, but the Wilson soils occur as dark areas on the landform.
Landscape position: Coastal plain
Slope: Nearly level and very gently sloping with plane and slightly convex surfaces

Shape of areas: Irregular
Size of areas: 50 to 500 acres

Typical Profile

Davilla

Surface layer:
0 to 9 inches—moderately acid, pale brown fine sandy loam

Subsoil:
9 to 18 inches—slightly acid, dark grayish brown clay loam with red and yellow iron concentrations
18 to 28 inches—neutral, grayish brown clay loam with yellow and red iron concentrations
28 to 49 inches—neutral, light brownish gray clay loam with yellow and brown iron concentrations
49 to 63 inches—slightly alkaline, gray clay loam with yellow iron concentrations
63 to 80 inches—slightly alkaline, light brownish gray clay loam with yellow iron concentrations

Wilson

Surface layer:
0 to 6 inches—slightly acid, dark grayish brown loam

Subsoil:
6 to 42 inches—slightly alkaline, very dark gray clay with few brown iron concentrations
42 to 54 inches—moderately alkaline, dark grayish brown clay with gray iron depletions
54 to 80 inches—moderately alkaline, light brownish gray clay loam with yellow iron concentrations

Soil Properties

Depth: Very deep
Drainage class: Moderately well drained
Water table: Davilla—none within a depth of 6 feet; Wilson—none within a depth of 6 feet; however, the soil is seasonally wet and saturated in the surface layer and upper part of the subsoil for short periods in most years
Flooding: None
Runoff: Very high
Permeability: Very slow
Available water capacity: High
Root zone: Very deep
Shrink-swell potential: High
Water erosion hazard: Moderate

Composition

Davilla soil and similar inclusions: 55 percent
Wilson soil and similar inclusions: 35 percent
Contrasting inclusions: 10 percent

Contrasting Soils

- The Benchley soils are in concave areas on upland positions.
- The very slowly permeable Crockett soils are on slightly higher upland positions.

- The Luling soils are on higher upland positions.

Land Uses

Major land use: Cropland (fig. 11)
Other land uses: Pasture and rangeland

Management Concerns

Pasture
Major limitations:
- The very slow permeability of the clay subsoil restricts water movement and root development of crops.

Minor limitations:
- A moderate water erosion hazard exists when this soil is tilled prior to being established to improved grasses.

Cropland
Major limitations:
- The very slow permeability of the clay subsoil restricts water movement and root development of growing crops.

Minor limitations:
- A moderate water erosion hazard exists when this soil is cultivated.

Rangeland
Major limitations:
- The very slow permeability of the clay subsoil restricts water movement and root development of native plants.

Figure 11.—Peanuts on an area of Davilla-Wilson complex, 0 to 2 percent slopes.

Urban development
Major limitations:
- High shrink-swell can cause structural damage to residential and small commercial buildings.
- The very slow permeability of the clay subsoil may interfere with the proper functioning of septic tank absorption fields.
- Low soil strength is a limitation in the construction of local roads and streets.

Minor limitations:
- A moderate risk of corrosion exists for uncoated steel.

Interpretive Groups

Land capability classification: Davilla soil—2s; Wilson soil—3w
Ecological site: Davilla soil—Claypan Prairie; Wilson soil—Claypan Prairie
Pasture management group: Seasonally Wet Loamy Claypan Group

EdB—Edge fine sandy loam, 1 to 3 percent slopes

Setting

Landform: Summit, shoulder, and upper backslopes on broad ridge
Landscape position: Coastal plain
Slope: Very gently sloping and gently sloping with convex surfaces
Shape of areas: Irregular to elongated
Size of areas: 20 to 200 acres

Typical Profile

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

Subsurface layer:
6 to 13 inches—strongly acid, light brown fine sandy loam

Subsoil:
13 to 26 inches—very strongly acid, red clay with brown iron concentrations
26 to 39 inches—strongly acid, red clay with brown iron concentrations
39 to 47 inches—strongly acid, reddish yellow clay loam with red and brown iron concentrations

Underlying material:
47 to 65 inches—slightly acid, brownish yellow clay loam with red iron concentrations
65 to 80 inches—neutral, brownish yellow weakly consolidated siltstone stratified with brown and gray fine sandy loam

Soil Properties

Depth: Deep
Drainage class: Well drained
Water table: None within a depth of 6 feet
Flooding: None
Runoff: Very high
Permeability: Very slow
Available water capacity: Moderate
Root zone: Deep
Shrink-swell potential: High
Water erosion hazard: Severe

Composition

Edge soil and similar inclusions: 85 percent
Contrasting inclusions: 15 percent

Contrasting Soils

- The very deep, moderately permeable Gasil soils are on similar landscape positions.
- The very deep, moderately permeable Padina soils are on slightly higher landscape positions.
- The very deep, moderately well drained Rader soils are in lower concave positions.
- The very deep, moderately permeable Silstid soils are on slightly higher landscape positions.
- The very deep, moderately well drained Tabor soils are in slightly lower concave positions.

Land Uses

Major land use: Rangeland
Other land uses: Pasture and cropland

Management Concerns

Pasture
Major limitations:
- A severe water erosion hazard exists when this soil is tilled prior to being established to improved grasses.
- The very slow permeability of the clay subsoil restricts water movement and root development of improved grasses.

Minor limitations:
- The moderate available water capacity limits plant growth during periods of drought.

Cropland
Major limitations:
- A severe water erosion hazard exists when this soil is cultivated.
- The very slow permeability of the clay subsoil restricts water movement and root development of crops.

Minor limitations:
- The moderate available capacity limits plant growth during periods of drought.

Rangeland
Major limitations:
- The very slow permeability of the clay subsoil restricts water movement and root development of native plants.
- The low natural fertility limits yield potential of native plants.

Minor limitations:
- The moderate available water capacity limits native plant growth during periods of drought.

Urban development
Major limitations:
- The high shrink-swell potential is a limitation that can cause structural damage to residential and small commercial buildings.
- Low soil strength is a limitation in the construction of local roads and streets.

- The very slow permeability of the clay subsoil may interfere with the proper functioning of septic tank absorption fields.

Minor limitations:

- A moderate risk of corrosion exists for uncoated steel and concrete.

Interpretive Groups

Land capability classification: 4e
Ecological site: Claypan Savannah PE 48-68
Pasture management group: Loamy Claypan Group

EdC2—Edge fine sandy loam, 2 to 5 percent slopes, eroded

Setting

Landform: Shoulder and upper and lower backslopes on broad ridges
Distinctive surface features: The surface layer has been thinned by sheet erosion and is less than 5 inches thick in most places. Some areas have rills and shallow gullies that can be crossed with farm machinery. Other areas have gullies that are 1 to 3 feet deep, 5 to about 15 feet wide, and 75 to 300 feet apart.
Landscape position: Coastal plain
Slope: Very gently sloping and gently sloping with convex surfaces
Shape of areas: Elongated to irregular
Size of areas: 20 to 75 acres

Typical Profile

Surface layer:
0 to 5 inches—moderately acid, brown fine sandy loam

Subsoil:
5 to 14 inches—moderately acid, red clay
14 to 41 inches—very strongly acid, red clay with brown and red iron concentrations
41 to 55 inches—strongly acid, brown clay loam with red and brown iron concentrations and gray iron depletions

Underlying material:
55 to 80 inches—slightly acid, stratified light brownish gray shale and yellow fine sandy loam

Soil Properties

Depth: Deep
Drainage class: Well drained
Water table: None within a depth of 6 feet
Flooding: None
Runoff: Very high
Permeability: Very slow
Available water capacity: Moderate
Root zone: Deep
Shrink-swell potential: High
Water erosion hazard: Severe

Composition

Edge soil and similar inclusions: 80 percent
Contrasting inclusions: 20 percent

Contrasting Soils

- The very deep, moderately permeable Gasil soils are on similar landscape positions.
- The moderately well drained Rader soils are in lower concave positions.
- The very deep, moderately well drained Tabor soils are in slightly lower concave positions.

Land Uses

Major land use: Rangeland
Other land uses: Pasture and cropland

Management Concerns

Pasture
Major limitations:
- Eroded areas may require mechanical shaping before establishing improved grasses.
- The very slow permeability of the clay subsoil restricts water movement and root development of improved grasses.

Minor limitations:
- The moderate available water capacity limits plant growth during periods of drought.

Cropland
Major limitations:
- This soil is poorly suited to cropland because of the severe water erosion hazard.
- The yield potential of this soil is greatly reduced because of the lack of topsoil.
- The very slow permeability of the clay subsoil restricts water movement and root development of crops.

Minor limitations:
- The moderate available water capacity limits crop growth during periods of drought.

Rangeland
Major limitations:
- The lack of topsoil and the low natural fertility limits yield potential of native plants.
- The very slow permeability of the clay subsoil restricts water movement and root development of native plants.

Minor limitations:
- The moderate available water capacity limits native plant growth during periods of drought.

Urban development
Major limitations:
- The high shrink-swell potential is a limitation that can cause structural damage to residential and small commercial buildings.
- Low soil strength is a limitation in the construction of local roads and streets.
- The very slow permeability of the clay subsoil may interfere with the proper functioning of septic tank absorption fields.

Minor limitations:
- A moderate risk of corrosion exists for uncoated steel and concrete.

Interpretive Groups

Land capability classification: 4e
Ecological site: Claypan Savannah PE 48-68
Pasture management group: Poorly Suited Group

EdD—Edge fine sandy loam, 5 to 8 percent slopes

Setting

Landform: Shoulder and upper and lower backslopes of broad ridges
Landscape position: Coastal plain
Slope: Moderately sloping with convex surfaces
Shape of areas: Irregular to elongated
Size of areas: 20 to 200 acres

Typical Profile

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

Subsoil:
4 to 25 inches—strongly acid, red clay
25 to 32 inches—moderately acid, yellowish red clay
32 to 46 inches—moderately acid, yellowish red clay loam with strata of grayish brown shale and siltstone

Underlying material:
46 to 80 inches—slightly acid, stratified yellowish red siltstone and light brownish gray shale

Soil Properties

Depth: Deep
Drainage class: Well drained
Water table: None within a depth of 6 feet
Flooding: None
Runoff: Very High
Permeability: Very slow
Available water capacity: Moderate
Root zone: Deep
Shrink-swell potential: High
Water erosion hazard: Severe

Composition

Edge soil and similar inclusions: 85 percent
Contrasting inclusions: 15 percent

Contrasting Soils

- The very deep, moderately permeable Gasil soils are on similar side slope positions.
- The very deep, moderately permeable Silstid on slightly higher upper side slope positions.

Land Uses

Major land use: Rangeland
Other land uses: Pasture and cropland

Management Concerns

Pasture
Major limitations:
- A severe water erosion hazard exists when this soil is tilled prior to being established to improved grasses.
- The very slow permeability of the clay subsoil restricts water movement and root development of improved grasses.

Minor limitations:
- The moderate available water capacity limits plant growth during periods of drought.

Cropland
Major limitations:
- The soil is poorly suited to cropland because of the severe water erosion.
- The very slow permeability of the clay subsoil restricts water movement and root development of crops.

Minor limitations:
- The moderate available capacity limits plant growth during periods of drought.

Rangeland
Major limitations:
- The very slow permeability of the clay subsoil restricts water movement and root development of native plants.
- The low natural fertility limits yield potential of native plants.

Minor limitations:
- The moderate available water capacity limits native plant growth during periods of drought.

Urban development
Major limitations:
- The high shrink-swell potential is a limitation that can cause structural damage to residential and small commercial buildings.
- Low soil strength is a limitation in the construction of local roads and streets.
- The very slow permeability of the clay subsoil may interfere with the proper functioning of septic tank absorption fields.

Minor limitations:
- A moderate risk of corrosion exists for uncoated steel and concrete.

Interpretive Groups

Land capability classification: 6e
Ecological site: Claypan Savannah PE 48-68
Pasture management group: Loamy Claypan Group

EgD—Edge-Gullied land complex, 3 to 8 percent slopes

Setting

Landform: Shoulder and upper and lower backslopes of broad ridges
Distinctive surface features: Gullies, that are uncrossable by farm machinery, are 5 to 20 feet deep, 20 to 200 feet wide, and 100 to 1,000 feet in length, exposing the Edge soil and its parent material of the Wilcox geologic formation (fig. 12).
Landscape position: Coastal plain

Slope: Gently sloping and moderately sloping with concave surfaces
Shape of areas: Elongated to irregular
Size of areas: 20 to 100 acres

Typical Profile

Edge soil

Surface layer:
0 to 4 inches—moderately acid, light brown fine sandy loam

Subsoil:
4 to 22 inches—strongly acid, red clay
22 to 33 inches—strongly acid, red clay loam with yellow iron concentrations and gray iron depletions
33 to 41 inches—strongly acid, light gray sandy clay loam with red and brown iron concentrations

Underlying material:
41 to 80 inches—moderately acid, very pale brown weakly consolidated siltstone with loam texture, stratified with yellow and gray seams of shale

Gullied land

Gullies are 5 to 20 feet deep, 20 to 200 feet wide, and 100 to 1,000 feet in length, exposing the Edge soil and its parent material of the Wilcox Formation.

Soil Properties

Depth: Deep
Drainage class: Well drained
Water table: None within a depth of 6 feet
Flooding: None
Runoff: Very high
Permeability: Very slow
Available water capacity: Low
Root zone: Deep
Shrink-swell potential: High
Water erosion hazard: Severe

Composition

Edge soil and similar inclusions: 35 to 60 percent
Gullied soil and similar inclusions: 20 to 50 percent
Contrasting inclusions: 10 to 30 percent

Contrasting Soils

- The very deep, moderately permeable Gasil soils are on slightly lower side slope positions.
- The very deep, moderately well drained Rader soils are in lower concave positions.

Land Uses

Major land use: Rangeland
Other land uses: Pasture

Management Concerns

Pasture

Major limitations:

- This soil is poorly suited for pasture due to numerous deep gullies and severe erosion hazard (fig.12). Areas may require extensive mechanical shaping before establishing improved grasses.

Cropland

Major limitations:

- This soil is not suited for cropland pasture due to numerous deep gullies and severe erosion hazard.

Rangeland

Major limitations:

- This soil is moderately suited to rangeland; the deep gullies and severe erosion hazard severely limits the growth of native plants.
- The low available water capacity restricts the growth of native plants during periods of drought.
- The lack of topsoil and low natural fertility limits the growth of native plants.

Urban development

Major limitations:

- This soil is poorly suited for most urban uses because of the deep gullies and severe erosion hazard.
- The high shrink-swell potential can cause structural damage to residential and small commercial buildings.
- The very slow permeability of the clay subsoil may interfere with the proper functioning of septic tank absorption fields.
- Low strength is a limitation in the construction of local roads and streets.

Minor limitations:

- A moderate risk of corrosion exists for uncoated steel and concrete.

Figure 12.—Gully erosion in an area of Edge-Gullied land complex, 3 to 8 percent slopes. These areas may need extensive mechanical shaping prior to pasture uses.

Interpretive Groups

Land capability classification: Edge soil—7e; Gullied land—not assigned
Ecological site: Edge soil—Claypan Savannah PE 48-68; Gullied land—not assigned
Pasture management group: Not Suited Group

FaB—Faula fine sand, 0 to 5 percent slopes

Setting

Landform: Stream terrace
Landscape position: Coastal plain
Slope: Nearly level to gently sloping with convex surfaces
Shape of areas: Oblong to elongated
Size of areas: 15 to 75 acres

Typical Profile

Surface layer:
0 to 10 inches—neutral, yellowish brown fine sand

Subsurface layer:
10 to 21 inches—neutral, very pale brown fine sand

Subsoil:
21 to 31 inches—neutral, yellow fine sand with 5 percent reddish yellow lamellae of fine sandy loam about 1/8 inch in thickness
31 to 40 inches—neutral, light yellowish brown fine sand with 20 percent brown lamellae of fine sandy loam about 0.25 to 0.5 inch in thickness
40 to 68 inches—neutral, yellow fine sand with 35 percent strong brown lamellae of fine sandy loam about 0.5 inch to 3 inches in thickness
68 to 80 inches—neutral, very pale brown fine sand with 15 percent reddish yellow lamellae of fine sandy loam about 0.5 inch to 2 inches in thickness

Soil Properties

Depth: Very deep
Drainage class: Somewhat excessively drained
Water table: None within a depth of 6 feet
Flooding: None
Runoff: Negligible
Permeability: Rapid
Available water capacity: Low
Root zone: Very deep
Shrink-swell potential: Low
Water erosion hazard: Moderate

Composition

Faula soil and similar inclusions: 85 percent
Contrasting inclusions: 15 percent

Contrasting Soils

- The moderately well drained, slowly permeable Chazos soils are on slightly higher convex positions.
- The moderately permeable Dutek soils are on similar convex positions.
- The moderately well drained, very slowly permeable Lufkin soils are in lower concave flat positions.

- The moderately well drained, very slowly permeable Rader soils in lower concave positions.
- The well drained, moderately permeable Silawa soils are on similar convex positions.

Land Uses

Major land use: Rangeland
Other land uses: Pasture and cropland

Management Concerns

Pasture
Major limitations:
- The low available water capacity limits plant growth during periods of drought.
- Seepage of the soil limits the use for livestock ponds.
- The rapid permeability of the soil promotes a high rate of leaching which may need a fertilization program.

Minor limitations:
- A moderate erosion hazard exists when this soil is tilled prior to being established to improved grasses.

Cropland
Major limitations:
- This soil is poorly suited to the commonly grown crops because of the low available water capacity and rapid permeability; however, they are suited to watermelons and peanuts.

Minor limitations:
- A moderate erosion hazard exists when this soil is cultivated.
- The sandy surface layer is loose when dry and interferes with the operation of farming equipment.

Rangeland
Major limitations:
- The low available water capacity limits native plant growth during periods of drought.
- The low natural fertility limits production of native plants.
- Seepage of the soil limits the use for livestock ponds.

Urban development
Major limitations:
- The rapid permeability of the soil may cause seepage of effluents into groundwater when this soil is used for septic tank absorption fields.
- Excavation sidewalls are unstable because of the sandy texture.
- The establishment and maintenance of lawn grasses and landscape plants is expensive because of the low available water capacity and rapid permeability.

Minor limitations:
- A moderate risk of corrosion exists for uncoated steel.

Interpretive Groups

Land capability classification: 4s
Ecological site: Deep Sand PE 48-68
Pasture management group: Deep Sandy Group

GaB—Gasil fine sandy loam, 1 to 3 percent slopes

Setting

Landform: Summit and shoulder of ridges
Landscape position: Coastal plain
Slope: Very gently sloping with convex surfaces
Shape of areas: Broad or irregular
Size of areas: 20 to 150 acres

Typical Profile

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

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

Subsoil:
17 to 42 inches—strongly acid and moderately acid, brownish yellow and yellow sandy clay loam with red iron concentrations
42 to 58 inches—moderately acid, red sandy clay loam with yellow iron concentrations and gray iron depletions
58 to 80 inches—moderately acid, reddish yellow sandy clay loam with yellow iron concentrations and pockets of gray loamy fine sand

Soil Properties

Depth: Very deep
Drainage class: Well drained
Water table: None within a depth of 6 feet
Flooding: None
Runoff: Low
Permeability: Moderate
Available water capacity: Moderate
Root zone: Very deep
Shrink-swell potential: Moderate
Water erosion hazard: Moderate

Composition

Gasil soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Contrasting Soils

- The very slowly permeable Edge soils are on similar to slightly higher convex landscape positions.
- The moderately slowly permeable Margie soils are on similar to slightly higher convex landscape positions.
- The moderately slowly permeable Rosanky soils are on similar to slightly higher convex landscape positions.
- The sandy Silstid soils are on similar to slightly higher convex landscape positions.
- The very slowly permeable Tabor soils are on slightly lower landscape positions.

Land Uses

Major land use: Pasture and rangeland
Other land uses: Cropland (fig.13)

Management Concerns

Pasture
Major limitations:
- There are no major limitations.

Minor limitations:
- A moderate water erosion hazard exists when this soil is tilled prior to being established to improved grasses.
- The moderate available water capacity limits plant growth during periods of drought.

Rangeland
Major limitations:
- There are no major limitations.

Minor limitations:
- The moderate available water capacity limits native plant growth during periods of drought.

Cropland
Major limitations:
- There are no major limitations.

Minor limitations:
- A moderate erosion hazard exists when this soil is cultivated.
- The moderate available water capacity limits crop growth during periods of drought.

Figure 13.—A field of wheat on an area of Gasil fine sandy loam, 1 to 3 percent slopes.

Urban development
Major limitations:
- There are no major limitations.

Minor limitations:
- The high shrink-swell potential is a limitation for the construction of residential and small commercial buildings.
- Low soil strength is a limitation in the construction of local roads and streets.
- A moderate risk of corrosion exists for concrete.

Interpretive Groups

Land capability classification: 2e
Ecological site: Sandy Loam PE 48-68
Pasture management group: Loamy Upland Group

GaD—Gasil fine sandy loam, 3 to 8 percent slopes

Setting

Landform: Upper and lower backslopes of ridges
Landscape position: Coastal plain
Slope: Gently sloping to moderately sloping with convex surfaces
Shape of areas: Broad or irregular
Size of areas: 20 to 75 acres

Typical Profile

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

Subsurface layer:
8 to 15 inches—moderately acid, light brown fine sandy loam

Subsoil:
15 to 45 inches—moderately acid, brownish yellow sandy clay loam with red iron concentrations
45 to 80 inches—moderately acid, red sandy clay loam with yellow iron concentrations in the upper part and gray iron depletions in the lower part

Soil Properties

Depth: Very deep
Drainage class: Well drained
Water table: None within a depth of 6 feet
Flooding: None
Runoff: Medium
Permeability: Moderate
Available water capacity: Moderate
Root zone: Very deep
Shrink-swell potential: Moderate
Water erosion hazard: Severe

Composition

Gasil soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Contrasting Soils

- The very slowly permeable Edge soils are on similar to slightly higher convex landscape positions.
- The very slowly permeable Jedd soils are on similar to slightly higher convex landscape positions.
- The moderately slowly permeable Rosanky soils are on similar to slightly higher convex landscape positions.
- The sandy Silstid soils are on similar to slightly higher convex landscape positions.
- The very slowly permeable Tabor soils are on slightly lower landscape positions.

Land Uses

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

Management Concerns

Pasture
Major limitations:
- A severe water erosion hazard exists when this soil is tilled prior to being established to improved grasses.

Minor limitations:
- The moderate available water capacity limits growth of improved grasses during periods of drought.

Rangeland
Major limitations:
- There are no major limitations.

Minor limitations:
- The moderate available water capacity limits growth of native plants during periods of drought.

Cropland
Major limitations:
- A severe water erosion hazard exists when this soil is cultivated.

Minor limitations:
- The moderate available water capacity limits the growth of crops during periods of drought.

Urban development
Major limitations:
- There are no major limitations.

Minor limitations:
- The high shrink-swell potential is a limitation for the construction of residential and small commercial buildings.
- Low soil strength is a limitation in the construction of local roads and streets.
- A moderate risk of corrosion exists for concrete.

Interpretive Groups

Land capability classification: 4e
Ecological site: Sandy Loam PE 48-68
Pasture management group: Loamy Upland Group

GgC—Gredge gravelly fine sandy loam, 1 to 5 percent slopes

Setting

Landform: Dissected relict stream terrace
Landscape position: Coastal plain
Slope: Very gently sloping and gently sloping with convex surfaces
Shape of areas: Oblong to irregular
Size of areas: 20 to 200 acres

Typical Profile

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

Subsurface layer:
7 to 13 inches—strongly acid, very pale brown gravelly fine sandy loam

Subsoil:
13 to 35 inches—strongly acid, red clay with brown iron depletions
35 to 42 inches—moderately acid, red clay loam with brown iron depletions
42 to 62 inches—neutral, light red sandy clay loam with gray iron depletions

Underlying material:
62 to 80 inches—slightly alkaline, light gray siltstone

Soil Properties

Depth: Very deep
Drainage class: Well drained
Water table: None within a depth of 6 feet
Flooding: None
Runoff: Very high
Permeability: Very slow
Available water capacity: Moderate
Root zone: Very deep
Shrink-swell potential: High
Water erosion hazard: Severe

Composition

Gredge soil and similar inclusions: 90 percent
Contrasting inclusions: 10 percent

Contrasting Soils

- The somewhat poorly drained Boonville soils in lower concave positions.
- The moderately well drained Zulch soils are on lower side slope positions.

Land Uses

Major land use: Pasture
Other land uses: Rangeland and cropland

Management Concerns

Pasture
Major limitations:
- The very slow permeability of the clay subsoil restricts water movement and root development of improved grasses.
- The gravelly surface layer makes tillage difficult when establishing improved grasses.

- A severe water erosion hazard exists when this soil is tilled prior to being established to improved grasses.

Minor limitations:

- The moderate available water capacity limits growth of improved grasses during periods of drought.

Cropland

Major limitations:

- A severe water erosion hazard exists when this soil is cultivated.
- The very slow permeability of the clay subsoil restricts water movement and root development of crops.
- The gravelly surface layer makes tillage operations difficult.

Minor limitations:

- The moderate available water capacity limits plant growth during periods of drought.

Rangeland

Major limitations:

- The very slow permeability of the clay subsoil restricts water movement and root development of native plants.
- The low natural fertility limits yield potential of native forage plants.

Minor limitations:

- The moderate available water capacity limits native plant growth during periods of drought.

Urban development

Major limitations:

- The high shrink-swell potential is a limitation that can cause structural damage to residential and small commercial buildings.
- Low soil strength is a limitation in the construction of local roads and streets.
- The very slow permeability of the clay subsoil may interfere with the proper functioning of septic tank absorption fields.
- The gravelly surface layer makes establishment and maintenance of lawns difficult.
- A high risk of corrosion exists for uncoated steel.

Interpretive Groups

Land capability classification: 4e
Ecological site: Claypan Savannah PE 48-68
Pasture management group: Gravelly Loamy Claypan Group

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

Setting

Landform: Dissected relict stream terrace
Landscape position: Coastal plain
Slope: Very gently sloping and gently sloping with convex surfaces
Shape of areas: Oblong to irregular
Size of areas: 20 to 200 acres

Typical Profile

Surface layer:
0 to 7 inches—moderately acid, grayish brown fine sandy loam

Subsoil:
7 to 15 inches—very strongly acid, red clay with common red iron concentrations
15 to 21 inches—strongly acid, reddish yellow clay with brown iron depletions
21 to 31 inches—slightly acid, very pale brown clay loam with red iron concentrations
31 to 42 inches—slightly alkaline, light gray sandy clay loam with yellow iron concentrations
42 to 53 inches—neutral, very pale brown fine sandy loam with brown iron concentrations

Underlying material:
53 to 70 inches—neutral, light yellowish brown fine sandy loam with yellow iron concentrations
70 to 80 inches—neutral, stratified pale yellow siltstone and mudstone

Soil Properties

Depth: Very deep
Drainage class: Well drained
Water table: None within a depth of 6 feet
Flooding: None
Runoff: Very high
Permeability: Very slow
Available water capacity: Moderate
Root zone: Very deep
Shrink-swell potential: High
Water erosion hazard: Severe

Composition

Gredge soil and similar inclusions: 90 percent
Contrasting inclusions: 10 percent

Contrasting Soils

- The somewhat poorly drained Boonville soils in lower concave positions.
- The moderately well drained Zulch soils are on slightly lower side slope positions.

Land Uses

Major land use: Pasture
Other land uses: Rangeland and cropland

Management Concerns

Pasture
Major limitations:
- A severe water erosion hazard exists when this soil is tilled prior to being established to improved grasses.
- The very slow permeability of the clay subsoil restricts water movement and root development of improved grasses.

Minor limitations:
- The moderate available water capacity limits plant growth during periods of drought.

Cropland
Major limitations:
- A severe water erosion hazard exists when this soil is cultivated.

- The very slow permeability of the clay subsoil restricts water movement and root development of crops.

Minor limitations:

- The moderate available water capacity limits plant growth during periods of drought.

Rangeland

Major limitations:

- The very slow permeability of the clay subsoil restricts water movement and root development of native plants.

Minor limitations:

- The moderate available water capacity limits native plant growth during periods of drought.
- The moderate natural fertility limits yield potential of native forage plants.

Urban development

Major limitations:

- The high shrink-swell potential is a limitation that can cause structural damage to residential and small commercial buildings.
- Low soil strength is a limitation in the construction of local roads and street.
- The very slow permeability of the clay subsoil may interfere with the proper functioning of septic tank absorption fields.
- A high risk of corrosion exists for uncoated steel.

Interpretive Groups

Land capability classification: 4e
Ecological site: Claypan Savannah PE 48-68
Pasture management group: Loamy Claypan Group

GsB—Gasil loamy fine sand, 1 to 3 percent slopes

Setting

Landform: Summit and shoulder of ridges
Landscape position: Coastal plain
Slope: Very gently sloping with convex surfaces
Shape of areas: Broad or irregular
Size of areas: 20 to 100 acres

Typical Profile

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

Subsurface layer:
8 to 18 inches—slightly acid, light yellowish brown loamy fine sand

Subsoil:
18 to 43 inches—moderately acid, brownish yellow sandy clay loam with red iron concentrations
43 to 59 inches—moderately acid, brownish yellow sandy clay loam with red and brown iron concentrations and gray iron depletions
59 to 80 inches—strongly acid, brownish yellow sandy clay loam with red iron concentrations and gray iron depletions

Soil Properties

Depth: Very deep

Drainage class: Well drained
Water table: None within a depth of 6 feet
Flooding: None
Runoff: Low
Permeability: Moderate
Available water capacity: Moderate
Root zone: Very deep
Shrink-swell potential: Moderate
Water erosion hazard: Moderate

Composition

Gasil soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Contrasting Soils

- The very slowly permeable Edge soils are on similar to slightly higher convex positions.
- The moderately slowly permeable Jedd soils are on higher ridgetop positions.
- The slowly permeable Robco soils are in slightly lower concave positions.
- The very slowly permeable Tabor soils are in slightly lower concave positions.

Land Uses

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

Management Concerns

Pasture
Major limitations:
- There are no major limitations.

Minor limitations:
- A moderate water erosion hazard exists when this soil is tilled prior to being established to improved grasses.
- The moderate available water capacity limits growth of improved grasses during periods of drought.

Rangeland
Major limitations:
- There are no major limitations.

Minor limitations:
- The moderate available water capacity limits growth of native plants during periods of drought.

Cropland
Major limitations:
- There are no major limitations.

Minor limitations:
- A moderate water erosion hazard exists when this soil is cultivated.
- The moderate available water capacity limits growth of crops during periods of drought.

Urban development
Major limitations:
- There are no major limitations.

Minor limitations:
- The high shrink-swell potential is a limitation for the construction of residential and small commercial buildings.
- Low strength is a limitation in the construction of local roads and streets.
- A moderate risk of corrosion exists for concrete.

Interpretive Groups

Land capability classification: 3e
Ecological site: Sandy Loam PE 48-68
Pasture management group: Sandy Upland Group

GsD—Gasil loamy fine sand, 3 to 8 percent slopes

Setting

Landform: Upper and lower backslopes of ridges
Landscape position: Coastal plain
Slope: Gently sloping to moderately sloping with convex surfaces
Shape of areas: Irregular
Size of areas: 20 to 75 acres

Typical Profile

Surface layer:
0 to 7 inches—moderately acid, brown loamy fine sand

Subsurface layer:
7 to 16 inches—moderately acid, light yellowish brown loamy fine sand

Subsoil:
16 to 27 inches—moderately acid, light yellowish brown sandy clay loam with brown iron concentrations
27 to 47 inches—moderately acid, brownish yellow sandy clay loam with red iron concentrations
47 to 68 inches—moderately acid, red sandy clay loam with brown iron concentrations
68 to 80 inches—moderately acid, strong brown sandy clay loam with red iron concentrations

Soil Properties

Depth: Very deep
Drainage class: Well drained
Water table: None within 6 feet
Flooding: None
Runoff: Medium
Permeability: Moderate
Available water capacity: Moderate
Root zone: Very deep
Shrink-swell potential: Moderate
Water erosion hazard: Severe

Composition

Gasil soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Contrasting Inclusions

- The very slowly permeable Edge soils are on similar to slightly higher convex landscape positions.
- The very slowly permeable Jedd soils are on similar to slightly higher convex landscape positions.
- The slowly permeable Robco soils are on slightly lower landscape positions.
- The moderately slow permeable Rosanky soils are on similar to slightly higher convex landscape positions.
- The very slowly permeable Tabor soils are on slightly lower landscape positions.

Land Uses

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

Management Concerns

Pasture
Major limitations:
- A severe water erosion hazard exists when this soil is tilled prior to being established to improved grasses.

Minor limitations:
- The moderate available water capacity limits the growth of improved grasses during periods of drought.

Rangeland
Major limitations:
- There are no major limitations.

Minor limitations:
- The moderate available water capacity limits the growth of native plants during periods of drought.

Cropland
Major limitations:
- A severe water erosion hazard exists when this soil is cultivated.

Minor limitations:
- The moderate available water capacity limits the growth of crops during periods of drought.

Urban development
Major limitations:
- There are no major limitations.

Minor limitations:
- Shrink-swell is a limitation for the construction of residential and small commercial buildings.
- Low soil strength is a limitation in the construction of local roads and streets.
- A moderate risk of corrosion exists for concrete.

Interpretive Groups

Land capability classification: 4e
Ecological site: Sandy Loam PE 48-68
Pasture management group: Sandy Upland Group

JeD—Jedd fine sandy loam, 3 to 8 percent slopes

Setting

Landform: Summit, shoulder, and upper backslopes on narrow ridges
Landscape position: Coastal plain
Slope: Gently sloping and moderately sloping with convex surfaces
Shape of areas: Oblong to elongated
Size of areas: 20 to 150 acres

Typical Profile

Surface layer:
0 to 5 inches—strongly acid, brown fine sandy loam

Subsurface layer:
5 to 8 inches—strongly acid, light brown fine sandy loam

Subsoil:
8 to 26 inches—very strongly acid, red clay

Underlying material:
26 to 60 inches—very strongly acid, red weakly cemented sandstone and light gray stratified shale

Soil Properties

Depth: Moderately deep
Drainage class: Well drained
Water table: None within a depth of 6 feet
Flooding: None
Runoff: High
Permeability: Moderately slow
Available water capacity: Low
Root zone: Moderately slow
Shrink-swell potential: Medium
Water erosion hazard: Severe

Composition

Jedd soil and similar inclusions: 90 percent
Contrasting inclusions: 10 percent

Contrasting Soils

- The somewhat excessively drained, rapid permeable Arenosa soils are on higher smooth positions.
- The moderately permeable Gasil soils are on lower side slope positions.
- Areas of Jedd soils that have more than 15 percent gravel in the surface layer.
- The moderately permeable Padina soils are on similar side slope and slightly higher convex positions.
- The moderately permeable Silstid soils are on similar side slope and slightly higher convex positions.
- The slowly permeable Spiller soils are on lower side slope positions.

Land Uses

Major land use: Rangeland
Other land uses: Pasture

Management Concerns

Pasture
Major limitations:
- The low available water capacity limits plant growth during periods of drought.

Minor limitations:
- The moderately deep solum may restrict root development of improved grasses.
- The moderately slow permeability of the clay subsoil restricts water development and root development.

Cropland
Major limitations:
- This soil is poorly suited to growing crops due to severe water erosion hazard.

Minor limitations:
- The moderately deep solum may restrict root development of crops.
- The moderately slow permeability of the clay subsoil restricts water development and root development.

Rangeland
Major limitations:
- The low natural fertility limits yield potential of native plants.
- The low available water capacity limits native plant growth during periods of drought.

Minor limitations:
- The moderately deep solum may restrict root development of native plants.
- The moderately slow permeability clay subsoil restricts water movement and root development.

Urban development
Major limitations:
- Slope, moderately slow permeability of the clay subsoil and solum thickness may interfere with the proper functioning of septic tank absorption fields.
- Slope and low strength are limitations in the construction of local roads and streets.
- Slope is a limitation affecting the construction of residential and small commercial buildings.
- A high risk of corrosion exists for uncoated steel.

Minor limitations:
- The high shrink-swell potential is a limitation for the construction of residential and small commercial buildings.
- A moderate risk of corrosion exists for concrete.

Interpretive Groups

Land capability classification: 6e
Ecological site: Sandstone Hill PE 48-68
Pasture management group: Poorly Suited Group

JeE—Jedd fine sandy loam, 5 to 20 percent slopes, stony

Setting

Landform: Shoulder and upper backslopes of narrow ridges
Distinctive surface features: Fragments of sandstone and ironstone 10 inches to about 48 inches in diameter cover 1 to 5 percent of the surface
Landscape position: Coastal plain
Slope: Moderately sloping to moderately steep with convex surfaces
Shape of areas: Oblong to elongated
Size of areas: 20 to 100 acres

Typical Profile

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

Subsoil:
7 to 26 inches—strongly acid, red clay
26 to 35 inches—strongly acid, red clay with gray shale

Underlying material:
35 to 80 inches—strongly acid, red weakly cemented sandstone with thin lenses of gray shale

Soil Properties

Depth: Moderately deep
Drainage class: Well drained
Water table: None within a depth of 6 feet
Flooding: None
Runoff: High
Permeability: Moderately slow
Available water capacity: Low
Root zone: Moderately deep
Shrink-swell potential: Medium
Water erosion hazard: Severe

Composition

Jedd soil and similar inclusions: 95 percent
Contrasting inclusions: 5 percent

Contrasting Soils

- The moderately permeable Gasil soils are on lower side slope positions.
- The moderately permeable Padina soils are on slightly higher convex positions.
- The moderately permeable Silstid soils are on similar and lower side slope positions.

Land Uses

Major land use: Rangeland
Other land uses: None

Management Concerns

Pasture
Major limitations:
- This soil is not suited for pasture because of large stones on the surface and slope.

Cropland
Major limitations:
- This soil is not suited to growing crops due to severe water erosion hazard, large stones on the surface, and slope.

Rangeland
Major limitations:
- Large stones on the surface restrict growth of native plants.
- The low natural fertility limits yield potential of native plants.
- The low available water capacity limits native plant growth during periods of drought.

Minor limitations:
- The moderately deep solum may restrict root development of native plants.

Urban development
Major limitations:
- Slope, moderately slow permeability of the clay subsoil, and solum thickness may interfere with the proper functioning of septic tank absorption fields.
- Slope and low soil strength are limitations in the construction of local roads and streets.
- Slope is a limitation in the construction of residential and small commercial buildings.
- Large stones and slope may interfere with the establishment and maintenance of lawns.
- A high risk of corrosion exists for uncoated steel.

Minor limitations:
- The high shrink-swell potential is a limitation in the construction of residential and small commercial buildings.
- A moderate risk of corrosion exists for concrete.

Interpretive Groups

Land capability classification: 6e
Ecological site: Sandstone Hill PE 48-68
Pasture management group: Not Suited Group

JeF—Jedd fine sandy loam, 8 to 20 percent slopes

Setting

Landform: Shoulder, and upper backslopes of narrow ridges
Landscape position: Coastal plain
Slope: Strongly sloping and moderately steep with convex surfaces
Shape of areas: Oblong to elongated
Size of areas: 20 to 75 acres

Typical Profile

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

Subsurface layer:
6 to 12 inches—moderately acid, light brown fine sandy loam

Subsoil:
12 to 22 inches—strongly acid, yellowish red clay
22 to 31 inches—very strongly acid, reddish yellow clay loam with thin lenses of weakly cemented sandstone

Underlying material:
31 to 60 inches—stratified reddish yellow weakly cemented sandstone and gray shale

Soil Properties

Depth: Moderately deep
Drainage class: Well drained
Water table: None within a depth of 6 feet
Flooding: None
Runoff: High
Permeability: Moderately slow
Available water capacity: Low
Root zone: Moderately slow
Shrink-swell potential: Medium
Water erosion hazard: Severe

Composition

Jedd soil and similar inclusions: 90 percent
Contrasting inclusions: 10 percent

Contrasting Soils

- The moderately permeable Gasil soils are on lower side slope positions.
- The moderately permeable Padina soils are on similar side slope and slightly higher convex positions.
- The moderately permeable Silstid soils are on slightly higher convex positions.

Land Uses

Major land use: Rangeland
Other land uses: Pasture

Management Concerns

Pasture
Major limitations:
- A severe water erosion hazard exists when this soil is tilled prior to being established to improved grasses.
- The low available water capacity limits plant growth during periods of drought.

Minor limitations:
- The moderately deep solum may restrict root development of improved grasses.
- The moderately slow permeability of the clay subsoil restricts water development and root development.

Cropland
Major limitations:
- This soil is not suited to growing crops due to the severe water erosion hazard and slope.

Rangeland
Major limitations:
- The low natural fertility limits yield potential of native plants.
- The low available water capacity limits native plant growth during periods of drought.

Minor limitations:
- The moderately deep solum may restrict root development of native plants.
- The moderately slow permeability of the clay subsoil restricts water movement and root development.

Urban development
Major limitations:
- Slope, moderately slow permeability of the clay subsoil and solum thickness may interfere with the proper functioning of septic tank absorption fields.
- Slope and low strength are limitations in the construction of local roads and streets.
- Slope is a limitation affecting the construction of residential and small commercial buildings.
- A high risk of corrosion exists for uncoated steel.

Minor limitations:
- The high shrink-swell potential is a limitation for the construction of residential and small commercial buildings.
- A moderate risk of corrosion exists for concrete.

Interpretive Groups

Land capability classification: 6e
Ecological site: Sandstone Hill PE 48-68
Pasture management group: Poorly Suited Group

JgD—Jedd soils, graded, 2 to 8 percent slopes

Setting

Landform: Summit and shoulder of narrow ridges
Distinctive surface features: Gravel pits; the gravelly surface layer and the upper part of the subsoil have been removed and used as a source of gravel for road construction.
Landscape position: Coastal plain
Slope: Very gently sloping to moderately sloping with convex surfaces
Shape of areas: Irregular
Size of areas: 10 to 75 acres

Typical Profile

Surface layer:
0 to 2 inches—slightly acid, strong brown gravelly fine sandy loam

Subsoil:
2 to 14 inches—moderately acid, red clay with brown iron concentrations
14 to 21 inches—moderately acid, red clay loam with thin layers of red and brown weakly cemented sandstone and gray shale

Underlying material:
21 to 80 inches—yellowish red and strong brown weakly cemented to strongly cemented sandstone

Soil Properties

Depth: Moderately deep
Drainage class: Well drained
Water table: None within a depth of 6 feet
Flooding: None
Runoff: High

Permeability: Moderately slow
Available water capacity: Low
Root zone: Moderately slow
Shrink-swell potential: Medium
Water erosion hazard: Severe

Composition

Jedd soil and similar inclusions: 90 percent
Contrasting inclusions: 10 percent

Contrasting Soils

- The moderately permeable Gasil soils are on lower side slope positions.
- The Jedd soils that have not been desurfaced and are in landscape positions similar to those of the Jedd soil.
- The moderately permeable Padina soils are on similar side slope and slightly higher convex positions.
- The moderately permeable Silstid soils are on similar side slope and slightly higher convex positions.

Land Uses

Major land use: Gravel pits
Other land uses: Rangeland and pasture

Management Concerns

Pasture
Major limitations:
- The lack of topsoil and low soil fertility restricts revegetation of areas that have been desurfaced.
- The low available water capacity limits growth of improved grasses during periods of drought.

Cropland
Major limitations:
- This soil is not suited to growing crops because of the severe water erosion hazard and lack of topsoil.

Rangeland
Major limitations:
- The lack of topsoil and low natural fertility severely limits yield potential of native plants.
- The low available water capacity limits native plant growth during periods of drought.

Urban development
Major limitations:
- The lack of topsoil and in some areas subsoil, may interfere with the proper functioning of septic tank absorption fields.
- Low strength is a limitation in the construction of local roads and streets.
- Establishment and maintenance of lawns and landscape plants may be difficult because of the lack of topsoil and low soil fertility.
- A high risk of corrosion exists for uncoated steel.

Minor limitations:

- The high shrink-swell potential is a limitation for the construction of residential and small commercial buildings.
- A moderate risk of corrosion exists for concrete.

Interpretive Groups

Land capability classification: 6e
Ecological site: Sandstone Hill PE 48-68
Pasture management group: Not Suited Group

KgC—Kurten very gravelly fine sandy loam, 1 to 5 percent slopes

Setting

Landform: Summit and shoulder on narrow ridges
Landscape position: Coastal plains
Slope: Very gently sloping to moderately sloping with convex surfaces
Shape of areas: Oblong to irregular
Size of areas: 50 to 300 acres

Typical Profile

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

Subsoil:
7 to 34 inches—strongly acid, red clay with gray relict iron depletions
34 to 45 inches—very strongly acid, light yellowish brown clay with gray relict iron depletions and red iron concentrations
45 to 53 inches—slightly acid, yellowish brown clay with gray fragments of shale

Underlying material:
53 to 80 inches—neutral, light brownish gray shale

Soil Properties

Depth: Deep
Drainage class: Well drained
Water table: None within a depth of 6 feet
Flooding: None
Runoff: Very high
Permeability: Very slow
Available water capacity: Moderate
Root zone: Deep
Shrink-swell potential: High
Water erosion hazard: Severe

Composition

Kurten soil and similar inclusions: 85 percent
Contrasting inclusions: 15 percent

Contrasting Soils

- Areas of Kurten soils that have had the very gravelly surface layer removed for road material.
- Kurten soils that have less than 15 percent gravel in the surface layers and are in similar landscape positions.

- The moderately well drained, slowly permeable Spiller soils are on similar and slightly lower positions.

Land Uses

Major land use: Rangeland
Other land uses: Pasture

Management Concerns

Pasture
Major limitations:
- A severe water erosion hazard exists when this soil is tilled prior to being established to improved grasses.
- The very slow permeability of the clay subsoil restricts water movement and root development of improved grasses.
- The very gravelly surface layer makes tillage difficult when establishing improved grasses.

Minor limitations:
- The moderate available water capacity limits growth of improved grasses during periods of drought.

Cropland
Major limitations:
- This soil is poorly suited for growing crops because of the severe water erosion hazard and very gravelly surface layer.
- The very slow permeability of the clay subsoil restricts water movement and root development of crops.

Minor limitations:
- The moderate available water capacity limits growth of crops during periods of drought.

Rangeland
Major limitations:
- The very slow permeability of the clay subsoil restricts water movement and root development of native plants.

Minor limitations:
- The moderate available water capacity limits growth of native plants during periods of drought.

Urban development
Major limitations:
- The high shrink-swell potential is a limitation that can cause structural damage to residential and small commercial buildings.
- Low soil strength is a limitation in the construction of local roads and streets.
- The very slow permeability of the clay subsoil may interfere with the proper functioning of septic tank absorption fields.
- The very gravelly surface layer makes lawn establishment and maintenance difficult.
- A high risk of corrosion exists for uncoated steel.

Minor limitations:
- A moderate risk of corrosion exists for concrete.

Interpretive Groups

Land capability classification: 4e
Ecological site: Claypan Savannah PE 48-68
Pasture management group: Not Suited Group

KuC—Kurten fine sandy loam, 1 to 5 percent slopes

Setting

Landform: Summit, shoulder, and upper backslopes on narrow ridges
Landscape position: Coastal plain
Slope: Very gently sloping and gently sloping with convex surfaces
Shape of areas: Oblong to irregular
Size of areas: 40 to 200 acres

Typical Profile

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

Subsurface layer:
4 to 10 inches—moderately acid, brown fine sandy loam

Subsoil:
10 to 23 inches—moderately acid, reddish brown clay with gray relict iron depletions
23 to 56 inches—very strongly acid, red clay with brown relict iron depletions

Underlying material:
56 to 80 inches—very strongly acid, brown shale

Soil Properties

Depth: Deep
Drainage class: Well drained
Water table: None within a depth of 6 feet
Flooding: None
Runoff: Very high
Permeability: Very slow
Available water capacity: Moderate
Root zone: Deep
Shrink-swell potential: High
Water erosion hazard: Severe

Composition

Kurten soil and similar inclusions: 90 percent
Contrasting inclusions: 10 percent

Contrasting Soils

- The moderately well drained Rader soils are in slightly lower concave positions.
- The moderately well drained, slowly permeable Spiller soils are on similar and slightly lower positions.

Land Uses

Major land use: Rangeland
Other land uses: Pasture and cropland

Management Concerns

Pasture
Major limitations:
- A severe water erosion hazard exists when this soil is tilled prior to being established to improved grasses.

- The very slow permeability of the clay subsoil restricts water movement and root development of improved grasses.

Minor limitations:

- The moderate available water capacity limits growth of improved grasses during periods of drought.

Cropland

Major limitations:

- A severe water erosion hazard exists when this soil is cultivated.
- The very slow permeability of the clay subsoil restricts water movement and root development of crops.

Minor limitations:

- The moderate available water capacity limits growth of crops during periods of drought.

Rangeland

Major limitations:

- The very slow permeability of the clay subsoil restricts water movement and root development of native plants.

Minor limitations:

- The moderate available water capacity limits growth of native plants during periods of drought.

Urban development

Major limitations:

- The high shrink-swell potential is a limitation that can cause structural damage to residential and small commercial buildings.
- Low soil strength is a limitation in the construction of local roads and streets.
- The very slow permeability of the clay subsoil may interfere with the proper functioning of septic tank absorption fields.
- A high risk of corrosion exists for uncoated steel.

Minor limitations:

- A moderate risk of corrosion exists for concrete.

Interpretive Groups

Land capability classification: 4e
Ecological site: Claypan Savannah PE 48-68
Pasture management group: Loamy Claypan Group

LeB—Lexton clay, 1 to 3 percent slopes

Setting

Landform: Summit, shoulder, and upper backslopes on ridges
Distinctive surface features: Gilgai microrelief in undisturbed areas
Landscape position: Coastal plain
Slope: Very gently sloping with convex surfaces
Shape of areas: Elongated
Size of areas: 20 to 100 acres

Typical Profile

Surface layer:
0 to 9 inches—moderately acid, brown clay

Subsurface layer:
9 to 15 inches—neutral, reddish brown clay with brown iron concentrations

Subsoil:
15 to 37 inches—neutral, reddish brown clay with brown iron concentrations
37 to 58 inches—moderately alkaline, olive clay with red and brown iron concentrations

Underlying material:
58 to 80 inches—moderately alkaline, yellow and olive horizontally bedded glauconitic marl, greensand, and shale

Soil Properties

Depth: Very deep
Drainage class: Well drained
Water table: None within a depth of 6 feet
Flooding: None
Runoff: Medium
Permeability: Very slow
Available water capacity: High
Root zone: Very deep
Shrink-swell potential: High
Water erosion hazard: Moderate

Composition

Lexton soil and similar inclusions: 90 percent
Contrasting inclusions: 10 percent

Contrasting Soils

- The deep Crockett soils that are on lower side slope positions.
- The moderately slowly permeable Margie soils are on similar convex ridge positions.

Land Uses

Major land use: Pasture
Other land uses: Rangeland and cropland

Management Concerns

Pasture
Major limitations:
- There are no major limitations.

Minor limitations:
- The moderately slow permeability of the clay subsoil restricts water movement and root development of improved grasses.

Cropland
Major limitations:
- There are no major limitations.

Minor limitations:
- A moderate erosion hazard exists when this soil is cultivated.
- The moderately slow permeability of the clay subsoil restricts water movement and root development of crops.

Rangeland
Major limitations:
- There are no major limitations.

Minor limitations:
- The moderately slow permeability of the clay subsoil restricts water movement and development of native plants.

Urban development
Major limitations:
- Low soil strength is a limitation in the construction of local roads and streets.
- A high risk of corrosion exists for uncoated steel.

Minor limitations:
- The moderately slow permeability of the clay subsoil may interfere with the proper functioning of septic tank absorption fields.
- The high shrink-swell potential is a limitation for the construction of residential and small commercial buildings.
- A moderate risk of corrosion exists for concrete.

Interpretive Groups

Land capability classification: 2e
Ecological site: Deep Redland PE 48-68
Pasture management group: Clayey Group

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

Setting

Landform: Stream terrace
Landscape position: Coastal plain
Slope: Nearly level with plane or slightly concave surfaces
Shape of areas: Oval to elongated
Size of areas: 10 to 75 acres

Typical Profile

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

Subsoil:
7 to 25 inches—very strongly acid, gray clay
25 to 41 inches—slightly alkaline, gray clay with gray iron depletions in the lower part
41 to 80 inches—slightly alkaline, light gray clay loam with brown iron concentrations in the lower part

Soil Properties

Depth: Very deep
Drainage class: Moderately well drained
Water table: None within a depth of 6 feet; this soil is seasonally wet and is saturated in the surface layer and upper part of the subsoil for short periods in most years.
Flooding: None
Runoff: High
Permeability: Very slow
Available water capacity: Moderate
Root zone: Very deep
Shrink-swell potential: High
Water erosion hazard: Slight

Composition

Lufkin soil and similar inclusions: 85 percent

Contrasting inclusions: 15 percent

Contrasting Soils

- The slowly permeable Chazos soils are on slightly higher convex positions.
- The somewhat excessively drained Faula soils are on higher smooth positions.
- The very slowly permeable Rader soils are on similar positions.
- The slowly permeable Robco soils are on similar positions.
- The moderately permeable Silawa soils are on slightly higher convex positions.

Land Uses

Major land use: Rangeland
Other land uses: Pasture and cropland

Management Concerns

Pasture
Major limitations:
- The very slow permeability of the clay subsoil restricts water movement and root development of improved grasses.

Minor limitations:
- The moderate available water capacity limits plant growth during periods of drought.

Cropland
Major limitations:
- Seasonal wetness due to low runoff may hamper the germination of crops and will limit tillage operations to when the periods are dry.
- The very slow permeability of the clay subsoil restricts water movement and root development of crops.

Minor limitations:
- The moderate available water capacity limits plant growth during periods of drought.

Rangeland
Major limitations:
- The very slow permeability of the clay subsoil restricts water movement and root development of native plants.
- The low natural fertility limits yield potential of native plants.

Minor limitations:
- The moderate available water capacity limits native plant growth during periods of drought.

Urban development
Major limitations:
- The high shrink-swell potential is a limitation that can cause structural damage to residential and small commercial buildings.
- Low soil strength, the high shrink-swell potential, and seasonal wetness are limitations in the construction of local roads and streets.
- The very slow permeability of the clay subsoil and seasonal wetness may interfere with the proper functioning of septic tank absorption fields.
- A high risk of corrosion exists for uncoated steel.

Minor limitations:
- A moderate risk of corrosion exists for concrete.

Interpretive Groups

Land capability classification: 3w
Ecological site: Claypan Savannah PE 48-68
Pasture management group: Seasonally Wet Loamy Claypan Group

LgB—Luling gravelly clay, 1 to 3 percent slopes

Setting

Landform: Summit and shoulder on ridges
Distinctive surface features: Linear gilgai microrelief in undisturbed areas
Landscape position: Coastal plain
Slope: Very gently sloping with convex surfaces
Shape of areas: Oblong to elongated
Size of areas: 20 to 50 acres

Typical Profile

Surface layer:
0 to 8 inches—neutral, dark grayish brown gravelly clay

Subsoil:
8 to 18 inches—neutral, grayish brown clay
18 to 32 inches—slightly alkaline, olive brown clay with brown iron concentrations
32 to 48 inches—moderately alkaline, light olive brown clay
48 to 55 inches—moderately alkaline, light yellowish brown clay with thin lenses of gray shale

Underlying material:
55 to 80 inches—moderately alkaline, light brownish gray shale with thin lenses of brown ironstone

Soil Properties

Depth: Very deep
Drainage class: Well drained
Water table: None within a depth of 6 feet
Flooding: None
Runoff: Very high
Permeability: Very slow
Available water capacity: High
Root zone: Deep
Shrink-swell potential: Very high
Water erosion hazard: Moderate

Composition

Luling soil and similar inclusions: 80 percent
Contrasting inclusions: 20 percent

Contrasting Soils

- The Benchley soils are in narrow drainageways.
- The moderately well drained Crockett soils are on similar landscape positions.
- The Luling soils have less than 15 percent siliceous gravel in the surface layer.

Land Uses

Major land use: Rangeland
Other land uses: Pasture and cropland

Management Concerns

Pasture
Major limitations:
- The very slow permeability of the clay subsoil restricts water movement and root development of improved grasses.
- The gravelly clay surface layer may cause difficulty in preparing a good seedbed for establishment of improved grasses.

Minor limitations:
- A moderate water erosion hazard exists when this soil is tilled prior to being established to improved grasses.

Cropland
Major limitations:
- The very slow permeability of the clay subsoil restricts water movement and root development of crops.
- The gravelly clay surface layer may make tillage operations difficult.

Minor limitations:
- A moderate erosion hazard exists when this soil is cultivated.

Rangeland
Major limitations:
- The very slow permeability of the clay subsoil restricts water movement and root development of native plants.

Urban development
Major limitations:
- The high shrink-swell potential is a limitation that can cause structural damage to residential and small commercial buildings.
- Low soil strength and the high shrink-swell potential are limitations in the construction of local roads and streets.
- Very slow permeability of the clay subsoil may interfere with the proper functioning of septic tank absorption fields.
- Excavation sidewalls are unstable because of the clayey texture.
- The gravelly surface layer may interfere with the establishment and maintenance of lawns.
- A high risk of corrosion exists for uncoated steel.

Interpretive Groups

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

LuB—Luling clay, 1 to 3 percent slopes

Setting

Landform: Summit and shoulder on ridges
Distinctive surface features: Linear gilgai microrelief in undisturbed areas
Landscape position: Coastal plain
Slope: Very gently sloping with convex surfaces

Shape of areas: Oblong to elongated
Size of areas: 20 to 150 acres

Typical Profile

Surface layer:
0 to 8 inches—neutral, dark grayish brown clay

Subsurface layer:
8 to 17 inches—neutral, dark grayish brown clay

Subsoil:
17 to 42 inches—moderately alkaline, grayish brown clay with brown iron concentrations
42 to 73 inches—moderately alkaline, olive yellow clay with brown iron concentrations in the upper part

Underlying material:
73 to 80 inches—moderately alkaline, light gray shale with thin lenses of yellow sandstone

Soil Properties

Depth: Very deep
Drainage class: Well drained
Water table: None within a depth of 6 feet
Flooding: None
Runoff: Very high
Permeability: Very slow
Available water capacity: High
Root zone: Deep
Shrink-swell potential: Very high
Water erosion hazard: Moderate

Composition

Luling soil and similar inclusions: 80 percent
Contrasting inclusions: 20 percent

Contrasting Soils

- The Benchley soils are in narrow drainageways.
- The moderately well drained Crockett soils are on slightly lower convex ridge and side slope positions.
- The Davilla and Wilson soils that occur in a complex are on slightly lower positions.
- The Margie soils are on similar convex ridge positions.

Land Uses

Major land use: Rangeland
Other land uses: Pasture (fig. 14) and cropland

Management Concerns

Pasture
Major limitations:
- The very slow permeability of the clay subsoil restricts water movement and root development of improved grasses.
- The clay surface layer requires a good seedbed preparation for establishment of improved grasses.

Figure 14.—Kleingrass pasture on an area of Luling clay, 1 to 3 percent slopes.

Minor limitations:
- A moderate water erosion hazard exists when this soil is tilled prior to being established to improved grasses.

Cropland
Major limitations:
- The very slow permeability of the clay subsoil restricts water movement and root development of crops.

Minor limitations:
- A moderate water erosion hazard exists when this soil is cultivated.

Rangeland
Major limitations:
- The very slow permeability of the clay subsoil restricts water movement and root development of native plants.

Urban development
Major limitations:
- The high shrink-swell potential is a limitation that can cause structural damage to residential and small commercial buildings.
- Low soil strength and The high shrink-swell potential are limitations in the construction of local roads and streets.
- Very slow permeability of the clay subsoil may interfere with the proper functioning of septic tank absorption fields.
- Excavation sidewalls are unstable because of the clayey texture.
- A high risk of corrosion exists for uncoated steel.

Interpretive Groups

Land capability classification: 2e

Ecological site: Blackland
Pasture management group: Clayey Group

LuC—Luling clay, 3 to 5 percent slopes

Setting

Landform: Shoulder, and upper backslopes on ridges
Distinctive surface features: Linear gilgai microrelief in undisturbed areas
Landscape position: Coastal plain
Slope: Gently sloping with convex surfaces
Shape of areas: Oblong to elongated
Size of areas: 20 to 200 acres

Typical Profile

Surface layer:
0 to 17 inches—neutral, very dark grayish brown clay

Subsoil:
17 to 31 inches—neutral, olive gray clay
31 to 47 inches—slightly alkaline, olive clay with yellow iron concentrations
47 to 67 inches—moderately alkaline, olive clay

Underlying material:
67 to 80 inches—moderately alkaline, light brownish gray shale with brown iron concentrations

Soil Properties

Depth: Very deep
Drainage class: Well drained
Water table: None within a depth of 6 feet
Flooding: None
Runoff: Very high
Permeability: Very slow
Available water capacity: High
Root zone: Very deep
Shrink-swell potential: Very high
Water erosion hazard: Severe

Composition

Luling soil and similar inclusions: 85 percent
Contrasting inclusions: 15 percent

Contrasting Soils

- The Benchley soils are in narrow drainageways.
- The moderately well drained Crockett soils are on slightly lower landscape positions.
- Similar soils are on slopes greater than 5 percent.
- The moderately well drained Normangee soils are on similar side slope positions.

Land Uses

Major land use: Rangeland
Other land uses: Pasture and cropland

Management Concerns

Pasture
Major limitations:

- A severe water erosion hazard exists when this soil is tilled prior to being established to improved grasses.
- The very slow permeability of the clay subsoil restricts water movement and root development of improved grasses.
- The clay surface layer requires a good seedbed for establishment of improved grasses.

Cropland
Major limitations:

- A severe water erosion hazard exists when this soil is cultivated.
- The very slow permeability of the clay subsoil restricts water movement and root development of crops.
- The clay surface layer may make tillage operations difficult when too wet or too dry.

Rangeland
Major limitations:

- The very slow permeability of the clay subsoil restricts water movement and root development of native plants.

Urban development
Major limitations:

- The high shrink-swell potential is a limitation that can cause structural damage to residential and small commercial buildings.
- Low soil strength and the high shrink-swell potential are limitations in the construction of local roads and streets.
- The very slow permeability of the clay subsoil may interfere with the proper functioning of septic tank absorption fields.
- Excavation sidewalls are unstable because of the clayey texture.
- A high risk of corrosion exists for uncoated steel.

Interpretive Groups

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

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

Setting

Landform: Stream terrace
Landscape position: Coastal plain
Slope: Nearly level with plane or slightly concave surfaces
Shape of areas: Irregular
Size of areas: 20 to 150 acres

Typical Profile

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

Subsoil:
6 to 17 inches—moderately acid, black clay
17 to 30 inches—slightly acid, black clay

30 to 50 inches—slightly acid, very dark gray clay
50 to 68 inches—slightly acid, dark grayish brown clay with brown iron concentrations

Underlying material:
68 to 80 inches—slightly acid, light yellowish brown sandy clay loam

Soil Properties

Depth: Very deep
Drainage class: Moderately well drained
Water table: None within a depth of 6 feet; the soil is seasonally wet and saturated in the surface layer and upper part of the subsoil for short periods in most years.
Flooding: None
Runoff: High
Permeability: Very slow
Available water capacity: Moderate
Root zone: Very deep
Shrink-swell potential: High
Water erosion hazard: Slight

Composition

Mabank soil and similar inclusions: 85 percent
Contrasting inclusions: 15 percent

Contrasting Soils

- The Crockett soils are on convex areas in upland positions.
- The Davilla soils are on slightly higher broad smooth terrace positions.
- The Tabor soils are on slightly higher convex terrace positions.

Land Uses

Major land use: Rangeland
Other land uses: Pasture and cropland

Management Concerns

Pasture
Major limitations:
- The very slow permeability of the clay subsoil restricts the water movement and root development of improved grasses.

Minor limitations:
- The moderate available water capacity limits the growth of improved grasses during periods of drought.

Cropland
Major limitations:
- The very slow permeability of the clay subsoil restricts the water movement and root development of growing crops.

Minor limitations:
- The moderate available water capacity limits the growth of crops during periods of drought.

Rangeland
Major limitations:
- The very slow permeability of the clay subsoil restricts the water movement and root development of native plants.

Minor limitations:
- The moderate available water capacity limits the growth of native plants during periods of drought.

Urban development
Major limitations:
- The high shrink-swell potential can cause structural damage to residential and small commercial buildings.
- Low soil strength, the high shrink-swell potential, and seasonal wetness are limitations in the construction of local roads and streets.
- The very slow permeability of the clay subsoil and seasonal wetness may interfere with the proper functioning of septic tank absorption fields.
- A high risk of corrosion exists for uncoated steel.

Minor limitations:
- A moderate risk of corrosion exists for concrete.

Interpretive Groups

Land capability classification: 3w
Ecological site: Claypan Prairie
Pasture management group: Seasonally Wet Loamy Claypan Group

MrB—Margie fine sandy loam, 1 to 3 percent slopes

Setting

Landform: Upper and lower backslope on ridges
Landscape position: Coastal plain
Slope: Very gently sloping with convex surfaces
Shape of areas: Elongated
Size of areas: 20 to 100 acres

Typical Profile

Surface layer:
0 to 9 inches—moderately acid, strong brown fine sandy loam

Subsoil:
9 to 34 inches—neutral, red clay with brown iron concentrations in the lower part
34 to 70 inches—neutral, brownish yellow clay with red and brown iron concentrations

Underlying material:
70 to 80 inches—neutral, brownish yellow partially weathered glauconitic material

Soil Properties

Depth: Very deep
Drainage class: Well drained
Water table: None within a depth of 6 feet
Flooding: None
Runoff: Medium
Permeability: Moderately slow
Available water capacity: Moderate
Root zone: Very deep
Shrink-swell potential: High
Water erosion hazard: Moderate

Composition

Margie soil and similar inclusions: 90 percent
Contrasting inclusions: 10 percent

Contrasting Soils

- The moderately permeable Gasil soils are on slightly lower side slope positions.
- The clayey Lexton soils that are on similar convex ridge positions.
- The clayey, very slowly permeable Luling soils that are on similar convex ridge and side slope positions.

Land Uses

Major land use: Pasture
Other land uses: Rangeland and cropland

Management Concerns

Pasture
Major limitations:
- There are no major limitations.

Minor limitations:
- A moderate water erosion hazard exists when this soil is tilled prior to establishment of improved grasses.
- The moderately slow permeability of the clay subsoil restricts water movement and root development of improved grasses.

Cropland
Major limitations:
- There are no major limitations.

Minor limitations:
- A moderate water erosion hazard exists when this soil is cultivated.
- The moderately slow permeability of the clay subsoil restricts water movement and root development of crops.

Rangeland
Major limitations:
- There are no major limitations.

Minor limitations:
- The moderately slow permeability of the clay subsoil restricts water movement and development of native plants.

Urban development
Major limitations:
- The high shrink-swell potential can cause structural damage to the construction of residential and small commercial buildings.
- Low soil strength is a limitation in the construction of local roads and streets.
- A high risk of corrosion exists for uncoated steel.

Minor limitations:
- The moderately slow permeability of the clay subsoil may interfere with the proper functioning of septic tank absorption fields.
- A moderate risk of corrosion exists for concrete.

Interpretive Groups

Land capability classification: 3e
Ecological site: Deep Redland PE 48-68

Pasture management group: Loamy Upland Group

NoC—Normangee clay loam, 1 to 5 percent slopes

Setting

Landform: Upper and lower backslopes on ridges
Landscape position: Coastal plain
Slope: Very gently and gently sloping with convex surfaces
Shape of areas: Irregular
Size of areas: 10 to 75 acres

Typical Profile

Surface layer:
0 to 5 inches—moderately acid, brown clay loam

Subsoil:
5 to 18 inches—moderately acid, brown clay with brown iron concentrations
18 to 32 inches—moderately alkaline, light olive brown clay with brown iron concentrations
32 to 43 inches—moderately alkaline, light yellowish brown clay with brown iron concentrations

Underlying material:
43 to 80 inches—moderately alkaline, light brownish gray shale with thin layers of brownish yellow weakly cemented sandstone

Soil Properties

Depth: Very deep
Drainage class: Moderately well drained
Water table: None within a depth of 6 feet
Flooding: None
Runoff: Very high
Permeability: Very slow
Available water capacity: High
Root zone: Very deep
Shrink-swell potential: High
Water erosion hazard: Severe

Composition

Normangee soil and similar inclusions: 85 percent
Contrasting inclusions: 15 percent

Contrasting Soils

- The slowly permeable Benchley soils are on similar and lower side slope positions.
- The Crockett soils are on similar side slope positions.
- The Luling soils are on similar side slope positions.

Land Uses

Major land use: Rangeland
Other land uses: Pasture and cropland

Management Concerns

Pasture
Major limitations:
- A severe water erosion hazard exists when this soil is tilled prior to being established to improved grasses.
- The very slow permeability of the clay subsoil restricts water movement and root development of improved grasses.

Cropland
Major limitations:
- A severe water erosion hazard exists when this soil is cultivated.
- The very slow permeability of the clay subsoil restricts water movement and root development of growing crops.

Rangeland
Major limitations:
- The very slow permeability of the clay subsoil restricts water movement and root development of native plants.

Urban development
Major limitations:
- The high shrink-swell potential is a limitation that can cause structural damage to residential and small commercial buildings.
- Low soil strength is a limitation in the construction of local roads and streets.
- The very slow permeability of the clay subsoil may interfere with the proper functioning of septic tank absorption fields.
- A high risk of corrosion exists for uncoated steel.

Interpretive Groups

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

NvA—Navasota clay, 0 to 1 percent slopes, frequently flooded

Setting

Landform: Flood plain
Landscape position: Coastal plain
Slope: Nearly level with slightly concave and plane surfaces
Shape of areas: Oblong to elongated
Size of areas: 20 to 200 acres

Typical Profile

Surface layer:
0 to 6 inches—moderately acid, dark gray clay with brown iron concentrations

Subsoil:
6 to 80 inches—slightly acid, gray clay in the upper part; moderately acid gray clay in the middle part; slightly alkaline, gray clay in the lower part with brown iron concentrations, and gray and brown iron depletions

Soil Properties

Depth: Very deep
Drainage class: Somewhat poorly drained

Water table: A seasonal water table is present at 1.0 to 3.5 feet, mainly from November through May.
Flooding: Occurs more than 50 times in 100 years; duration is more than 30 days
Runoff: High
Permeability: Very slow
Available water capacity: High
Root zone: Very deep
Shrink-swell potential: Very high
Water erosion hazard: Slight

Composition

Navasota soil and similar inclusions: 85 percent
Contrasting inclusions: 15 percent

Contrasting Soils

- Similar soils that occur in depressional areas and remain flooded for periods greater than 14 days.
- The moderately well drained, moderately slowly permeable Sandow soils are on slightly higher flood plain positions.
- The moderately well drained, moderately slowly permeable Uhland soils are on slightly higher flood plain positions.

Land Uses

Major land use: Rangeland
Other land uses: Pasture

Management Concerns

Pasture
Major limitations:
- Seasonal wetness is a limitation in the establishment and maintenance of improved grasses.
- The very slow permeability of the clay surface and subsoil layers restricts water movement and root development of improved grasses.

Minor limitations:
- Wetness limits the use of mechanical equipment when the water table is high or when flooding occurs.
- Flooding may disrupt livestock grazing for long periods.

Cropland
Major limitations:
- This soil is not suited for growing crops because of the flooding hazard.

Rangeland
Major limitations:
- The very slow permeability of the clayey surface and subsoil layers restricts water movement and root development of native plants.

Minor limitations:
- Flooding may disrupt livestock grazing during long periods.

Urban development
Major limitations:
- This soil is not suited for most urban uses because of the flooding hazard.
- The high shrink-swell potential, low soil strength, and wetness are limitations in construction of local roads and streets.
- A high risk of corrosion exists for uncoated steel.

Minor limitations:
- A moderate risk of corrosion exists for concrete.

Interpretive Groups

Land capability classification: 5w
Ecological site: Clayey Bottomland PE 48-68
Pasture management groups: Not Suited Group

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

Setting

Landform: Summit, shoulder, and upper backslopes on broad ridges
Landscape position: Coastal plain
Slope: Very gently sloping and gently sloping with convex surfaces
Shape of areas: Irregular
Size of areas: 20 to 300 acres

Typical Profile

Surface layer:
0 to 7 inches—slightly acid, brown loamy fine sand

Subsurface layer:
7 to 57 inches—neutral, very pale brown loamy fine sand

Subsoil:
57 to 72 inches—very strongly acid, very pale brown sandy clay loam with red and brown iron concentrations
72 to 80 inches—very strongly acid, reddish yellow sandy clay loam with yellow iron concentrations and gray iron depletions

Soil Properties

Depth: Very deep
Drainage class: Well drained
Water table: None within a depth of 6 feet
Flooding: None
Runoff: Low
Permeability: Moderate
Available water capacity: Low
Root zone: Very deep
Shrink-swell potential: Low
Water erosion hazard: Moderate

Composition

Padina soil and similar inclusions: 90 percent
Contrasting inclusions: 10 percent

Contrasting Soils

- The very slowly permeable Edge soils are on slightly lower convex positions.
- The moderately deep Jedd soils are on slightly lower side slope positions.
- The moderately well drained, slowly permeable Robco soils are in lower concave positions.
- The moderately slowly permeable Rosanky soils are on similar landscape positions.

Land Uses

Major land use: Rangeland
Other land uses: Pasture and cropland

Management Concerns

Pasture
Major limitations:
- The low available water capacity limits plant growth during periods of drought.
- Seepage of the soil limits the use for livestock ponds.
- Low fertility, soil acidity, and leaching require a more costly fertilization and liming program to maintain forage yields at a high level.

Cropland
Major limitations:
- This soil is poorly suited to most commonly grown crops because of the low available water capacity; however they are suited to watermelons and peanuts.

Minor limitations:
- A moderate water erosion hazard exists when this soil is cultivated.
- The sandy surface is loose when dry and may make operation of tillage equipment difficult.

Rangeland
Major limitations:
- The low available water capacity limits native plant growth during periods of drought.
- The low natural fertility limits yield potential of native forage plants.

Urban development
Major limitations:
- The sandy texture of the soil may cause seepage of effluents into groundwater when this soil is used for septic tank absorption fields.
- Excavation sidewalls are unstable because of the sandy texture.
- The establishment and maintenance of lawn grasses and landscape plants is expensive because of the low available water capacity and rapid permeability.
- A high risk of corrosion exists for uncoated steel.

Minor limitations:
- A moderate risk of corrosion exists for concrete.

Interpretive Groups

Land capability classification: 3e
Ecological site: Deep Sand PE 48-68
Pasture management group: Deep Sandy Group

PdF—Padina loamy fine sand, 5 to 15 percent slopes

Setting

Landform: Upper and lower backslopes on ridges
Landscape position: Coastal plain
Slope: Moderately sloping to moderately steep with convex surfaces
Shape of areas: Irregular
Size of areas: 20 to 100 acres

Typical Profile

Surface layer:
0 to 8 inches—slightly acid, pale brown loamy fine sand

Subsurface layer:
8 to 58 inches—neutral, very pale brown loamy fine sand

Subsoil:
58 to 68 inches—strongly acid, red sandy clay loam with yellow iron concentrations and gray iron depletions
68 to 80 inches—very strongly acid, light brownish gray sandy clay loam with yellow and red iron concentrations

Soil Properties

Depth: Very deep
Drainage class: Well drained
Water table: None within a depth of 6 feet
Flooding: None
Runoff: Low
Permeability: Moderate
Available water capacity: Low
Root zone: Very deep
Shrink-swell potential: Low
Water erosion hazard: Severe

Composition

Padina soil and similar inclusions: 90 percent
Contrasting inclusions: 10 percent

Contrasting Soils

- The moderately deep Jedd soils are on similar side slope positions.
- The moderately well drained, slowly permeable Robco soils are in lower concave positions.

Land Uses

Major land use: Rangeland
Other land uses: Pasture

Management Concerns

Pasture
Major limitations:
- The low available water capacity limits plant growth during periods of drought.
- Seepage of the soil limits the use for livestock ponds.
- Low fertility, soil acidity, and leaching require a more costly fertilization and liming program to maintain forage yields at a high level.

Cropland
Major limitations:
- This soil is not suited to most commonly grown crops because of the low available water capacity, slope, and severe hazard of erosion.

Rangeland
Major limitations:
- The low available water capacity limits native plant growth during periods of drought.
- The low natural fertility limits yield potential of native forage plants.

Urban development
Major limitations:
- The slope and sandy texture of the soil may cause seepage of effluents into groundwater when this soil is used for septic tank absorption fields.
- Excavation sidewalls are unstable because of the sandy texture.
- The establishment and maintenance of lawn grasses and landscape plants is expensive because of the low available water capacity, rapid permeability, and slope.
- Slope is a limitation affecting construction of residential and small commercial buildings.
- A high risk of corrosion exists for uncoated steel.

Minor limitations:
- A moderate risk of corrosion exists for concrete.
- The slope limits construction of local streets and roads.

Interpretive Groups

Land capability classification: 6e
Ecological site: Deep Sand PE 48-68
Pasture management group: Deep Sandy Group

Pt—Pits and Dumps

Setting

Landform: Summit, shoulder, and upper backslopes of ridges
Distinctive surface features: Deep excavations and mounds of mixed soil and substratum material in areas that have been strip mined for lignite (fig. 15). Pits have moderately steep to vertical walls, are 15 to 70 feet deep and commonly are partly filled with water in some years. Dumps are strongly sloping to very steep mounds of soil and substratum material 10 to 40 feet high. The soil material is clayey, loamy, and sandy overburden or by-products of the mining activities. The original soil layers have been mixed to a depth of more than 80 inches. Strata of clay, sand, shale, and fragments of lignite and sandstone are throughout the soil material. Slope ranges from 5 to 60 percent on the mounded dumps.
Landscape position: Coastal plain
Slope: Strongly sloping to very steep
Shape of areas: Irregular
Size of areas: 50 to 200 acres

Composition

Pits: 20 to 40 percent
Dumps: 30 to 50 percent
Contrasting inclusions: 10 to 20 percent

Contrasting Soils

- Edge, Gasil, Padina, Rader, Silstid and Tabor soils that have undisturbed profiles and are adjacent to the pits.

Figure 15.—Surface mining of lignite in Lee County, in an area of Pits and Dumps. Lignite, a low-grade coal, is used for generation of electricity.

Land Uses

Major land use: Wildlife
Other land uses: Improved pasture

Management Concerns

Pasture
Major limitations:

- This soil is not suited for improved pasture in present condition. Areas require extensive reclamation practices before establishing improved grasses. These areas require mechanical shaping and proper fertilizer amendments to properly sustain improved pasture grasses.

Urban development
Major limitations:

- This soil is not suited for most urban uses in its present condition. These areas require extensive reclamation practices. Unstable fill is a major concern for dwellings and commercial buildings

Interpretive Groups

The Pits and Dumps map unit is not assigned a capability subclass or ecological site.

RaB—Rader fine sandy loam, 1 to 3 percent slopes

Setting

Landform: High stream terraces
Landscape position: Coastal plain

Slope: Very gently sloping with slightly concave surfaces
Shape of areas: Oblong to elongated
Size of areas: 30 to 150 acres

Typical Profile

Surface layer:
0 to 7 inches—slightly acid, pale brown fine sandy loam with brown iron concentrations

Subsurface layer:
7 to 27 inches—moderately acid, very pale brown fine sandy loam with brown iron concentrations in the upper part

Subsoil:
27 to 32 inches—very strongly acid, yellow sandy clay loam with 30 percent streaks and pockets of gray fine sandy loam (E part)
32 to 54 inches—very strongly acid, light brownish gray clay loam with red and brown iron concentrations
54 to 80 inches—very strongly acid, very pale brown clay loam with yellow and red iron concentrations

Soil Properties

Depth: Very deep
Drainage class: Moderately well drained
Water table: A seasonal water table is present at a depth of 2.0 to 5.0 feet, mainly from December through May.
Flooding: None
Runoff: High
Permeability: Very slow
Available water capacity: Moderate
Root zone: Very deep
Shrink-swell potential: High
Water erosion hazard: Moderate

Composition

Rader soil and similar inclusions: 85 percent
Contrasting inclusions: 15 percent

Contrasting Soils

- The slowly permeable Chazos soils are on slightly higher convex positions.
- The well drained Edge soils are on higher convex upland positions.
- The somewhat excessively drained, rapidly permeable Faula soils are on higher smooth positions.
- The well drained Kurten soils are on higher convex upland positions.
- The Lufkin soils are in slightly lower depressional areas and flat positions.
- The well drained Rosanky soils are on higher convex upland positions.
- The well drained, moderately permeable Silawa soils are on slightly higher convex positions.
- The well drained Spiller soils are on higher convex upland positions.

Land Uses

Major land use: Pasture
Other land uses: Rangeland and cropland

Management Concerns

Pasture
Major limitations:
- There are no major limitations.

Minor limitations:
- A moderate erosion hazard exists when this soil is tilled prior to being established to improved grasses.
- The moderate available water capacity limits plant growth during periods of drought.

Cropland
Major limitations:
- There are no major limitations.

Minor limitations:
- A moderate erosion hazard exists when this soil is cultivated.
- Crop development may be delayed during periods of seasonal wetness associated with a water table.
- The moderate available water capacity limits crop growth during periods of drought.

Rangeland
Major limitations:
- There are no major limitations.

Minor limitations:
- The moderate available water capacity limits native plant growth during periods of drought.
- The moderate natural fertility limits yield potential of native plants.

Urban development
Major limitations:
- The very slow permeability of the subsoil and seasonal wetness may interfere with the proper functioning of septic tank absorption fields.
- A high risk of corrosion exists for uncoated steel.
- The high shrink-swell potential is a limitation in the construction of residential and small commercial buildings.
- A high risk of corrosion exists for uncoated steel.

Minor limitations:
- Seasonal wetness is a limitation in the construction of residential and small commercial buildings.
- Seasonal wetness is a limitation in the construction of local roads and streets.
- A moderate risk of corrosion exists for concrete.

Interpretive Groups

Land capability classification: 2e
Ecological site: Sandy Loam PE 48-68
Pasture management group: Loamy Claypan Group

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

Setting

Landform: Summit, shoulder, and upper backslopes on ridges
Landscape position: Coastal plain

Slope: Very gently sloping and gently sloping with convex surfaces
Shape of areas: Irregular
Size of areas: 50 to 150 acres

Typical Profile

Surface layer:
0 to 5 inches—moderately acid, pale brown loamy fine sand

Subsurface layer:
5 to 25 inches—strongly acid, pale brown and very pale brown loamy fine sand

Subsoil:
25 to 37 inches—very strongly acid, light brownish gray sandy clay loam with red and brown iron concentrations
37 to 44 inches—very strongly acid, sandy light gray clay loam with red and brown iron concentrations

Underlying material:
44 to 60 inches—weakly cemented tuffaceous sandstone and siltstone

Soil Properties

Depth: Deep
Drainage class: Moderately well drained
Water table: A seasonal water table is present at a depth of 3.0 to 5.0 feet, mainly from December through April.
Flooding: None
Runoff: High
Permeability: Very slow
Available water capacity: Low
Root zone: Deep
Shrink-swell potential: Medium
Water erosion hazard: Severe

Composition

Rehburg soil and similar inclusions: 85 percent
Contrasting inclusions: 15 percent

Contrasting Soils

- The moderately deep, well drained Burlewash soils are on similar and slightly lower convex positions.
- The shallow Koether soils are on lower steep side slope positions.
- The moderately deep Singleton soils are on lower convex positions.

Land Uses

Major land use: Pasture
Other land uses: Rangeland and cropland

Management Concerns

Pasture
Major limitations:

- A severe erosion hazard exists when this soil is tilled prior to being established to improved grasses.
- The low available water capacity limits growth of improved grasses during periods of drought.

Cropland

Major limitations:

- A severe erosion hazard exists when this soil is cultivated.
- The low available water capacity limits plant growth during periods of drought.

Rangeland

Major limitations:

- The low available water capacity limits native plant growth during periods of drought.
- The low natural fertility limits yield potential of native plants.

Urban development

Major limitations:

- Seasonal wetness may interfere with the proper functioning of septic tank absorption fields.
- Excavation sidewalls are unstable because of the sandy soil texture.
- A high risk of corrosion exists for uncoated steel and concrete.

Minor limitations:

- The high shrink-swell potential is a limitation in the construction of residential and small commercial buildings.

Interpretive Groups

Land capability classification: 3e
Ecological site: Sandy PE 48-68
Pasture management group: Sandy Upland Group

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

Setting

Landform: Footslopes and toeslopes on ridges
Landscape position: Coastal plain
Slope: Very gently sloping with slightly convex and concave surfaces
Shape of areas: Oblong to elongated
Size of areas: 10 to 200 acres

Typical Profile

Surface layer:
0 to 6 inches—moderately acid, brown loamy fine sand

Subsurface layer:
6 to 23 inches—strongly acid loamy fine sand, pale brown in the upper part and light gray in the lower part

Subsoil:
23 to 28 inches—strongly acid, brownish yellow sandy clay loam with streaks and pockets of gray loamy fine sand, gray iron depletions and yellow iron concentrations
28 to 44 inches—very strongly acid, light brownish gray and light gray sandy clay loam with brown and yellow iron concentrations
44 to 80 inches—very strongly acid, light gray sandy clay loam with yellow and brown iron concentrations

Soil Properties

Depth: Very deep
Drainage class: Moderately well drained
Water table: A seasonal water table is present at a depth of 1.5 to 4.0 feet, mainly from January through April.
Flooding: None
Runoff: Medium
Permeability: Slow
Available water capacity: Moderate
Root zone: Very deep
Shrink-swell potential: Medium
Water erosion hazard: Moderate

Composition

Robco soil and similar inclusions: 90 percent
Contrasting inclusions: 10 percent

Contrasting Soils

- The somewhat excessively drained, rapidly permeable Arenosa soils are on higher broad smooth positions.
- The well drained, moderately permeable Gasil soils are on higher convex ridge and side slope positions.
- The moderately well drained, very slowly permeable Lufkin soils are on slightly lower positions.
- The moderately permeable Padina soils are on higher broad smooth ridges.
- Similar soils are poorly drained.
- The moderately slowly permeable Uhland soils are on flood plain positions.

Land Uses

Major land use: Rangeland
Other land uses: Pasture and cropland

Management Concerns

Pasture
Major limitations:
- There are no major limitations.

Minor limitations:
- The moderate available water capacity limits plant growth during periods of drought.

Cropland
Major limitations:
- There are no major limitations.

Minor limitations:
- A moderate erosion hazard exists when this soil is cultivated.
- The moderate available water capacity limits plant growth during periods of drought.

Rangeland
Major limitations:
- The low natural fertility limits yield potential of native plants.

Minor limitations:

- The moderate available water capacity limits native plant growth during periods of drought.

Urban development
Major limitations:

- The slow permeability of the subsoil and seasonal wetness may interfere with the proper functioning of septic tank absorption fields.
- Excavation sidewalls are unstable because of the sandy soil structure.
- A high risk of corrosion exists for uncoated steel and concrete.

Minor limitations:

- The high shrink-swell potential and wetness are limitations in the construction of residential and small commercial buildings.
- Wetness is a limitation in the construction of local roads and streets.

Interpretive Groups

Land capability classification: 3e
Ecological site: Sandy PE 48-68
Pasture management group: Sandy Upland Group

RsC—Rosanky fine sandy loam, 1 to 5 percent slopes

Setting

Landform: Summit, shoulder, and upper backslopes on ridges
Landscape position: Coastal plain
Slope: Very gently sloping and gently sloping with convex surfaces
Shape of areas: Oblong
Size of areas: 20 to 100 acres

Typical Profile

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

Subsurface layer:
5 to 10 inches—slightly acid, very pale brown fine sandy loam

Subsoil:
10 to 35 inches—strongly acid, red clay with brown iron concentrations
35 to 43 inches—strongly acid, reddish yellow clay loam with thin strata of yellow weakly cemented sandstone and gray shale

Underlying material:
43 to 80 inches—strongly acid, reddish yellow weakly cemented sandstone with thin strata of gray shale

Soil Properties

Depth: Deep
Drainage class: Well drained
Water table: None within a depth of 6 feet
Flooding: None
Runoff: Medium
Permeability: Moderately slow
Available water capacity: Moderate
Root zone: Very deep

Shrink-swell potential: Moderate
Water erosion hazard: Moderate

Composition

Rosanky soil and similar inclusions: 90 percent
Contrasting inclusions: 10 percent

Contrasting Soils

- The moderately permeable Gasil soils are on lower side slope positions.
- The moderately permeable Padina on similar convex positions.
- The very slowly permeable Rader soils are in lower concave positions.
- The moderately permeable Silstid on similar convex positions.
- The slowly permeable Spiller soils are on lower side slope positions.

Land Uses

Major land use: Pasture
Other land uses: Rangeland and cropland

Management Concerns

Pasture
Major limitations:
- There are no major limitations.

Minor limitations:
- A moderate water erosion hazard exists when this soil is tilled prior to establishment of improved grasses.
- The moderately slow permeability of the clay subsoil restricts water movement and root development of improved grasses.
- The moderate available water capacity limits growth of improved grasses during periods of drought.

Cropland
Major limitations:
- There are no major limitations.

Minor limitations:
- A moderate water erosion hazard exists when this soil is cultivated.
- The moderately slow permeability of the clay subsoil restricts water movement and root development of crops.
- The moderate available water capacity limits growth of crops during periods of drought.

Rangeland
Major limitations:
- There are no major limitations.

Minor limitations:
- The moderately slow permeability of the clay subsoil restricts water movement and development of native plants.
- The moderate available water capacity limits growth of native plants during periods of drought.

Urban development
Major limitations:
- Low soil strength is a limitation in the construction of local roads and streets.
- A high risk of corrosion exists for uncoated steel.

Minor limitations:

- The moderately slow permeability of the clay subsoil may interfere with the proper functioning of septic tank absorption fields.
- The high shrink-swell potential can cause structural damage to the construction of residential and small commercial buildings.

Interpretive Groups

Land capability classification: 3e
Ecological site: Claypan Savannah PE 48-68
Pasture management group: Loamy Upland Group

SaA—Sandow loam, 0 to 1 percent slopes, frequently flooded

Setting

Landform: Flood plain
Landscape position: Coastal plain
Slope: Nearly level with plane surfaces
Shape of areas: Elongated
Size of areas: 50 to 300 acres

Typical Profile

Surface layer:
0 to 7 inches—slightly acid, dark grayish brown loam

Subsoil:
7 to 14 inches—slightly acid, brown clay loam
14 to 20 inches—slightly acid, dark grayish brown clay loam
20 to 24 inches—neutral, brown sandy clay loam with yellow iron concentrations
24 to 80 inches—slightly acid, dark grayish brown clay loam with brown and yellow iron concentrations

Soil Properties

Depth: Very deep
Drainage class: Moderately well drained
Water table: A seasonal water table is present at a depth of 3.5 to 6.0 feet, mainly from April through June.
Flooding: Occurs more than 50 times in 100 years and usually lasts 2 to 7 days
Runoff: High
Permeability: Moderately slow
Available water capacity: Moderate
Root zone: Very deep
Shrink-swell potential: Medium
Water erosion hazard: Slight

Composition

Sandow soil and similar inclusions: 85 percent
Contrasting inclusions: 15 percent

Contrasting Soils

- The somewhat poorly drained, very slowly permeable Navasota soils are on slightly lower flood plain positions.
- The very slowly permeable Zilaboy soils are on similar and slightly lower flood plain positions.

Land Uses

Major land use: Rangeland
Other land uses: Pasture

Management Concerns

Pasture
Major limitations:
- There are no major limitations.

Minor limitations:
- Wetness temporarily limits the use of mechanical equipment after brief flooding.
- Flooding may disrupt livestock grazing for brief periods.

Cropland
Major limitations:
- This soil is not suitable for cropland because of the flooding hazard.

Rangeland
Major limitations:
- There are no major limitations.

Minor limitations:
- Flooding may disrupt livestock grazing for brief periods.

Urban development
Major limitations:
- This soil is not suited to most urban uses because of the flooding hazard.
- Low soil strength and flooding are limitations in construction of local roads and streets.
- A high risk of corrosion exists for uncoated steel.

Interpretive Groups

Land capability classification: 5w
Ecological site: Loamy Bottomland PE 48-68
Pasture management group: Loamy Bottomland Group

SmC—Silawa loamy fine sand, 1 to 5 percent slopes

Setting

Landform: Stream terrace
Landscape position: Coastal plain
Slope: Very gently sloping and gently sloping with convex surfaces
Shape of areas: Oval to oblong
Size of areas: 20 to 100 acres

Typical Profile

Surface layer:
0 to 10 inches—strongly acid, light brown loamy fine sand

Subsurface layer:
10 to 15 inches—moderately acid, pink loamy fine sand

Subsoil:
15 to 43 inches—moderately acid, red sandy clay loam
43 to 57 inches—moderately acid, reddish yellow sandy clay loam
57 to 80 inches—moderately acid, reddish yellow fine sandy loam

Soil Properties

Depth: Very deep
Drainage class: Well drained
Water table: None within a depth of 6 feet
Flooding: None
Runoff: Low
Permeability: Moderate
Available water capacity: Moderate
Root zone: Very deep
Shrink-swell potential: Low
Water erosion hazard: Moderate

Composition

Silawa soil and similar inclusions: 85 percent
Contrasting inclusions: 15 percent

Contrasting Soils

- The somewhat excessively drained, rapidly permeable Faula soils are on similar convex positions.
- The moderately well drained, very slowly permeable Lufkin soils are in lower concave positions.
- The moderately well drained, very slowly permeable Rader soils are in slightly lower concave positions.
- The moderately well drained, very slowly permeable Tabor soils are on slightly lower smooth positions.

Land Uses

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

Management Concerns

Pasture
Major limitations:
- There are no major limitations.

Minor limitations:
- The moderate available water capacity limits growth of improved grasses during periods of drought.

Cropland
Major limitations:
- There are no major limitations.

Minor limitations:
- A moderate erosion hazard exists when then soil is cultivated.
- The moderate available water capacity limits crop growth during periods of drought.

Rangeland
Major limitations:
- The low natural fertility limits yield potential of native plants.

Minor limitations:
- The moderate available water capacity limits native plant growth during periods of drought.

Urban development

Major limitations:

- There are no major limitations.

Minor limitations:

- A moderate risk of corrosion exists for uncoated steel and concrete.

Interpretive Groups

Land capability classification: 3e
Ecological site: Sandy Loam PE 48-68
Pasture management group: Sandy Upland Group

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

Setting

Landform: Summit, shoulder, and upper backslopes on ridges
Landscape position: Coastal plain
Slope: Very gently sloping and gently sloping with convex surfaces
Shape of areas: Elongated to irregular
Size of areas: 20 to 150 acres

Typical Profile

Surface layer:
0 to 7 inches—slightly acid, brown loamy fine sand

Subsurface layer:
7 to 23 inches—slightly acid, very pale brown loamy fine sand

Subsoil:
23 to 37 inches—moderately acid, brownish yellow sandy clay loam with red iron concentrations
37 to 49 inches—strongly acid, yellow sandy clay loam with red iron concentrations
49 to 80 inches—strongly acid, light red sandy clay loam with yellow iron concentrations and gray iron depletions

Soil Properties

Depth: Very deep
Drainage class: Well drained
Water table: None within a depth of 6 feet
Flooding: None
Runoff: Very low
Permeability: Moderate
Available water capacity: Low
Root zone: Very deep
Shrink-swell potential: Low
Water erosion hazard: Moderate

Composition

Silstid soil and similar inclusions: 90 percent
Contrasting inclusions: 10 percent

Contrasting Soils

- The somewhat excessively drained, rapidly permeable Arenosa soils are on broad smooth positions.

- The very slowly permeable Edge soils are on similar convex positions.
- The moderately permeable Gasil soils are on slightly lower side slope positions.
- The moderately slowly permeable Jedd soils are on side slope positions.
- The moderately slowly permeable Rosanky soils are on similar convex positions.
- The slowly permeable Spiller soils are on similar convex positions.

Land Uses

Major land use: Pasture
Other land uses: Rangeland and cropland

Management Concerns

Pasture
Major limitations:
- The low available water capacity limits growth of improved grasses during periods of drought.

Minor limitations:
- A moderate water erosion hazard exists when this soil is tilled prior to being established to improved grasses.
- Seepage may be a concern in the construction of ponds for livestock and wildlife.

Cropland
Major limitations:
- The low available water capacity limits growth of crops during periods of drought.

Minor limitations:
- A moderate erosion hazard exists when this soil is cultivated.
- The sandy surface is loose when dry and may make operation of tillage equipment difficult.

Rangeland
Major limitations:
- The low available water capacity limits growth of native plants during periods of drought.
- The low natural fertility limits yield potential of native plants.

Minor limitations:
- Seepage may be a concern in the construction of ponds for livestock and wildlife.

Urban development
Major limitations:
- Excavation sidewalls are unstable because of the sandy soil texture.
- The establishment and maintenance of lawn grasses and landscape plants is expensive because of the low available water capacity.
- The sandy texture of the soil may cause seepage of effluents into groundwater when this soil is used for septic tank absorption fields.

Minor limitations:
- Slope is a limitation for construction of small commercial buildings.
- A moderate risk of corrosion exists for uncoated steel and concrete.

Interpretive Groups

Land capability classification: 3e

Ecological site: Sandy PE 48-68
Pasture management group: Sandy Upland Group

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

Setting

Landform: Upper backslopes on ridges
Landscape position: Coastal plain
Slope: Moderately sloping with convex surfaces
Shape of areas: Elongated to irregular
Size of areas: 20 to 75 acres

Typical Profile

Surface layer:
0 to 8 inches—slightly acid, pale brown loamy fine sand

Subsurface layer:
8 to 22 inches—slightly acid, very pale brown loamy fine sand

Subsoil:
22 to 30 inches—moderately acid, yellowish brown sandy clay loam
30 to 45 inches—moderately acid, yellowish brown sandy clay loam with red iron concentrations
45 to 62 inches—moderately acid, yellowish brown sandy clay loam with red accumulations and gray iron depletions
62 to 80 inches—moderately acid, red sandy clay loam with red iron concentrations and gray iron depletions

Soil Properties

Depth: Very deep
Drainage class: Well drained
Water table: None within 6 feet
Flooding: None
Runoff: Low
Permeability: Moderate
Available water capacity: Low
Root zone: Very deep
Shrink-swell potential: Low
Water erosion hazard: Moderate

Composition

Silstid soil and similar inclusions: 90 percent
Contrasting inclusions: 10 percent

Contrasting Inclusions

- The very slowly permeable Edge soils are on similar side slope positions.
- The moderately slowly permeable Jedd soils are on similar side slope positions.

Land Uses

Major land use: Pasture
Other land uses: Rangeland and cropland

Management Concerns

Pasture
Major limitations:
- The low available water capacity limits growth of improved grasses during periods of drought.

Minor limitations:
- A moderate water erosion hazard exists when this soil is tilled prior to being established to improved grasses.
- Seepage may be a concern in the construction of ponds for livestock and wildlife.

Cropland
Major limitations:
- The low available water capacity limits growth of crops during periods of drought.

Minor limitations:
- A moderate water erosion hazard exists when this soil is cultivated.
- The sandy surface is loose when dry and may make operation of tillage equipment difficult.

Rangeland
Major limitations:
- The low available water capacity limits native plant growth during periods of drought.
- The low natural fertility limits yield potential of native plants.

Minor limitations:
- Seepage may be a concern in the construction of ponds for livestock and wildlife.

Urban development
Major limitations:
- Excavation sidewalls are unstable because of the sandy soil texture.
- The establishment and maintenance of lawn grasses and landscape plants is expensive because of the low available water capacity.
- The sandy texture of the soil may cause seepage of effluents into groundwater when this soil is used for septic tank absorption fields.

Minor limitations:
- Slope is a limitation for construction of small commercial buildings.
- A moderate risk of corrosion exists for uncoated steel and concrete.

Interpretive Groups

Land capability classification: 3e
Ecological site: Sandy PE 48-68
Pasture management group: Sandy Upland Group

SoC—Singleton fine sandy loam, 1 to 5 percent slopes

Setting

Landform: Footslopes and toeslopes on broad ridges
Landscape position: Coastal plain
Slope: Very gently sloping and gently sloping with slightly concave surfaces
Shape of areas: Irregular
Size of areas: 50 to 300 acres

Typical Profile

Surface layer:
0 to 5 inches—moderately acid, pale brown fine sandy loam

Subsoil:
5 to 14 inches—very strongly acid, brown clay with brown iron concentrations
14 to 24 inches—very strongly acid, dark grayish brown clay with brown iron concentrations
24 to 37 inches—moderately acid, dark grayish brown clay with brown iron concentrations

Underlying material:
37 to 60 inches—pale yellow, weakly cemented tuffaceous sandstone

Soil Properties

Depth: Moderately deep
Drainage class: Moderately well drained
Water table: None within a depth of 6 feet
Flooding: None
Runoff: Very high
Permeability: Very slow
Available water capacity: Low
Root zone: Moderately deep
Shrink-swell potential: High
Water erosion hazard: Severe

Composition

Singleton soil and similar inclusions: 85 percent
Contrasting inclusions: 15 percent

Contrasting Soils

- The shallow Koether soils are on higher steep positions.
- The deep Rehburg soils are on slightly higher convex positions.

Land Uses

Major land use: Rangeland
Other land uses: Pasture and cropland

Management Concerns

Pasture
Major limitations:
- A severe erosion hazard exists when this soil is tilled prior to being established to improved grasses.
- The very slow permeability of the clay subsoil restricts water movement and root development of improved grasses.
- The low available water capacity limits plant growth during periods of drought.

Minor limitations:
- The moderately deep solum may inhibit root development of improved grasses.

Cropland
Major limitations:
- A severe erosion hazard exists when this soil is cultivated.

- The low available water capacity limits plant growth during periods of drought.
- The very slow permeability of the clay subsoil restricts water movement and root development of crops.

Minor limitations:

- The moderately deep solum may inhibit root development of crops.

Rangeland

Major limitations:

- The low natural fertility limits yield potential of native plants.
- The very slow permeability of the clay subsoil restricts water movement and root development of native forage plants.
- The low available water capacity limits native plant growth during periods of drought.

Minor limitations:

- The moderately deep solum may inhibit root development of native plants.

Urban development

Major limitations:

- The very slow permeability of the clay subsoil and the moderately deep solum may interfere with the proper functioning of septic tank absorption fields.
- The high shrink-swell potential is a limitation that can cause structural damage to residential and small commercial buildings.
- Low soil strength and the high shrink-swell potential are limitations in the construction of local roads and streets.
- A high risk of corrosion exists for uncoated steel.

Minor limitations:

- A moderate risk of corrosion exists for concrete.

Interpretive Groups

Land capability classification: 4e
Ecological site: Claypan Savannah PE 48-68
Pasture management group: Poorly Suited Group

SpC—Spiller fine sandy loam, 1 to 5 percent slopes

Setting

Landform: Summit, shoulder, and upper backslopes on ridges
Landscape position: Coastal plain
Slope: Very gently sloping and gently sloping with convex surfaces
Shape of areas: Broad or irregular
Size of areas: 10 to 75 acres

Typical Profile

Surface layer:
0 to 10 inches—slightly acid, light yellowish brown fine sandy loam

Subsoil:
10 to 19 inches—slightly acid, yellowish brown clay with red and yellow iron concentrations
19 to 27 inches—slightly acid, brownish yellow clay with red iron concentrations
27 to 47 inches—moderately acid, light yellowish brown clay

47 to 58 inches—slightly acid, light yellowish brown clay loam with thin layers of gray shale

Underlying material:
58 to 80 inches—light brownish gray shale with yellow loamy strata

Soil Properties

Depth: Very deep
Drainage class: Moderately well drained
Water table: None within a depth of 6 feet
Flooding: None
Runoff: High
Permeability: Slow
Available water capacity: Moderate
Root zone: Very deep
Shrink-swell potential: Moderate
Water erosion hazard: Moderate

Composition

Spiller soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Contrasting Soils

- The moderately slowly permeable Jedd soils are on higher ridgetop positions.
- The very slowly permeable Kurten soils are on similar landscape positions.
- The very slowly permeable Rader soils in lower concave positions.
- The well drained Rosanky soils are on similar landscape positions.
- The moderately permeable Silstid soils are on similar to slightly higher convex landscape positions.
- The very slowly permeable Tabor soils are on slightly lower landscape positions.

Land Uses

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

Management Concerns

Pasture
Major limitations:
- There are no major limitations.

Minor limitations:
- A moderate water erosion hazard exists when this soil is tilled prior to being established to improved grasses.
- The moderate available water capacity limits growth of improved grasses during periods of drought.
- The slow permeability of the clay subsoil restricts water movement and root development of improved grasses.

Rangeland
Major limitations:
- There are no major limitations.

Minor limitations:
- The moderate available water capacity limits growth of native plants during periods of drought.
- The slow permeability of the clay subsoil restricts water movement and root development of native plants.

Cropland
Major limitations:
- There are no major limitations.

Minor limitations:
- A moderate water erosion hazard exists when this soil is cultivated.
- The moderate available water capacity limits growth of crops during periods of drought.
- The slow permeability of the clay subsoil restricts water movement and root development of crops.

Urban development
Major limitations:
- A high risk of corrosion exists for uncoated steel.

Minor limitations:
- The high shrink-swell potential is a limitation for the construction of residential and small commercial buildings.
- Low soil strength is a limitation in the construction of local roads and streets.
- The slow permeability of the clay subsoil may interfere with the proper functioning of septic tank adsorption fields.
- A moderate risk of corrosion exists for concrete.

Interpretive Groups

Land capability classification: 3e
Ecological site: Sandy Loam PE 48-68
Pasture management group: Loamy Upland Group

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

Setting

Landform: Stream terrace and dissected relict stream terrace
Landscape position: Coastal plain
Slope: Very gently sloping with smooth to slightly convex surfaces
Shape of areas: Oblong to elongated
Size of areas: 20 to 200 acres

Typical Profile

Surface layer:
0 to 9 inches—moderately acid, pale brown fine sandy loam

Subsurface layer:
9 to 15 inches—slightly acid, very pale brown fine sandy loam

Subsoil:
15 to 32 inches—strongly acid, light brownish gray and light gray clay with brown, yellow, and red iron concentrations
32 to 50 inches—neutral, light yellowish brown clay loam
50 to 70 inches—neutral, light gray clay loam with yellow iron concentrations
70 to 80 inches—slightly alkaline, light gray sandy clay loam

Soil Properties

Depth: Very deep
Drainage class: Moderately well drained
Water table: None within a depth of 6 feet
Flooding: None
Runoff: Very high
Permeability: Very slow
Available water capacity: Moderate
Root zone: Very deep
Shrink-swell potential: High
Water erosion hazard: Moderate

Composition

Tabor soil and similar inclusions: 85 percent
Contrasting inclusions: 15 percent

Contrasting Soils

- The well drained Edge soils are on higher convex positions.
- The well drained, moderately permeable Gasil soils are on higher convex positions.
- The Mabank soils are in slightly lower concave positions.
- The moderately permeable, well drained Silawa soils are on slightly higher convex positions.
- The well drained, slowly permeable Spiller soils are on higher convex positions.
- The Wilson soils are in slightly lower concave positions.

Land Uses

Major land use: Pasture
Other land uses: Rangeland and cropland

Management Concerns

Pasture
Major limitations:
- The very slow permeability of the clay subsoil restricts water movement and root development of improved grasses.

Minor limitations:
- A moderate erosion hazard exists when this soil is tilled prior to being established to improved grasses.
- The moderate available water capacity limits plant growth during periods of drought.

Cropland
Major limitations:
- The very slow permeability of the clay subsoil restricts water movement and root development of crops.

Minor limitations:
- A moderate erosion hazard exists when this soil is cultivated.
- The moderate available water capacity limits plant growth during periods of drought.

Rangeland
Major limitations:
- The very slow permeability of the clay subsoil restricts water movement and root development of native plants.

Minor limitations:
- The moderate available water capacity limits native plant growth during periods of drought.
- The moderate natural fertility limits yield potential of native forage plants.

Urban development
Major limitations:
- The very slow permeability of the clay subsoil may interfere with the proper functioning of septic tank absorption fields.
- The high shrink-swell potential is a limitation that can cause structural damage to residential and small commercial buildings.
- Low strength and the high shrink-swell potential are limitations in the construction of local roads and streets.
- A high risk of corrosion exists for uncoated steel and concrete.

Interpretive Groups

Land capability classification: 3e
Ecological site: Claypan Savannah PE 48-68
Pasture management group: Loamy Claypan Group

UcA—Uhland clay loam, 0 to 1 percent slopes, frequently flooded

Setting

Landform: Flood plain
Landscape position: Coastal plain
Slope: Nearly level with plane surfaces
Shape of areas: Long and narrow
Size of areas: 50 to 500 acres

Typical Profile

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

Subsoil:
6 to 43 inches—slightly acid, light yellowish brown fine sandy loam with gray iron depletions
43 to 52 inches—neutral, light brownish gray loamy fine sand with yellow iron concentrations
52 to 80 inches—slightly acid, brown fine sandy loam with brown iron depletions

Soil Properties

Depth: Very deep
Drainage class: Moderately well drained
Water table: Perched at a depth of 2.0 to 5.0 feet for about 30 to 60 days, mostly during spring
Flooding: Occurs more than 50 times in 100 years and usually lasts 2 to 7 days
Runoff: High
Permeability: Moderately slow
Available water capacity: Moderate
Root zone: Very deep

Shrink-swell potential: Low
Water erosion hazard: Slight

Composition

Uhland soil and similar inclusions: 85 percent
Contrasting inclusions: 15 percent

Contrasting Soils

- The somewhat poorly drained, very slowly permeable Navasota soils on lower flood plain positions.
- The slowly permeable Robco soils occur at head of drainageways.
- Similar soils are poorly drained.
- The moderately permeable Whitesboro soils are on similar flood plain positions.
- The very slowly permeable Zilaboy soils are on slightly lower flood plain positions.

Land Uses

Major land use: Rangeland
Other land uses: Pasture

Management Concerns

Pasture
Major limitations:
- There are no major limitations.

Minor limitations:
- The moderate available water capacity limits the growth of improved grasses during periods of drought.
- Flooding may disrupt livestock grazing for brief periods.
- Wetness may limit the use of farm equipment following flooding.

Cropland
Major limitations:
- This soil is not suited to growing crops because of the flooding hazard.

Rangeland
Major limitations:
- There are no major limitations.

Minor limitations:
- The moderate available water capacity limits the growth of native grasses during periods of drought.
- Flooding may disrupt livestock grazing for brief periods.

Urban development
Major limitations:
- This soil is not suited to most urban uses because of the flooding hazard.
- Flooding is a limitation in the construction of local roads and streets.
- A high risk of corrosion exists for uncoated steel.

Interpretive Groups

Land capability classification: 5w
Ecological site: Loamy Bottomland PE 48-68
Pasture management group: Loamy Bottomland Group

UfA—Uhland fine sandy loam, 0 to 1 percent slopes, frequently flooded

Setting

Landform: Flood plain
Landscape position: Coastal plain
Slope: Nearly level with plane surfaces
Shape of areas: Long and narrow
Size of areas: 50 to 500 acres

Typical Profile

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

Subsoil:
11 to 24 inches—slightly acid, light yellowish brown fine sandy loam with brown iron concentrations
24 to 44 inches—slightly acid, very pale brown fine sandy loam with brown iron concentrations and gray iron depletions
44 to 55 inches—moderately acid, yellow fine sandy loam with gray iron depletions
55 to 80 inches—moderately acid, light gray sandy clay loam with red and brown iron concentrations

Soil Properties

Depth: Very deep
Drainage class: Moderately well drained
Water table: Perched at a depth of 2.0 to 5.0 feet for about 30 to 60 days, mostly during spring
Flooding: Occurs more than 50 times in 100 years and usually lasts 2 to 7 days
Runoff: High
Permeability: Moderately slow
Available water capacity: Moderate
Root zone: Very deep
Shrink-swell potential: Low
Water erosion hazard: Slight

Composition

Uhland soil and similar inclusions: 85 percent
Contrasting inclusions: 15 percent

Contrasting Soils

- The somewhat poorly drained, very slowly permeable Navasota soils are on lower flood plain positions.
- The slowly permeable Robco soils are at head of drainageways.
- Similar soils are poorly drained.
- The moderately permeable Whitesboro soils are on similar flood plain positions.
- The very slowly permeable Zilaboy soils in slightly lower flood plain positions.

Land Uses

Major land use: Rangeland
Other land uses: Pasture

Management Concerns

Pasture
Major limitations:
- There are no major limitations.

Minor limitations:
- The moderate available water capacity limits the growth of improved grasses during periods of drought.
- Flooding may disrupt livestock grazing for brief periods.
- Wetness may limit the use of mechanical equipment following flooding.

Cropland
Major limitations:
- This soil is not suited to growing crops because of the flooding hazard.

Rangeland
Major limitations:
- There are no major limitations.

Minor limitations:
- The moderate available water capacity limits the growth of native plants during periods of drought.
- Flooding may disrupt livestock grazing for brief periods.

Urban development
Major limitations:
- This soil is not suited to most urban uses because of the flooding hazard.
- Flooding is a limitation in the construction of local roads and streets.
- A high risk of corrosion exists for uncoated steel.

Interpretive Groups

Land capability classification: 5w
Ecological site: Loamy Bottomland PE 48-68
Pasture management group: Loamy Bottomland Group

W—Water

Small, natural or constructed lake, pond, or pit that contains water most of the year.

WgE—Winedale very gravelly fine sandy loam, 2 to 8 percent slopes

Setting

Landform: Summit, shoulder, and upper backslopes on ridges
Landscape position: Coastal plain
Slope: Very gently sloping to moderately sloping with convex surfaces
Shape of areas: Irregular
Size of areas: 50 to 200 acres

Typical Profile

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

Subsoil:
7 to 14 inches—strongly acid, dark reddish brown clay
14 to 34 inches—strongly acid, red clay with gray iron depletions

34 to 38 inches—strongly acid, reddish yellow clay loam with gray iron depletions and gray fragments of shale

Underlying material:
38 to 80 inches—strongly acid, light yellowish brown weakly bedded shale

Soil Properties

Depth: Moderately deep
Drainage class: Moderately well drained
Water table: None within a depth of 6 feet
Flooding: None
Runoff: Very High
Permeability: Very slow
Available water capacity: Moderate
Root zone: Moderately deep
Shrink-swell potential: High
Water erosion hazard: Severe

Composition

Winedale soil and similar inclusions: 85 percent
Contrasting inclusions: 15 percent

Contrasting Soils

- The very slowly permeable Boonville soils are in lower concave positions.
- The very slowly permeable Tabor soils are in lower concave positions.
- Areas of Winedale soils where the very gravelly surface layer was removed for road material.

Land Uses

Major land use: Rangeland
Other land uses: Pasture

Management Concerns

Pasture
Major limitations:
- A severe water erosion hazard exists when this soil is tilled prior to establishment of improved grasses.
- The very slow permeability of the clay subsoil restricts water movement and root development of improved grasses.
- The very gravelly surface layer makes tillage difficult when establishing improved grasses (fig. 16).

Minor limitations:
- The moderate available water capacity limits growth of improved grasses during periods of drought.

Cropland
Major limitations:
- This soil is not suitable for cropland because of the severe erosion hazard and the very gravelly surface layer.
- The very slow permeability of the clay subsoil restricts water movement and root development of crops.

Minor limitations:
- The moderate available water capacity limits growth of crops during periods of drought.

Rangeland

Major limitations:

- The very slow permeability of the clay subsoil restricts water movement and development of native plants.

Minor limitations:

- The moderate available water capacity limits growth of native plants during periods of drought.

Urban development

Major limitations:

- Shrink swell can cause structural damage to the construction of residential and small commercial buildings.
- The very slow permeability of the clay subsoil may interfere with the proper functioning of septic tank absorption fields.
- Low soil strength is a limitation in the construction of local roads and streets.
- The very gravelly surface layer interferes with the establishment and maintenance of lawns.
- A high risk of corrosion exists for uncoated steel.

Minor limitations:

- A moderate risk of corrosion exists for concrete.

Interpretive Groups

Land capability classification: 4e
Ecological site: Claypan Savannah PE 48-68
Pasture management group: Poorly Suited Group

Figure 16.—Pastureland on an area of Winedale very gravelly fine sandy loam, 2 to 8 percent slopes. The Winedale soils are in the Poorly Suited pasture management group.

WnB—Wilson clay loam, 0 to 2 percent slopes

Setting

Landform: Stream terraces and relict stream terraces
Landscape position: Coastal plain
Slope: Nearly level with plane or slightly concave surfaces
Shape of areas: Irregular
Size of areas: 20 to 75 acres

Typical Profile

Surface layer:
0 to 4 inches—moderately acid, dark gray clay loam

Subsoil:
4 to 27 inches—neutral and slightly alkaline, dark gray clay
27 to 41 inches—moderately alkaline, light brownish gray clay
41 to 50 inches—moderately alkaline, light brownish gray clay with brown iron concentrations
50 to 80 inches—moderately alkaline, grayish brown clay with brown iron concentrations and gray iron depletions

Soil Properties

Depth: Very deep
Drainage class: Moderately well drained
Water table: None within a depth of 6 feet; the soil is seasonally wet and saturated in the surface layer and upper part of the subsoil for short periods in most years.
Flooding: None
Runoff: Very high
Permeability: Very slow
Available water capacity: Moderate
Root zone: Very deep
Shrink-swell potential: High
Water erosion hazard: Moderate

Composition

Wilson soil and similar inclusions: 85 percent
Contrasting inclusions: 15 percent

Contrasting Soils

- The Benchley soils are in concave areas on upland positions.
- The Crockett soils are on convex areas on upland positions.
- The Davilla soils are on adjacent slightly higher convex areas on terrace positions.
- The Luling soils are on convex areas in upland positions.
- The Tabor soils are on slightly higher convex terrace positions.

Land Uses

Major land use: Rangeland
Other land uses: Pasture and cropland (fig. 17)

Figure 17.—A field of grain sorghum on an area of Wilson clay loam, 0 to 2 percent slopes.

Management Concerns

Pasture

Major limitations:

- The very slow permeability of the clay subsoil restricts the water movement and root development of improved grasses.

Minor limitations:

- A moderate water erosion hazard exists when this soil is tilled prior to being established to improved grasses.
- The moderate available water capacity limits the growth of improved grasses during periods of drought.

Cropland

Major limitations:

- The very slow permeability of the clay subsoil restricts the water movement and root development of growing crops.

Minor limitations:

- A moderate water erosion hazard exists when this soil is cultivated.
- The moderate available water capacity limits the growth of crops during periods of drought.

Rangeland

Major limitations:

- The very slow permeability of the clay subsoil restricts the water movement and root development of native plants.

Minor limitations:

- The moderate available water capacity limits the growth of native plants during periods of drought.

Urban development
Major limitations:

- The high shrink-swell potential can cause structural damage to residential and small commercial buildings.
- Low soil strength, the high shrink-swell potential, and seasonal wetness are limitations in the construction of local roads and streets.
- The very slow permeability of the clay subsoil and seasonal wetness may interfere with the proper functioning of septic tank absorption fields.
- A high risk of corrosion exists for uncoated steel and concrete.

Interpretive Groups

Land capability classification: 3w
Ecological site: Claypan Prairie
Pasture management group: Seasonally Wet Loamy Claypan Group

WwA—Whitesboro loam, 0 to 1 percent slopes, frequently flooded

Setting

Landform: Flood plain
Landscape position: Coastal plain
Slope: Nearly level with plane surfaces
Shape of areas: Elongated
Size of areas: 50 to 200 acres

Typical Profile

Surface layer:
0 to 6 inches—slightly acid, brown loam

Subsoil:
6 to 35 inches—slightly acid, dark grayish brown sandy clay loam
35 to 60 inches—slightly acid, brown sandy clay loam with brown iron concentrations
60 to 80 inches—neutral, yellowish brown sandy clay loam

Soil Properties

Depth: Very deep
Drainage class: Moderately well drained
Water table: None within a depth of 6 feet
Flooding: Occurs more than 50 times in 100 years and usually lasts 2 to 7 days
Runoff: Negligible
Permeability: Moderate
Available water capacity: High
Root zone: Very deep
Shrink-swell potential: Moderate
Water erosion hazard: Slight

Composition

Whitesboro soil and similar inclusions: 85 percent
Contrasting inclusions: 15 percent

Contrasting Soils

- The moderately slowly permeable Uhland soils are on slightly higher flood plain positions.

- The very slowly permeable Zilaboy soils are on slightly lower flood plain positions.

Land Uses

Major land use: Rangeland
Other land uses: Pasture

Management Concerns

Pasture
Major limitations:
- There are no major limitations.

Minor limitations:
- Livestock grazing may be briefly disrupted during periods of flooding.
- Wetness may limit the use of farm equipment following flooding.

Cropland
Major limitations:
- This soil is not suitable for cropland because of the flooding hazard.

Rangeland
Major limitations:
- There are no major limitations.

Minor limitations:
- Livestock grazing may be briefly disrupted during periods of flooding.

Urban development
Major limitations:
- This soil is not suited to most urban uses because of the flooding hazard.
- Low soil strength and flooding are limitations in construction of local roads and streets.
- A high risk of corrosion exists for uncoated steel.

Interpretive Groups

Land capability classification: 5w
Ecological site: Loamy Bottomland PE 48-68
Pasture management area: Loamy Bottomland Group

ZaC—Zack fine sandy loam, 1 to 5 percent slopes

Setting

Landform: Summit, shoulder, and upper backslopes on broad ridges
Landscape position: Coastal plain
Slope: Very gently sloping and gently sloping with convex surfaces
Shape of areas: Oblong to irregular
Size of areas: 50 to 200 acres

Typical Profile

Surface layer:
0 to 5 inches—moderately acid, brown fine sandy loam

Subsoil:
5 to 14 inches—moderately acid, reddish brown clay with red iron concentrations
14 to 21 inches—neutral, brown clay with red iron concentrations
21 to 33 inches—slightly alkaline, light gray sandy clay loam

Underlying material:
33 to 60 inches—moderately alkaline, light gray thinly bedded mudstone

Soil Properties

Depth: Moderately deep
Drainage class: Moderately well drained
Water table: None within a depth of 6 feet
Flooding: None
Runoff: Very high
Permeability: Very slow
Available water capacity: Moderate
Root zone: Moderately deep
Shrink-swell potential: High
Water erosion hazard: Severe

Composition

Zack soil and similar inclusions: 85 percent
Contrasting inclusions: 15 percent

Contrasting Soils

- The somewhat poorly drained Boonville soils are in lower concave positions.

Land Uses

Major land use: Pasture
Other land uses: Rangeland and cropland

Management Concerns

Pasture
Major limitations:
- A severe erosion hazard exists when this soil is tilled prior to being established to improved grasses.
- The very slow permeability of the clay subsoil restricts water movement and root development of improved grasses.

Minor limitations:
- The moderately deep solum may inhibit root development of improved grasses.
- The moderately available water capacity limits plant growth during periods of drought.

Cropland
Major limitations:
- A severe erosion hazard exists when this soil is cultivated.
- The very slow permeability of the clay subsoil restricts water movement and root development of crops.

Minor limitations:
- The moderately deep solum may inhibit root development of crops.
- The moderately available water capacity limits plant growth during periods of drought.

Rangeland
Major limitations:
- The very slow permeability of the clay subsoil restricts water movement and root development of native plants.

Minor limitations:

- The moderately deep solum may inhibit root development of native plants.
- The moderately available water capacity limits native plant growth during periods of drought.

Urban development
Major limitations:

- The high shrink-swell potential is a limitation that can cause structural damage to residential and small commercial buildings.
- The moderately deep solum and very slow permeability of the clay subsoil may interfere with the proper functioning of septic tank absorption fields.
- Low soil strength is a limitation in the construction of local roads and streets.
- A high risk of corrosion exists for uncoated steel.

Interpretive Groups

Land capability classification: 4e
Ecological site: Claypan Savannah PE 48-68
Pasture management group: Loamy Claypan Group

ZaD—Zack fine sandy loam, 5 to 8 percent slopes

Setting

Landform: Upper backslopes on broad ridges
Landscape position: Coastal plain
Slope: Moderately sloping with convex surfaces
Shape of areas: Irregular
Size of areas: 20 to 100 acres

Typical Profile

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

Subsoil:
3 to 10 inches—moderately acid, reddish brown clay
10 to 28 inches—slightly acid, grayish brown clay

Underlying material:
28 to 60 inches—neutral, very pale brown stratified mudstone and siltstone

Soil Properties

Depth: Moderately deep
Drainage class: Moderately well drained
Water table: None within a depth of 6 feet
Flooding: None
Runoff: Very high
Permeability: Very slow
Available water capacity: Moderate
Root zone: Moderately deep
Shrink-swell potential: High
Water erosion hazard: Severe

Composition

Zack soil and similar inclusions: 85 percent
Contrasting inclusions: 15 percent

Contrasting Soils

- The somewhat poorly drained Boonville soils are in lower concave positions.

Land Uses

Major land use: Pasture
Other land uses: Rangeland

Management Concerns

Pasture
Major limitations:
- A severe erosion hazard exists when this soil is tilled prior to being established to improved grasses.
- The very slow permeability of the clay subsoil restricts water movement and root development of improved grasses.

Minor limitations:
- The moderately deep solum may inhibit root development of improved grasses.
- The moderately available water capacity limits plant growth during periods of drought.

Cropland
Major limitations:
- This soil is not suitable for cropland because of the severe water erosion hazard.

Rangeland
Major limitations:
- The very slow permeability of the clay subsoil restricts water movement and root development of native plants.

Minor limitations:
- The moderately deep solum may inhibit root development of native plants.
- The moderately available water capacity limits native plant growth during periods of drought.

Urban development
Major limitations:
- The high shrink-swell potential is a limitation that can cause structural damage to residential and small commercial buildings.
- The moderately deep solum and very slow permeability of the clay subsoil may interfere with the proper functioning of septic tank absorption fields.
- Low soil strength is a limitation in the construction of local roads and streets.
- A high risk of corrosion exists for uncoated steel.

Interpretive Groups

Land capability classification: 6e
Ecological site: Claypan Savannah PE 48-68
Pasture management group: Loamy Claypan Group

ZbA—Zilaboy clay, 0 to 1 percent slopes, frequently flooded

Setting

Landform: Flood plain
Distinctive surface features: Undisturbed areas have gilgai microrelief
Landscape position: Coastal plain
Slope: Nearly level with plane surfaces
Shape of areas: Elongated
Size of areas: 100 to 500 acres

Typical Profile

Surface layer:
0 to 8 inches—neutral, dark grayish brown clay with brown iron concentrations

Subsoil:
8 to 22 inches—slightly acid, gray clay with brown iron concentrations
22 to 50 inches—slightly acid and moderately acid, dark grayish brown clay with brown iron concentrations
50 to 80 inches—moderately acid, grayish brown clay with masses and threads of calcium sulfate

Soil Properties

Depth: Very deep
Drainage class: Moderately well drained
Water table: A seasonal water table is present from a depth of 1.0 to more than 6.0 feet, mainly from October through May.
Flooding: Occurs more than 50 times in 100 years and usually lasts 2 to 7 days
Runoff: High
Permeability: Very slow
Available water capacity: High
Root zone: Very deep
Shrink-swell potential: High
Water erosion hazard: Slight

Composition

Zilaboy soil and similar inclusions: 90 percent
Contrasting inclusions: 10 percent

Contrasting Soils

- The moderately well drained, moderately slowly permeable Sandow soils are on slightly higher flood plain positions.
- The moderately well drained, moderately slowly permeable Uhland soils are on slightly higher flood plain positions.
- The moderately well drained, moderately permeable Whitesboro soils are on slightly higher flood plain positions.

Land Uses

Major land use: Rangeland
Other land uses: Pasture

Management Concerns

Pasture
Major limitations:
- The very slow permeability of the clay surface and subsoil restricts water movement and root development of improved grasses.
- The clayey surface layer requires a good seedbed preparation for establishment of improved grasses.

Minor limitations:
- Wetness limits the use of mechanical equipment when flooding occurs.
- Flooding may disrupt livestock grazing for brief periods.

Cropland
Major limitations:
- This soil is not suitable for cropland because of frequent flooding.

Rangeland
Major limitations:
- The very slow permeability of the clay surface and subsoil restricts water movement and root development of native plants.

Minor limitations:
- Flooding may disrupt livestock grazing for brief periods.

Urban development
Major limitations:
- This soil is not suited to most urban uses because of the flooding hazard.
- Low soil strength, high shrink-swell potential, and wetness are limitations in construction of local roads and streets.
- A high risk of corrosion exists for uncoated steel.

Interpretive Groups

Land capability classification: 5w
Ecological site: Clayey Bottomland PE 48-68
Pasture management group: Clayey Bottomland Group

ZgC—Zack gravelly fine sandy loam, 1 to 5 percent slopes

Setting

Landform: Summit, shoulder, and upper backslopes on broad ridges
Landscape position: Coastal plain
Slope: Very gently sloping and gently sloping with convex surfaces
Shape of areas: Oblong to irregular
Size of areas: 20 to 100 acres

Typical Profile

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

Subsoil:
7 to 16 inches—very strongly acid, reddish brown clay with brown iron concentrations
16 to 25 inches—moderately alkaline, dark grayish brown clay with brown iron concentrations
25 to 30 inches—moderately alkaline, brown clay interbedded with gray shale

Underlying material:
30 to 80 inches—moderately alkaline, light brownish gray shale

Soil Properties

Depth: Moderately deep
Drainage class: Moderately well drained
Water table: None within a depth of 6 feet
Flooding: None
Runoff: Very high
Permeability: Very slow
Available water capacity: Moderate
Root zone: Moderately deep
Shrink-swell potential: High
Water erosion hazard: Severe

Composition

Zack soil and similar inclusions: 95 percent
Contrasting inclusions: 5 percent

Contrasting Soils

- The somewhat poorly drained Boonville soils are in lower concave positions.

Land Uses

Major land use: Rangeland
Other land uses: Pasture and cropland

Management Concerns

Pasture
Major limitations:
- The very slow permeability of the clay subsoil restricts water movement and root development of improved grasses.

Minor limitations:
- The moderately deep solum may inhibit root development of improved grasses.
- The moderate available water capacity limits plant growth during periods of drought.

Cropland
Major limitations:
- A severe water erosion hazard exists when this soil is cultivated.
- The very slow permeability of the clay subsoil restricts water movement and root development of crops.

Minor limitations:
- The moderately deep solum may inhibit root development of crops.
- The moderate available water capacity limits plant growth during periods of drought.
- The gravelly surface layer may make tillage operations difficult.

Rangeland
Major limitations:
- The very slow permeability of the clay subsoil restricts water movement and root development of native plants.
- The low natural fertility limits yield potential of native plants.

Minor limitations:
- The moderately deep solum may inhibit root development of native plants.

- The moderate available water capacity limits native plant growth during periods of drought.

Urban development
Major limitations:
- The high shrink-swell potential is a limitation that can cause structural damage to residential and small commercial buildings.
- The moderately deep solum and very slow permeability of clay subsoil may interfere with the proper functioning of septic tank absorption fields.
- Low soil strength and the high shrink-swell potential are limitations in the construction of local roads and streets.
- A high risk of corrosion exists for uncoated steel.

Interpretive Groups

Land capability classification: 4e
Ecological site: Claypan Savannah PE 48-68
Pasture management group: Gravelly Loamy Claypan Group

ZuC—Zulch fine sandy loam, 1 to 5 percent slopes

Setting

Landform: Broad ridges
Landscape position: Coastal plain
Slope: Very gently sloping and gently sloping with convex and concave surfaces
Shape of areas: Irregular
Size of areas: 50 to 200 acres

Typical Profile

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

Subsoil:
4 to 20 inches—neutral and slightly alkaline, dark gray clay
20 to 33 inches—moderately alkaline, light gray clay loam with brown iron concentrations

Underlying material:
33 to 80 inches—moderately alkaline, light gray stratified siltstone and shale

Soil Properties

Depth: Moderately deep
Drainage class: Moderately well drained
Water table: None within a depth of 6 feet
Flooding: None
Runoff: Very high
Permeability: Very slow
Available water capacity: Moderate
Root zone: Moderately deep
Shrink-swell potential: High
Water erosion hazard: Severe

Composition

Zulch soil and similar inclusions: 85 percent
Contrasting inclusions: 15 percent

Contrasting Soils

- The somewhat poorly drained Boonville soils are in lower concave positions.
- The well drained Gredge soils are on higher convex ridgetop positions.

Land Uses

Major land use: Pasture
Other land uses: Rangeland and cropland

Management Concerns

Pasture
Major limitations:
- A severe erosion hazard exists when this soil is tilled prior to being established to improved grasses.
- The very slow permeability of the clay subsoil restricts water movement and root development of grasses.

Minor limitations:
- The moderately deep solum may inhibit root development of improved grasses.
- The moderate available water capacity limits plant growth during periods of drought.

Cropland
Major limitations:
- A severe erosion hazard exists when this soil is cultivated.
- The very slow permeability of the clay subsoil restricts water movement and root development of crops.

Minor limitations:
- The moderately deep solum may inhibit root development of crops.
- The moderate available water capacity limits plant growth during periods of drought.

Rangeland
Major limitations:
- The very slow permeability of the clay subsoil restricts water movement and root development of native plants.
- The low natural fertility limits yield potential of native plants.

Minor limitations:
- The moderately deep solum may inhibit root development of native plants.
- The moderately available water capacity limits native plant growth during periods of drought.

Urban development
Major limitations:
- The high shrink-swell potential is a limitation that can cause structural damage to residential and small commercial buildings.
- The very slow permeability of the clay subsoil and moderately deep solum may interfere with the proper functioning of septic tank absorption fields.
- Low soil strength and the high shrink-swell potential are limitations in the construction of local roads and streets.
- A high risk of corrosion exists for uncoated steel.

Minor limitations:

- A moderate risk of corrosion exists for concrete.

Interpretive Groups

Land capability classification: 4e
Ecological site: Claypan Prairie PE 44-64
Pasture management group: Loamy Claypan Group

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. The 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 65,498 acres in the survey area or nearly 17 percent of the total acreage meets the soil requirements for prime farmland. It is located throughout the county, but the major portion lays in General Soil Map Units 4, 5, 7 and 8; which are on savannah uplands and prairie uplands. Most of the acreage is used for cultivated crops, improved pasture, and rangeland.

A 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 that make up the prime farmland in Lee County are listed in table 5. This list does not constitute a recommendation for a particular land use. Onsite evaluation is needed to determine whether or not the hazard or limitation has been overcome by corrective measures. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps. The soil qualities that affect use and management are described under the heading "Detailed Soil Map Units."

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and 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 and forestland; 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 in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

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

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

Interpretive Ratings

The interpretive tables in this survey rate the soils in the survey area for various uses. Many of the tables identify the limitations that affect specified uses and indicate the severity of those limitations.

Rating Class Terms

Rating classes are expressed in the tables in terms that indicate the extent to which the soils are limited by all of the soil features that affect a specified use or in terms that indicate the suitability of the soils for the use. Thus, the tables may show limitation classes or suitability classes. Terms for the limitation classes are *not limited, somewhat limited,* and *very limited*. The suitability ratings are expressed as *well suited, moderately suited, poorly suited,* and *not suited* or as *good, fair,* and *poor*.

Numerical Ratings

Numerical ratings in the tables indicate the relative severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.00 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use and the point at which the soil feature is not a limitation.

The limitations appear in order from the most limiting to the least limiting. Thus, if more than one limitation is identified, the most severe limitation is listed first and the least severe one is listed last.

Cropland and Pasture

General management needed for cropland and pasture is suggested in this section. The system of land capability classification used by the Natural Resources Conservation Service is explained. The estimated yields of the main crops and hay and pasture plants are listed for each soil in table 6.

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 Texas Cooperative Extension.

Cropland

Cropland comprises about 7 percent of Lee County. The major crops grown in the county are corn, grain sorghum, and peanuts. Other crops grown include small grains, soybeans, watermelons, strawberries, and other truck crops. Most of the corn, grain sorghum, and small grains are grown on the Benchley, Davilla, Lexton, Luling, and Wilson soils are on the uplands and terraces. Most of the peanuts (fig. 18) are grown on Chazos, Gasil, Rader, Silawa, and Tabor soils. Other soils are suitable for cropland, but are presently in other uses.

Soil erosion is the major problem on nearly all of the cropland where slopes are more than 2 percent. Productivity is reduced as the surface layer is lost and subsoil is incorporated into the plow layer. This is especially true on soils with clayey subsoils. Soil erosion on cropland also results in sedimentation of streams. Where erosion is controlled, the pollution of streams by sediment is minimized and the quality of water for municipal use, recreation, fisheries, and wildlife is improved.

Figure 18.—Peanuts being harvested on an area of Silawa loamy fine sand, 1 to 5 percent slopes.

Management of crop residue helps control erosion and improves soil tilth. A 30 percent or greater cover of crop residue left on the surface of the soil protects against packing rains, reduces crusting, decreases runoff, and reduces evaporation of soil moisture (see cover photo). It shades the soil thus reducing the soil temperature. In addition, the increased organic matter at the surface can help reduce the compacting effects of farm machinery. Crop residue should be protected from burning and overgrazing. Tillage equipment that keeps residue on the surface should be used. Residue management and minimum tillage can be used on nearly all cropland soil in the county.

Contour terraces reduce slope lengths and subsequent erosion on cropland. They are most practical on moderately deep and deep, clayey and loamy soils that have more than 1 percent slope.

All crops respond well to commercial fertilizer. Where fertilizers are applied according to a current soil test, and erosion is controlled, fertility levels can be maintained. Proper pH must also be maintained to ensure that applied fertilizers can be used by plants. On sandy soils, fertilizer, especially nitrogen, should be applied in split applications to ensure the best usage for plants and to protect water quality. Split applications should also be used on any sloping fields where runoff potential is high.

Weed and insect pests need to be controlled on cropland. Type and extent of infestation will vary within the growing season and from year to year. Weed and insect pests need to be properly identified and control measures applied when the population of the pest reaches a level where the control cost is less than the cost of the damage inflicted by the pest. The best control measures should be selected after considering all treatment options including mechanical, biological, and chemical. When chemical controls are used, label instructions should be strictly followed as well as local, state, and federal laws regulating their use.

Applications of agricultural chemicals with a high potential for leaching should be limited on sandy soils to situations where no suitable substitute is available. Likewise, the use of chemicals with a high runoff potential should be limited on clay soils.

Pasture and Hayland

Land used for pasture and hay in Lee County is mainly planted to introduced grasses that respond to recommended management practices. Some of the species used are common and improved 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 grains for additional winter and early spring forage. Some cropland fields are used continuously for annual winter pasture production.

Well managed perennial warm-season pasture grasses will usually produce more forage than is needed during the peak of the growing season. Excess pasture production is often harvested as hay for use during the winter. Some perennial grasses; as well as, annual plantings of forage sorghum are managed strictly for hay production.

Year-round forage programs can be developed by planning land use and the kinds of forage to be grown. Such a planned grazing system maximizes production by providing a guide to stocking rates, allowing timely rest periods from grazing, and more efficient forage harvest.

Recommended pasture management practices include adequate fence arrangement for rotational grazing and efficient use of forage. Proper use of forage ensures that plant vigor remains high for continued production and soil erosion protection. 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.

Fertilizer should be applied in split 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 due to the potential of nitrogen and other nutrients leaching into ground water. Split applications should also be used on sloping clay soils due to their high runoff potential. Some soils need applications of agricultural limestone to correct acidity problems and allow better usage of applied nutrients by plants. Soil pH should be maintained at a minimum of 5.5 for most grasses and if legumes are to be over seeded, pH greater than 5.5 must be maintained.

Hay production (fig. 19) requires the same high management standards as pasture production. Additionally, the forage needs to be cut at the proper interval and height based on species requirements in order to maintain stand vigor, and promote timely regrowth.

Pasture Management Groups

A Pasture Management Group is a grouping of soils that have about the same level of productivity and have similar management concerns. The soils of Lee County were rated and grouped based on characteristics that affect plant establishment and growth. The major characteristics that were considered include texture and thickness of the topsoil, drainage, erosion, available water holding capacity, permeability, and soil depth.

The yields shown in the pasture management groups are estimates developed for established grasses. They are based on average climatic conditions and it is assumed that recommended management practices are followed. Recommended management practices include, setting economically feasible yield goals; establishment and maintenance of the proper fertility levels to attain goals based on current soil test results; intensive rotational grazing; weed, insect, and disease control; and brush management.

Figure 19.—Round bales on an area of Davilla-Wilson complex, 0 to 2 percent slopes. Many areas of the Davilla-Wilson map unit are used for production of hay.

The yield for pasture is expressed in animal unit months (AUMs) for the grass most commonly grown in each group. An animal unit month is the length of time that the forage produced on one 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 AUMs will provide forage for one animal unit for 8 months during the growing season (April through October). Expressed another way, it will take 1.5 acres producing at this rate to provide adequate forage for one animal unit for one year, assuming that the excess forage produced during the growing season is harvested as hay for winter feeding. Estimated forage yields are given in Table 5 for all soils suitable for pasture. They 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 portion of the forage is not used for grazing due to trampling, fouling by manure, or must be left to control erosion. Bermudagrass and bahiagrass pasture grazed or cut to 3 to 4 inches ensures continued productivity and maintains or improves soil and water quality. Hay yields in tons per acre can be estimated by multiplying the AUMs by 0.53.

The following description of each Pasture Management Group discusses the soil characteristics that affect forage production, major grass and legume adaptation, yield estimate of major grasses, and management problems associated with forage production. Additional information about the soils is in the sections, “Detailed Soil Map Units” and “Soil Series and Their Morphology.”

Loamy Upland Group. This group includes Benchley, Gasil, Margie, Rosanky and Spiller in map units BeB, BeC, GaB, GaD, MrB, RsC, and SpC. These soils have a moderately acid and slightly acid loamy surface layer over loamy and clayey subsoil and occur on very gently sloping and moderately sloping uplands. This group has no major limitations to the production of forage; however, if adequate cover is not maintained on the sloping units, erosion can be a problem. Potential production of this group is 6 to 8 AUMs of grazing in a normal year with recommended management.

Perennial grasses adapted to loamy upland soils include hybrid bermudagrass, common bermudagrass, bahiagrass, kleingrass, and switchgrass. Annual grasses grown on these soils include hay-grazer or forage sorghum in the summer, and ryegrass, cereal rye, oat and wheat in the cool season. Annual legumes adapted include crimson clover and ball clover, on Margie, Rosanky, and Spiller, and arrowleaf clover, bur medic, rose clover, and hairy vetch on the remaining soils, however, intensive management is required to have a successful legume program.

Sandy Upland Group. This group includes Chazos, Dutek, Gasil, Rehburg, Robco, Silawa, and Silstid (fig. 20) soils in map units ChC, DuC, GsB, GsD, ReC, RoB, SmC, SnC, and SnD. These are very gently sloping to moderately sloping, strongly acid to slightly acid soils with a sandy surface layer over loamy and clayey subsoil. They occur on uplands and terraces. A low to moderate capacity to hold water for plant growth is a minor limitation to the production of pasture, but the rapid and moderately rapid permeability of the surface layer helps off-set this limitation. If adequate cover is not maintained on the steeper slopes erosion can be a problem.

Droughtiness can be a problem with these soils reducing production in some years, but they recover well if they are not overgrazed and good fertility levels are maintained. Due to the coarse surface texture and permeable subsoil, nutrient leaching, particularly nitrogen can be a problem. Agricultural chemicals with a high potential for leaching should not be used on these soils, unless no suitable substitute is available. The soils in this group can be expected to produce about 4 to 7 AUMs of grazing in a normal year with recommended management.

Adapted perennial grasses for the soils in this group include hybrid bermudagrass, bahiagrass, common bermudagrass, and kleingrass. Annual grasses grown on these soils include, forage sorghum and crabgrass in the summer, with

Figure 20.—Pasture grasses on an area of Silstid loamy fine sand, 1 to 5 percent slopes. The Silstid soils are in the Sandy Upland pasture management group.

ryegrass and cereal rye used in the cool season. Annual cool-season legumes adapted include ball clover, crimson clover, and hairy vetch; summer legumes include cowpea, soybean, and alyce clover.

Deep Sandy Group. This group consists of Faula and Padina soils in map units FaB, PdC, and PdF. Faula and Padina are slightly acid and neutral soils with a thick sandy surface layer over sandy or loamy subsoils that occur on nearly level to moderately steep uplands and terraces. The major limitation of these soils is a poor ability to hold water for plant growth in the surface layers. However, the loamy subsoil of the Padina has the ability to hold water for plant growth. This fact combined with the good infiltration rate of the surface layer results in a favorable situation for the growth of established deep rooted forage plants.

Droughtiness can be a limitation during establishment, and may limit production of established stands during dry periods in some years. These soils will recover from drought well if not overgrazed and if adequate fertility is maintained. Erosion can be a problem on steep slopes if cover is not maintained.

The coarse texture of the surface soil and the permeable subsoil, nutrient leaching, particularly nitrogen, can be a limitation. A suitable management practice is to apply nutrients based on the timing of the planting. Agricultural chemicals with a high potential for leaching should not be used on these soils unless no suitable substitute is available. The Padina soils in this group can be expected to produce about 5 to 7 AUMs of grazing with normal rainfall and management. The Faula, due to its more sandy subsoil and reduced ability to hold water, has a production potential of about 4 AUMs of grazing in a normal year with recommended management.

Adapted perennial grasses for the soils in this group include hybrid bermudagrass, weeping lovegrass, and Willman lovegrass. Annual grasses include crabgrass in the summer and ryegrass in the cool-season. Annual legumes adapted include hairy vetch for the cool season and partridge pea and alyce clover for the summer. The success of warm- or cool-season annuals is very dependant on rainfall.

Loamy Claypan Group. This group consists of Crockett, Edge, Gredge, Kurten, Normangee, Rader, Tabor, Zack, and Zulch soils in map units CrC, EdB, EdD, GrC, KuC, NoC, RaB, TaB, ZaC, ZaD, and ZuC. These soils are characterized by a thin to moderately thick loamy surface of dense clay subsoil with very slow permeability. They occur on very gently sloping to moderately sloping uplands and terraces, and range in pH from strongly acid to slightly acid. Seasonal wetness, a minor limitation, is reduced due to adequate natural surface drainage. Another minor limitation is a moderate ability to hold water for plant growth.

In some years droughtiness may reduce production of these soils, but they recover well if they are not overgrazed and good fertility levels are maintained. Erosion can be a problem on sloping units if adequate cover is not maintained. Loamy claypan soils are expected to yield 2 to 7 AUMs of grazing in a normal year with recommended management.

Perennial grasses adapted to this group include hybrid bermudagrass, bahiagrass, common bermudagrass, kleingrass, old world bluestems, and switchgrass. Annual legumes adapted include crimson clover, arrowleaf clover, subterranean clover, rose clover, and hairy vetch.

Clayey Group. This group includes Lexton and Luling soils in map units LeB, LgC, LuB, and LuC. These soils are moderately acid to neutral, clayey throughout, and occur on very gently sloping or gently sloping uplands. They have a major limitation of very slow permeability and a minor limitation of a clay surface layer. The potential production of this group is about 4.5 to 8 AUMs with recommended management.

Clayey soils are difficult to prepare for seeding or sprigging, especially if moisture conditions are not ideal. During dry periods these soils may become droughty causing reduced production. Clay soils are slower to recover from drought than other soils. Care should be taken to avoid overgrazing during drought periods. If adequate cover is not maintained on steeper slopes, erosion could be a problem. Agricultural chemicals with high runoff potential should not be used on sloping clay soils unless no suitable substitute is available.

Adapted perennial grasses for these soils include hybrid bermudagrass, kleingrass, common bermudagrass, old world bluestem, Johnsongrass, and switchgrass. Annual grasses suited to these soils are forage sorghum and haygrazer in the summer, and ryegrass and wheat in the cool season. Annual cool-season legumes adapted include red clover, rose clover, singletary pea, sweetclover, bur medic, and hairy vetch.

Gravelly Loamy Claypan Group. This group includes Burlewash, Crockett, Gredge, and Zack soils in map units BwC, CgB, GgC, and ZgC. They are strongly acid or moderately acid with a gravelly loamy surface layer over clayey subsoil that occurs on very gently sloping or gently sloping uplands and terraces. The major limitations of this group are gravelly surface layer and very slow permeability. Moderate ability to hold moisture for plant growth is a minor limitation.

Early in the growing season, excess water held up in the surface layer may cause delays in seedbed preparation and establishment of new stands. Gravel presents a minor problem for seedbed preparation. Droughtiness may effect establishment later in the season and will reduce production of established stands in most years. These soils recover moderately well from drought if not overgrazed and fertility is maintained. The potential production of this group is about 4 to 6 AUMs with recommended management.

Adapted perennial grasses for these soils include hybrid bermudagrass, kleingrass, bahiagrass, common bermudagrass, old world bluestem, and switchgrass. Annual grasses include forage sorghum, haygrazer, and crabgrass in the summer, and wheat, cereal rye, triticale, oat, and ryegrass in the cool season.

Cool-season annual legumes adapted include crimson clover, ball clover, rose clover, singletary pea, Austrian winter pea, and hairy vetch.

Seasonally Wet Loamy Claypan Group. This group consists of Boonville, Davilla-Wilson, Lufkin, Mabank, and Wilson soils in map units BoB, DwB, LfA, MaA, and WnB. They are strongly acid to slightly acid soils with a loamy surface layer over clayey subsoil that occur on nearly level or very gently sloping uplands and terraces. Their major limitations are very slow permeability, fairly thin surface layer, and relatively flat landscape position which results in excess wetness typically in the spring and fall. Boonville is the wettest soil of this group with somewhat poorly natural drainage. The rest of the group is moderately well drained. Minor limitations include a moderate ability to hold moisture for plant growth.

During wet portions of the year, planting and establishment of forage species could be delayed, and failure may occur. The growth of established stands could be inhibited. These soils may become droughty in dry periods. They can recover moderately well from drought if not overgrazed and if adequate fertility is maintained. Potential annual production for seasonally wet claypan soils is about 4 to 8 AUMs.

Adapted perennial grasses include hybrid bermudagrass, bahiagrass, common bermudagrass, kleingrass, and switchgrass. Annual grasses include crabgrass in the summer, and oat and ryegrass in the cool season. Annual cool-season legumes adapted include ball clover, singletary pea, and hairy vetch.

Clayey Bottomland Group. This group consists Zilaboy soil in map unit ZbA. This soil is clayey throughout. The Zilaboy soil is neutral and occurs on nearly level flood plains. The Zilaboy soil is frequently flooded for brief periods. Frequent flooding, and very slow permeability are the major limitations. Clayey bottomland soils have a production potential of about 5 to 6 AUMs with recommended management.

These soils are difficult to prepare for seeding or sprigging, since they are often too wet to prepare a good seedbed. Wetness and flooding may cause slow establishment or failure of new seedlings. Long wet periods will reduce productivity in some years. Delays in hay harvest and interference with grazing are common during and after flooding periods. It is not recommended to store hay on these soils due to the risk of loss or damage in the event of a flood.

Adapted perennial grasses include hybrid bermudagrass, common bermudagrass, bahiagrass, dallisgrass, johnsongrass, eastern gamagrass, Virginia wildrye, and switchgrass. Annual grasses include ryegrass, triticale, and wheat. The best-adapted cool-season legumes are white clover, bur medic, and singletary pea.

Loamy Bottomland Group. This group consists Sandow, Uhland, and Whitesboro soils in map units SaA, UcA, UfA, and WwA. These soils have a loamy surface and are loamy and clayey with depth. They are moderately acid to slightly acid, and occur on nearly level flood plains. All are frequently flooded for brief periods. Frequent flooding is the major limitation. Loamy bottomland soils have a production potential of about 6.5 to 8 AUMs with recommended management.

These soils are difficult to prepare for seeding or sprigging, since they are often too wet to prepare a good seedbed. Wetness and flooding may cause slow establishment or failure of new seedlings. Long wet periods will reduce productivity in some years. Delays in hay harvest and interference with grazing are common during and after flooding periods. It is not recommended to store hay on these soils due to the risk of loss or damage in the event of a flood.

Adapted perennial grasses include hybrid bermudagrass, common bermudagrass, bahiagrass, dallisgrass, johnsongrass, eastern gamagrass, Virginia wildrye, and switchgrass. Annual cool-season grasses include ryegrass, triticale, and wheat. The best-adapted cool-season legumes are white clover, bur medic, and singletary pea.

Very Deep Sandy Group. This group consists of Arenosa soils in map unit ArD. It is very strongly acid and sandy throughout. The Arenosa soils occur on very gently sloping to moderately sloping uplands. The major limitations of this group are poor ability to hold water for plant growth, somewhat excessive drainage, rapid permeability, and strongly acid subsoil.

Droughtiness will slow establishment of new stands, and occasionally cause failure. Production from established stands will be effected by droughty periods throughout the year. These soils will recover from drought rapidly if not overgrazed and adequate fertility is maintained. Due to coarse surface texture and permeable subsoil nutrient leaching, particularly nitrogen, can be a problem. Application of nutrients should be split to meet the plants annual needs. Agricultural chemicals with a high potential for leaching should not be used on these soils unless a suitable substitute is not available. Potential annual production for this group is about 3 AUMs.

Perennial grasses adapted to this soil include hybrid bermudagrass, weeping lovegrass, and Willman lovegrass; adapted cool-season annual legumes include hairy vetch. Crabgrass may be used as a warm-season annual. All plantings are very dependant on timely rainfall to succeed, and failure is common.

Poorly Suited Group. This group includes Boonville, Burlewash, Crockett, Edge, Jedd, Singleton, and Winedale soils in map units BgB, BuC, CrC2, EdC2, JeD, JeF, SoC, and WgE. They are strongly acid or moderately acid, have a thin loamy surface layer over clayey subsoil. They occur on very gently sloping to moderately steep uplands. Their major limitations are a very slow permeability, poor ability to hold water for plant growth, fragments on the surface, severe erosion hazard, and steep slope. The CrC2 and EdC2 (fig. 11) map units have sustained severe erosion in the past and much of their original topsoil is gone. Moderate soil depth is a minor limitation on some units. Additionally Jedd has high erosion hazard as a minor limitation. These soils are marginal for the production of pasture and hay. It may not be economically feasible to establish and maintain pasture grasses on these soils.

Droughtiness will cause slow establishment or possibly failure of new stands. Production of established stands will be reduced during dry periods in most years. On the lowest pH map units, adequate amounts of lime should be applied and incorporated during establishment, and additional applications made as needed to maintain the minimum pH for the selected grass. The slope of some of these soils will make management difficult. Erosion, during establishment and if adequate cover is not maintained, is a problem on the steeper slopes. The potential production for this group when planted to pasture species is not much higher than if the existing native vegetation is managed properly.

In the event that planting is needed on these soils, adapted grass species include hybrid bermudagrass, bahiagrass, common bermudagrass, kleingrass, and switchgrass. Legumes will not perform well if pH is below 5.5; therefore, it is probably not cost effective to overseed these soils unless a liming program has been followed. Hairy vetch can grow reasonably well on any of these soils that have a surface pH of 5.0 or higher.

Not Suited Group. This group includes Burlewash, Edge, Jedd, Koether, Kurten, and Navasota soils in map units BxG, EgD, JgD, JeE, KgC, and NvA. These soils are not suitable for the production of pasture and hay. The limitations of these soils make it economically unfeasible to try to establish and maintain pasture grasses on these soils. The major limitations are very low available water holding capacity, soil acidity, removal of topsoil by erosion and by man for road construction, steep slope, and stony or very gravelly surfaces in the Burlewash-Koether, Kurten, and Jedd soils. Long flooding duration and somewhat poor drainage are the major limitations of the Navasota soil.

These soils are best left undisturbed and managed under native vegetation. In the event that planting is needed for erosion control on these soils, adapted grass species include hybrid bermudagrass, bahiagrass, and common bermudagrass.

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 6. 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.

Crops other than those shown in Table 5 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Natural Resources Conservation Service or 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 forestland, or for engineering purposes.

In the capability system, soils are generally grouped at three levels—capability class, subclass, and unit (23).

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 slight limitations that restrict their use.

Class 2 soils have moderate limitations that restrict the choice of plants or that require moderate conservation practices (fig. 21).

Class 3 soils have severe limitations that restrict the choice of plants or that require special conservation practices, or both.

Class 4 soils have very severe limitations that restrict the choice of plants or that require very careful management, or both.

Class 5 soils are subject to little or no erosion but have other limitations, impractical to remove, that restrict their use mainly to Pasture and rangeland, forestland, or wildlife habitat.

Class 6 soils have severe limitations that make them generally unsuitable for cultivation and that restrict their use mainly to Pasture and rangeland, forestland, or wildlife habitat.

Class 7 soils have very severe limitations that make them unsuitable for cultivation and that restrict their use mainly to grazing, forestland, or wildlife habitat.

Class 8 soils and miscellaneous areas have limitations that preclude commercial plant production and that restrict their use to recreational purposes, wildlife habitat, watershed, or esthetic purposes.

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 and rangeland, forestland, wildlife habitat, or recreation.

Capability units are soil groups within a subclass. The soils in a capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, 2e-4 and 3e-6. These units are not given in all soil surveys.

Figure 21.—Pastureland on Gasil loamy fine sand, 1 to 3 percent slopes. Gasil soils are in Capability Class 2e.

Rangeland

Homer Sanchez, Range Management Specialist, Natural Resource Conservation Service, Temple, Texas prepared this section.

Rangeland is land on which the native vegetation (the climax plant community) is predominantly grasses, grasslike plants, forbs, shrubs, and trees. Rangeland receives no regular or frequent cultural treatment. The composition and production of the natural plant community is determined mainly by soil, climate, and topography. The management needed to conserve soil and water resources and improve production includes balancing livestock numbers with forage production and rotating livestock to allow desirable plants to improve vigor, produce seed, and establish seedlings.

Ecological Sites

An ecological site for rangeland is a distinctive kind of land with specific physical characteristics that makes it different from other kinds of land in its ability to produce a distinctive kind and amount of vegetation (a characteristic plant community). Rangeland ecological sites generally can be determined directly from the soil map. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the productivity of plants. Soil reaction, salt content, and a seasonal high water table are also important. The electronic "Field Office Technical Guide, (eFOTG)" which is available online at http://www.nrcs.usda.gov/technical/efotg, can provide specific information about ecological sites.

Over historical time, the combination of plants best suited to a particular soil and climate became dominant. If the soil is not excessively disturbed, this group of plants is the historic climax plant community for the site. Historic climax plant communities are not static but vary slightly from year to year and place to place.

Nearly all plant communities have undergone changes over time. Many years of continuous livestock grazing, the absence of fire, the invasion of plants that were not originally in the plant community, and climatic events, such as major droughts, have all interacted to affect changes in the vegetation on rangeland.

Abnormal disturbances that change the historic climax plant community include repeated overuse by livestock, excessive burning, erosion, and plowing. Grazing animals select the most palatable plants. These plants will eventually die if they are continually grazed at a severity that does not allow for recovery. Under these conditions, less desirable plants, such as annuals and weed-like plants, can increase. Usually, these degradation processes (also called retrogression) take place over many years. If the plant community and soils have not been degraded significantly and proper grazing management is implemented, native plants can return.

The Natural Resources Conservation Service and other agencies assist landowners in identifying problems and concerns, as well as opportunities to maintain or improve their rangeland resources. A rangeland ecological site may be evaluated by three distinct methods: similarity index, rangeland trend, and rangeland health.

A similarity index is a comparison of the present plant community to the historic climax plant community. A similarity index is the percentage, by weight, of historic climax vegetation that is found in the present plant community. This index provides an indication of past disturbance as well as potential for improvement. Further information about range similarity index is available in the "National Range and Pasture Handbook" (http://www.glti.nrcs.usda.gov/technical/publications/nrph.html).

Rangeland trend determinations assess the direction of change occurring in the present plant community compared to the historic climax plant community. The plant community may be either moving toward or away from the historic climax plant community. This rating provides information to landowners regarding the direction of change in plant community in response to present management.

Rangeland health is a determination of how the ecological processes on a rangeland ecological site are functioning. Ecological processes evaluated soil and site stability, hydrologic function, and biotic integrity.

How rangeland is managed affects forage production, species composition, plant health, and the ability of the vegetation to protect the soil. Rangeland management requires knowledge of the kinds of soil and of the historic climax plant community. Effective range management conserves rainfall, enhances water quality, reduces the hazard of downstream flooding, improves yields, provides forage for livestock and wildlife, enhances recreational opportunities, and protects the soil.

Following years of prolonged overuse of range, seed sources of desirable vegetation will be eliminated. In such instances, vegetation can be reestablished by applying one or a combination of the following practices: mechanical or chemical treatment, range planting, fencing, water development, prescribed burning, or other treatments to revitalize stands of native plants. Thereafter, deferred grazing, proper grazing use, and planned grazing systems must be applied to maintain and improve the range. The implementation of physical practices must be followed by grazing management and follow-up brush control for maintenance purposes. The combination of alternatives, or Resource Management Systems (RMS), is essential if rangeland productivity is to be maintained. Following are some of the more commonly used resource management practices.

The rangeland in Lee County is located within two Major Land Resource Areas (MLRA's). They are the Southern Claypan and the Southern Blackland Prairie. The Southern Claypan MLRA covers about 80 percent of Lee County. The Southern Blackland Prairie makes up the remaining 20 percent and covers an area several miles wide that runs parallel to the southern county boundary. Claypan soils typically have clayey subsoils overlain by sandy or loamy surface layers. Blackland soils are darker colored and generally are clayey throughout

Southern Blackland Prairie MLRA

This part of Lee County has predominantly clayey soils that have the potential to support tall grasses and a climax plant community, or potential natural plant community that is dominantly a tall grass prairie. Historically, these areas characteristically maintained a mixture of tall grasses, such as big bluestem, little bluestem, switchgrass, indiangrass, Virginia wildrye, and some Eastern gamagrass. Mid grasses are such species as sideoats grama, tall dropseed, and Texas wintergrass. Interspersed areas of trees are frequently along major drainageways and occasionally in motts.

The Southern Blackland Prairie rangeland is divided into 4 ecological sites that include Blackland, Clay Loam, Claypan Prairie, and Loamy Bottomland.

Blackland Ecological Site (PE 44-64) The Luling soils are in the Blackland ecological site, which occur only within the Southern Blackland Prairie MLRA. The climax vegetation is a tall grass prairie where a few large live oaks, elm, and hackberry trees are along drainageways and in 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. Other grasses, such as switchgrass, sideoats grama, Texas wintergrass, Texas cupgrass, tall dropseed, Florida paspalum, and Virginia wildrye make up the other 10 percent. Woody plants are live oak, elm, hackberry, bumelia, and coralberry. Many palatable forbs and legumes are native to the site.

Overgrazing by cattle eventually kills out tall grasses, such as big bluestem, indiangrass, switchgrass, and eastern gamagrass. They are replaced by silver bluestem, Texas wintergrass, tall dropseed, and other mid grasses. With continued grazing pressure, buffalograss, Texas grama, tumblegrass, annual weeds, and annual grasses dominate the site and noxious brush plants, such as mesquite, winged elm, retama, baccharis, and huisache, will invade.

Clay Loam Ecological Site (PE 44-64). The Benchley soils make up this site, which is only within the Southern Blackland Prairie MLRA. In pristine condition, this is a highly productive, true tall grass prairie site. The composition by weight is 90 percent grasses, 5 percent woody plants, and 5 percent forbs. Little bluestem dominates the site, constituting 40 to 50 percent of the total annual yield. Indiangrass, big bluestem, switchgrass, Virginia wildrye and Canada wildrye, and Florida paspalum make up about 30 percent. Sideoats grama, silver bluestem, low panicums, and Texas wintergrass make up about 15 percent. Short grasses make up about 5 percent. Woody plants include hackberry, elm, pecan, and oak. The primary forbs are Maximilian sunflower, Engelmann daisy, penstemon, bundleflower, and numerous other legumes.

As retrogression occurs due to overgrazing, tall grasses, such as bluestem, indiangrass, switchgrass, and Florida paspalum decrease and are replaced by sideoats grama, silver bluestem, low panicums, Texas wintergrass, and tall dropseed. In a deteriorated condition, total production potential is reduced by invader plants, such as threeawns, hairy grama, red lovegrass, Texas grama, buffalograss, tumblegrass, western ragweed, broomweed, prairie coneflower, and dominant woody plants, such as mesquite, baccharis, yaupon, and hawthorn.

Claypan Prairie Ecological Site (PE 44-64). The Boonville, Crockett, Davilla, Mabank, Normangee, Wilson, and Zulch soils are in the Claypan Prairie ecological site, which is within the Southern Blackland Prairie MLRA and the Southern Claypan MLRA. In climax condition, this is a true tall grass prairie site or very open savannah. Oak, elm, and hackberry trees are along drainageways or in motts. The composition weight is 85 percent grasses, 10 percent forbs, and 5 percent woody plants.

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, and vine mesquite make up about 15 percent. Purpletop, brownseed paspalum, longspike tridens, buffalograss, low panicums, fall switchgrass, and sedges make up 5 percent. Live oak, elm, hackberry, bumelia, coralberry, and an occasional 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.

Continued overgrazing by cattle decreases big bluestem, little bluestem, indiangrass, and switchgrass. Meadow dropseed, silver bluestem, sideoats grama, and Texas wintergrass increase. Finally, mesquite and pricklypear invade and buffalograss, Texas wintergrass, Texas grama, windmillgrass, and weedy forbs dominate the site.

Loamy Bottomland Ecological Site (PE 44-64). The Whitesboro soils are in this site, which is within the Southern Claypan MLRA and Southern Blackland MLRA. The climax plant community is a tall grass savannah where trees shade 30 to 40 percent of the ground. Overstory consists of oaks, pecan, hackberry, elm, cottonwood, and hickory or ash trees. Understory plants are hawthorns, greenbriar, honeysuckle, grapes, and peppervines. Cool-season grasses and sedges dominate the shaded areas, and warm-season grasses dominate the openings. The composition by weight is 75 percent grasses, 20 percent woody plants, and 5 percent forbs.

Virginia wildrye, sedges, and rustyseed paspalum grow in the shaded and wet areas and make up 25 percent of the composition. Switchgrass, beaked panicum, indiangrass, big bluestem, little bluestem, eastern gamagrass, vine mesquite, and purpletop grow in the open areas and make up 35 percent of the plant community. Redtop panicum, gaping panicum, low panicums, uniola, buffalograss, knotroot bristlegrass, Texas wintergrass, and other grasses make up 10 percent. The forbs are tickclover, lespedeza, snoutbean, partridge pea, and gayfeather.

This is a site preferred by livestock. Overgrazing and fire suppression reduce 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.

Southern Claypan MLRA

Loamy and sandy soils are typical of this part of Lee County. The majority of the Southern Claypan MLRA is in rangeland and in improved pastureland. There are significant areas in cultivation or in woodland. The climax plant community generally is a post oak and blackjack oak savannah. In climax, trees shade as much as 15 to 20 percent of the ground on uplands. Such large trees as oaks, American elm, and hackberry form a dense overstory along major drainageways. Mid to tall grasses dominate the understory. As retrogression or deterioration occurs, woody plants invade and tall grasses are replaced by mid to short grasses and forbs, which are less productive and less nutritious to livestock.

Nine different ecological sites are within the Southern Claypan MLRA. They are Clayey Bottomland, Claypan Savannah, Deep Redland, Deep Sand, Loamy Bottomland, Sandstone Hill, Sandy, Sandy Loam, and Very Deep Sand.

Clayey Bottomland Ecological Site (PE 44-64). The Navasota and Zilaboy soils are in this site, which is only within the Southern Blackland Prairie MLRA. The climax plant community is a tall grass savannah. Oak, elm, hackberry, cottonwood, ash, black willow, some pecan, and other large trees make up about 30 percent canopy cover. The canopy generally is heavier along streams or drainageways. Cool-season grasses and sedges grow under the canopy, and warm-season grasses and forbs dominate the open areas. The composition weight is 70 percent grasses, 25 percent woody plants, and 5 percent forbs.

Sedges, Virginia wildrye, Canada wildrye, and rustyseed paspalum produce 15 percent of the composition by weight. Beaked panicum, switchgrass, indiangrass, vine mesquite, Florida paspalum, and others produce 55 percent. Buffalograss, longleaf uniola, knotroot bristlegrass, and other grasses produce about 5 percent. The forbs are tickclover, snoutbean, lespedeza, and gayfeather.

This is a site preferred by livestock. Heavy grazing and fire suppression reduce the warm-season grasses and forbs and allow the brush to form a dense canopy. Shade-tolerant grasses then dominate the understory, drastically reducing the total usable forage. Bermudagrass and buffalograss often invade closely grazed open areas.

Claypan Savannah Ecological Site (PE 48-68). The Burlewash, Edge, Gredge, Lufkin, Koether, Kurten, Singleton, Winedale, and Zack soils are in this, which is only within the Southern Claypan MLRA. The climax plant community is a post oak, blackjack oak savannah where trees shade 15 to 20 percent of the ground. The composition by weight is about 80 percent grasses, 15 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, sensitive brier, 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 Redland Ecological Site PE 48-68. The Lexton and Margie soils make up this site, which in pristine condition, is an oak savannah. Post oak and blackjack oak shade about 20 percent of the ground. The climax plant community consists of about 80 percent grasses, 15 percent woody plants, and 5 percent forbs.

Little bluestem dominates the understory and can account for as much as 40 to 50 percent of the total annual production. Indiangrass and beaked panicum are subdominants, producing about 20 percent. In lesser amounts are big bluestem, Florida paspalum, purpletop, and longleaf uniola.

As retrogression occurs, woody plants often increase along with shade-tolerant grasses such as sedges and uniolas. Invaders to this site are broomsedge bluestem, red lovegrass, arrowfeather threeawn, frogfruit, bitter sneezeweed, broomweed, winged elm, sesbania baccharis, and persimmon. Grazeable forage declines considerably and shrub and woody production increase. All or part of this growth can be unpalatable or out of reach of grazing animals.

Deep Sand Ecological Site PE 48-68. The Faula and Padina soils are in this site, which is only within the Southern Claypan MLRA. The climax vegetation is a post oak and blackjack oak savannah where the canopy is 20 to 25 percent. The understory consists of mid to tall grasses. The composition by weight is 80 percent grasses, 15 percent woody plants, and 5 percent forbs.

Little bluestem makes up about 50 percent of the composition, and indiangrass makes up about 10 percent. Also present in lesser amounts are purpletop, switchgrass, and sand lovegrass. Other grasses are low panicums, purple lovegrass, sand dropseed, brownseed paspalum, and splitbeard bluestem. Woody plants, such as blackjack oak and post oak, make up 10 percent of the composition. Other woody plants include shrubs, such as yaupon, hawthorn, and American beautyberry, which make up the understory. Forbs include legumes, such as lespedeza, tickclover, 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 queen’s delight. Forage plants are virtually eliminated.

Loamy Bottomland Ecological Site PE 48-68. The Sandow, Uhland, and Whitesboro soils are in this site, which is within both the Southern Claypan MLRA and the Southern Blackland MLRA. The climax plant community is a tall grass savannah where trees shade 30 to 40 percent of the ground. Overstory consists of oaks, pecan, hackberry, elm, cottonwood, and hickory or ash trees. Understory plants are hawthorn, greenbriar, honeysuckle, grapes, and peppervine. Cool-season grasses and sedges dominate the shaded areas, and warm-season grasses dominate the openings. The composition by weight is 75 percent grasses, 20 percent woody plants, and 5 percent forbs.

Virginia wildrye, sedges, and rustyseed paspalum grow in the shaded and wet areas and make up 25 percent of the composition. Switchgrass, beaked panicum, indiangrass, big bluestem, little bluestem, eastern gamagrass, vine mesquite, and purpletop grow in the open areas and make up 35 percent of the plant community. Redtop panicum, gaping panicum, low panicums, uniola, buffalograss, knotroot bristlegrass, Texas wintergrass, and other grasses make up 10 percent. The forbs are tickclover, lespedeza, snoutbean, partridge pea, and gayfeather.

This is a site preferred by livestock. Overgrazing and fire suppression reduce 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.

Sandstone Hill Ecological Site PE 48-68. The Jedd soils are in this site, which is only within the Southern Claypan MLRA. The climax plant community is made up of moderate-sized post oak, live oak, blackjack oak, and hickory tree savannah along with an open stand of mid to tall grasses. The composition by weight is 70 percent grasses, 10 percent forbs, and 20 percent woody plants.

Open areas are dominated by grasses, such as little bluestem, sideoats grama, tanglehead, and silver bluestem. Forbs, legumes, woody vines, and shrubs add variety to the climax plant community.

As retrogression occurs, the surface compacts, causing sheet erosion with the increase of bare ground. The tall grasses decrease and are replaced by less palatable and robust plants, such as annual threeawn, red lovegrass, and gummy lovegrass. Understory brush, such as American beautyberry and yaupon, can invade the more wooded areas. The landscape can be beautifully decorated with flowering plants like bluebonnets, Indian paintbrush, Liatris, and primrose. Unique to the site is the abundance of irregularly shaped rocks on the surface.

Sandy Ecological Site PE 48-68. The Dutek, Rehburg, Robco (fig. 22), Silawa, and Silstid soils are in this site, which is only within the Southern Claypan MLRA. The climax vegetation is an open savannah of post oak and blackjack oak, which shade 20 to 25 percent of the ground. Tall grasses are predominantly in the inner spaces. The composition by weight is 80 percent grasses, 15 percent woody plants, and 5 percent forbs.

About 50 percent of the composition is little bluestem, with indiangrass making 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 10 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, sensitive brier, snoutbean, Tephrosia, partridge pea, and western ragweed.

With continuous overgrazing and the lack of natural fires, the taller grasses are grazed out or shaded out, or both, by an increasing canopy of woody plants. Little bluestem, indiangrass, and switchgrass are replaced by brownseed paspalum, tall dropseed, fall witchgrass, and other increaser plants. They, in turn, are grazed out and replaced by red lovegrass, yankeeweed, bullnettle, snakecotton, and croton. Other invading plants are broomsedge bluestem, smutgrass, sandbur, pricklypear, queen’s delight, beebalm, pricklypoppy, baccharis, and waxmyrtle. Woody plants increase and invade to form dense thickets.

Sandy Loam Ecological Site PE 48-68. The Chazos, Gasil, Rader, Rosanky, Silawa, Spiller, and Tabor soils are in this site. The climax plant community is a post oak and blackjack oak savannah that has a 20 to 25 percent canopy. The understory consists of mid and tall grasses and is dominated by little bluestem, which makes up 50 percent of the composition. The total composition by weight is 80 percent grasses, 15 percent woody plants, and 5 percent forbs.

Little bluestem, the dominant grass, and indiangrass make up about 10 percent of the total composition. Eastern gamagrass, switchgrass, big bluestem, beaked panicum, and longleaf uniola make up 10 percent, and numerous other grasses collectively make up about 10 percent. Post oak and blackjack oak make up about 10 percent of the total annual production. Numerous other woody plants include elm, yaupon, greenbriar, American beautyberry, and berry vines. The forbs include Engelmann daisy, gayfeather, sensitive briar, and native legumes.

Figure 22.—Little bluestem in the foreground with mixed trees on an area of Robco loamy fine sand, 1 to 3 percent slopes. Robco soils are in the Sandy ecological site.

In a situation where wildfires are few and overgrazing is continual, this ecological site deteriorates and exhibits 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.

Very Deep Sand Ecological Site PE 48-68. The Arenosa soil is in this site (fig. 8). The climax plant community is a savannah. Bluejack oak, blackjack oak, and hickory produce as much as a 30 percent canopy. Scattered yaupon and other shrubs make up the secondary canopy. The composition by weight is 75 percent grasses, 20 percent woody plants, and 5 percent forbs.

In open areas, the grass composition consists of about 35 percent little bluestem and pinehill bluestem. Mid and short grasses, such as red lovegrass, purple lovegrass, sand lovegrass, dropseed, and threeawn occupy the spaces between tall grasses, such as bluestem and indiangrass. Under tree canopies, the dominant grasses are slender indiangrass, purpletop tridens, and longleaf uniola.

Grazing pressure causes a decrease in the tall grass vegetation and an increase in mid and short grass plants. Low panicums, low paspalums, and woolysheath threeawn continue to flourish as overgrazing occurs. As a final result of continuous overuse, the areas beneath tree canopies deteriorate to bare ground or a sparse cover of small forbs and invader grasses, such as red sprangletop, sandbur, purple sandgrass, and curly threeawn. Shrub vegetation can produce as much as a 60 percent canopy.

Rangeland Productivity

Table 7 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 table 7 follows.

An *ecological 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. The electronic "Field Office Technical Guide, (eFOTG)" which is available online at http://www.nrcs.usda.gov/technical/efotg, can provide specific information about ecological sites.

Total dry-weight 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.

The objective in range management is to control grazing so that the plants growing on a site remain or improve to about the same in kind and amount as the climax plant community for that site. Such management generally results in the optimum production of vegetation, reduction of undesirable brush species, conservation of water, and control of erosion. Sometimes, however, a range condition somewhat below the potential meets grazing needs, provides wildlife habitat, and protects soil and water resources.

Good production of livestock and forage on rangeland is obtained primarily by managing the time of grazing and limiting the amount of forage removed. The green parts of plants manufacture food for growth and store part of it for use in regrowth and seed production.

A typical growth curve for dominantly little bluestem and native perennial grasses in the Southern Claypan Area (MLRA 87A) and in the Southern Blackland Prairie (MLRA 86B) would be:

Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	2	3	7	20	30	15	5	10	4	2	0

Approximately 72 percent of the annual forage production occurs in the months April to July responding to spring and early summer rains. A second smaller growth period may occur in the fall if sufficient moisture is available.

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.

Recreation

John C. Copeland, Area Resource Conservationist, Natural Resources Conservation Service, helped prepare this section.

Lee County, with its location, climate, topography, highways, and natural resources, has a high potential for numerous outdoor recreational activities. The county is a little more than a 1-hour drive from Austin and a 2-hour drive from Houston. Pleasant daytime temperatures and cool nights contribute to summer activity. The mean temperature and rainfall of the county are favorable when compared to the two major metropolitan areas. Pleasant temperatures and little snowfall are typical characteristics of the winter. Several cold fronts that are severe enough to restrict outside recreational activity for a few days move through the region in the winter. Rolling terrain and variety of vegetative patterns contribute to the visual quality.

Lake Somerville, an 11,460-acre reservoir, bounds the county on the northeast corner and provides multiple recreational opportunities including fishing, boating, swimming, camping, hiking, biking, and nature study. Nails Creek Park of the Lake Somerville State Recreation Area is in Lee County. Private recreational areas are also available near the lake.

Several private lakes in the county provide recreational opportunities as well as the Middle Yegua Creek.

The soils of the survey area are rated in table 8 and table 9 according to limitations that affect their suitability for recreation. The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect the recreational uses. Not limited indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. Somewhat limited indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. Very limited indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the tables indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

The ratings in the tables 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.

The information in table 8 and table 9 can be supplemented by other information in this survey, for example, interpretations for building site development, construction materials, sanitary facilities, and water management.

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 ratings are based on the soil properties that affect the ease of developing camp areas and the performance of the areas after development. Slope, stoniness, and depth to bedrock or a cemented pan are the main concerns affecting the development of camp areas. The soil properties that affect the performance of the areas after development are those that influence trafficability and promote the growth of vegetation, especially in heavily used areas. For good trafficability, the surface of camp areas should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry. The soil properties that influence trafficability are texture of the surface layer, depth to a water table, ponding, flooding, permeability, and large stones. The soil properties that affect the growth of plants are depth to bedrock or a cemented pan, permeability, and toxic substances in the soil.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The ratings are based on the soil properties that affect the ease of developing picnic areas and that influence trafficability and the growth of vegetation after development. Slope and stoniness are the main concerns affecting the development of picnic areas. For good trafficability, the surface of picnic areas should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry. The soil properties that influence trafficability are texture of the surface layer, depth to a water table, ponding, flooding, permeability, and large stones. The soil properties that affect the growth of plants are depth to bedrock or a cemented pan, permeability, and toxic substances in the soil.

Playgrounds require soils that are nearly level, are free of stones, and can withstand intensive foot traffic. The ratings are based on the soil properties that affect the ease of developing playgrounds and that influence trafficability and the growth of vegetation after development. Slope and stoniness are the main concerns affecting the development of playgrounds. For good trafficability, the surface of the playgrounds should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry. The soil properties that influence trafficability are texture of the surface layer, depth to a water table, ponding, flooding, permeability, and large stones. The soil properties that affect the growth of plants are depth to bedrock or a cemented pan, permeability, and toxic substances in the soil.

Paths and trails for hiking and horseback riding should require little or no slope modification through cutting and filling. The ratings are based on the soil properties that affect trafficability and erodibility. These properties are stoniness, depth to a water table, ponding, flooding, slope, and texture of the surface layer.

Off-road motorcycle trails require little or no site preparation. They are not covered with surfacing material or vegetation. Considerable compaction of the soil material is likely. The ratings are based on the soil properties that influence erodibility, trafficability, dustiness, and the ease of revegetation. These properties are stoniness, slope, depth to a seasonal high water table, ponding, flooding, and texture of the surface layer.

Golf course fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. Irrigation is not considered in the ratings. The ratings are based on the soil properties that affect plant growth and trafficability after vegetation is established. The properties that affect plant growth are reaction; depth to a water table; ponding; depth to bedrock or a cemented pan; the available water capacity in the upper 40 inches; the content of salts, sodium, or calcium carbonate; and sulfidic materials. The properties that affect trafficability are flooding, depth to a water table, ponding, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer. The suitability of the soil for traps, tees, roughs, and greens is not considered in the ratings.

Wildlife Habitat

Mike Stellbauer, Area Biologist, Natural Resources Conservation Service, helped to prepare this section.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. The kind and abundance of wildlife depend largely on the amount and distribution of quality food, cover, and water. Wildlife habitat can be created, maintained, or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the establishment of desirable plants through various management techniques such as prescribed burning and prescribed grazing.

Six major kinds of habitat occur in Lee County and include: prairie habitat, post oak woods/grassland mosaic habitat, post oak woods habitat, cropland habitat, bottomland hardwoods habitat, and aquatic habitat.

The prairie habitat occurs on clayey upland soils such as Benchley, Crockett, and Luling. The historic landscape was a prairie of little bluestem, big bluestem, silver bluestem, indiangrass, Texas winter grass, Maximillian sunflower, Illinois bundleflower, black sampson, gayfeather, and snow on the prairie with scattered live oaks, hackberry, and elms in motts and along drainageways. Scattered remnants of this prairie still exists but most has been converted to cropland or pasture or has been invaded by mesquite. Introduced grasses including bermudagrass, bahiagrass, kleingrass, or non-native bluestems occur on converted pastureland. Reclamation of these introduced grass pastures by range seeding, prescribed burning, and prescribed grazing can greatly improve food and cover for grassland birds including bobwhite quail and turkey.

The post oak woods/grassland mosaic habitat and the post oak woods habitat generally are on upland soils, such as Arenosa, Burlewash, Padina, Tabor, Silstid, Singleton, Zack, and Zulch. Post oak, blackjack oak, black hickory, winged elm, Eastern red cedar, yaupon, greenbriar, rattan, American beautyberry, sparkleberry, and coralberry comprise the woodland component. The grassland component can include native plants, such as little bluestem, yellow indiangrass, arrowfeather threeawn, lespedeza, western ragweed, croton, and tickclover; introduced species, such as bermudagrass and bahiagrass; or a combination of both. White tail deer, fox squirrel, raccoon, opossum, coyotes, bobcat, bobwhite quail, turkey (fig. 23), mourning dove, owls, hawks, woodpeckers, and songbirds may use these habitats.

The quality of the habitat in woodland is influenced by the density of the canopy in the overstory and midstory and by livestock grazing management practices. As canopy cover increases, the diversity and quantity of understory plants decrease. Continuous livestock grazing, especially during the winter, decreases the quality and quantity of understory plants, such as greenbriar, rattan, and yaupon. Selective thinning, creating openings, planting supplemental food plots, prescribed burning, and prescribed grazing are practices that can improve the quality of this habitat.

The quality of the habitat in grassland is related to the structure and diversity of the grassland. When a mixture of native grasses, legumes, forbs, vines, and shrubs is in this habitat, it provides fawning cover and forage for white tail deer and nesting, feeding, and loafing cover for bobwhite quail and turkey. Introduced grasses, such as bermudagrass or bahiagrass tend to limit the plant diversity and structure needed for deer, quail, turkey, and mourning dove. Introduced bunchgrasses, such as kleingrass or switchgrass, tend to provide better structure and plant diversity. Practices that can influence the structure and diversity of grassland include annual disking, over-seeding annual grasses and legumes, reseeding native grasses and forbs, selective control of shrubs and trees, creating supplemental food plots, prescribed burning, and prescribed grazing.

Figure 23.—Rio Grande turkeys in an area of the Southern Claypan MLRA.

The Houston Toad, a federally listed endangered animal, has been found in the post oak woods/grassland mosaic habitat of Lee County and is associated with deep sandy soils, such as Padina and Arenosa.

Wildlife habitat associated with cropland generally corresponds to areas adjacent to Texas Highway 21 that traverses the county. The cropland soils generally used for cropland are Benchley, Crockett, Davilla, Luling, and Wilson. Other small areas that are used for cropland throughout the county include Chazos, Gasil, Silawa and Tabor. Waste grains and seed from corn, grain sorghum, peanuts and small grains, along with associated forbs such as croton, ragweed, and partridge pea, provide food for dove, quail, turkey, songbirds, and waterfowl. White tail deer and rabbits also find food and cover in the habitats associated with cropland. Annual cool-season forage crops, such as wheat, oats, and ryegrass provide food for deer, turkey, and rabbits.

Several improvement practices are applicable to cropland habitats. They include retaining crop residues on the soil surface through the winter months, maintaining forbs, grasses, and shrubs in fence lines and along turnrows, providing unharvested rows of grain crops through the winter months, establishing cover crops of small grains or legumes, and constructing shallow water impoundments.

The bottomland hardwood habitat occurs on the flood plains and associated terraces of the drainageways. Navasota, Whitesboro, Sandow, Uhland, and Zilaboy soils are characteristic of flood plain soils. Associated plants include pecan, cedar elm, water and willow oaks, water hickory, cottonwood, ash, hackberry, black willow, yaupon, wax myrtle, baccharis, Alabama supplejack, greenbriar, and pepper vine. Representative terrace soils include Chazos and Silawa soils. Plants associated with the terrace soils include post oak, ash, water oak, sycamore, hackberry, yaupon, and American beautyberry.

These flood plains and terraces are some of the most productive wildlife lands in the county and provide habitat to migratory and resident waterfowl, white tail deer, turkey, feral hogs, beaver, raccoon, bobcat, gray and fox squirrels, woodpeckers, and songbirds. Water snakes, frogs, toads, turtles, and salamanders are also on the flood plains and terraces.

Improvement practices applicable to this habitat include selectively thinning hardwoods, reforesting hardwoods where needed, properly managing livestock grazing, creating food plots, and installing structures to create shallow water areas for waterfowl.

Lakes and creeks, along with the many farm ponds in the county, provide aquatic habitat for largemouth bass, channel, blue, and flathead catfish, crappie, and bluegill sunfish. Beaver, raccoon, blue and green herons, common and cattle egrets, wood ducks, mallards, scaup, gadwall, and red head ducks also use these aquatic habitats. Farm ponds also provide aquatic habitat for upland wildlife. Soils suitable for farm pond construction include Benchley, Crockett, Luling, Tabor, Zack, and Zulch soils. These ponds are usually stocked with largemouth bass, channel catfish, fathead minnows, and bluegill sunfish.

Farm ponds in Lee County may require the application of agricultural limestone to ensure good productivity. Other practices useful in maintaining or improving quality pond habitat include aquatic weed control, fertilization, proper fish stocking and harvest, the installation of siphon or trickle tubes, and proper grazing use and livestock management in the pond watershed.

Table 11, table 12, table 13, and table 14 shows the degree and kind of soil limitations that affect various kinds of habitat for wildlife. The tables show limitations of the soils for grain and seed crops for food and cover; domestic grasses and legumes for food and cover; irrigated grain and seed crops for food and cover; irrigated domestic grasses and legumes for food and cover; desertic herbaceous plants; habitat for burrowing mammals and reptiles; upland wild herbaceous plants; upland desertic shrubs and trees; upland shrubs and vines; upland deciduous trees; upland coniferous trees; upland mixed deciduous-coniferous trees; riparian herbaceous plants; riparian shrubs, vines, and trees; and freshwater wetland plants; This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting areas for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect the element or kind of habitat. *Not limited indicates* that the soil has features that are very favorable for the element or kind of habitat. Good performance and very low maintenance can be expected. *Slightly limited* indicates that the soil has features that are favorable for the specified use. The limitations are minor and can be easily overcome. Good performance and low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Creating, improving, or maintaining habitat is impractical or impossible..

Numerical ratings in the tables indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

Ratings for *grain and seed crops for food and cover* can be used in the selection of sites that have the soil properties and plant species necessary to sustain wildlife habitat. The ratings do not reflect the limitation for commercial agronomic production. The soil properties and features that affect the growth of grain and seed crops are soil texture, content of organic matter, the amount of rock fragments on or near the soil surface, available water capacity, depth to bedrock or a cemented pan, soil moisture and temperature regimes, depth to a high water table, ponding, flooding, permeability of the soil surface, slope, presence of excess salts in the soil, and susceptibility of the soil surface to water erosion and wind erosion. Examples of grain and seed crops are corn, grain sorghum, wheat, oats, sunflowers, and soybeans.

Ratings for *domestic grasses and legumes for food and cover* can be used in the selection of sites that have the soil properties and plant species necessary to sustain wildlife habitat. The ratings do not reflect the limitations for commercial agronomic production. The soil properties and features that affect the growth of grasses and legumes are soil texture, content of organic matter, the amount of rock fragments on or near the soil surface, available water capacity, depth to bedrock or a cemented pan, soil moisture and temperature regimes, depth to a high water table, ponding, flooding, permeability of the soil surface, slope, presence of excess salts in the soil, and susceptibility of the soil surface to water erosion and wind erosion. Examples of grasses and legumes are kleingrass, lovegrass, yellow bluestem, eastern gamagrass, and switchgrass; examples of legumes are clover, vetch, and cowpeas.

Ratings for *irrigated grain and seed crops for food and cover* can be used in the selection of sites that have the soil properties and plant species necessary to sustain wildlife habitat. The ratings do not reflect the limitations for commercial agronomic production. The soil properties and features that affect the growth of grain and seed crops are soil texture, content of organic matter, the amount of rock fragments on or near the soil surface, available water capacity, depth to bedrock or a cemented pan, depth to a high water table, ponding, flooding, permeability of the soil surface, slope, presence of excess salts in the soil, and susceptibility of the soil surface to water erosion and wind erosion. Examples of grain and seed crops are corn, grain sorghum, wheat, oats, and soybeans.

Ratings for *irrigated domestic grasses and legumes for food and cover* can be used in the selection of sites that have the soil properties and plant species necessary to sustain wildlife habitat. The ratings do not reflect the limitations for commercial agronomic production. The soil properties and features that affect the growth of grasses and legumes are soil texture, content of organic matter, the amount of rock fragments on or near the soil surface, available water capacity, depth to bedrock or a cemented pan, depth to a high water table, ponding, flooding, permeability of the soil surface, slope, presence of excess salts in the soil, and susceptibility of the soil surface to water erosion and wind erosion. Examples of grasses are kleingrass, yellow bluestem, eastern gamagrass, and switchgrass; examples of legumes are clover, vetch, and soybeans.

Ratings for *habitat for burrowing mammals and reptiles* indicate the limitation of the soil for maintaining or increasing local populations of specific burrowing animals. The soil properties and features that affect the preservation of these species are flooding, ponding, depth to bedrock or a cemented pan, depth to a high water table, sandy layers, clayey layers, a high content of organic matter, and high concentrations of rock fragments. Examples of burrowing mammals and reptiles are gophers, badgers, lizards, rattlesnakes, and bull snakes.

Ratings for *upland wild herbaceous plants* indicate the limitation of the soils as a growing medium for a diverse upland herbaceous plant community. This community is adapted to soils that are drier than the common soils in moist riparian and wetland zones but that are not as dry as the soils in upland desert areas. The soil properties and features that affect the ability of these species to thrive include soil texture, available water capacity, the presence of excess salts in the soil, soil moisture and temperature regimes, depth to a high water table, and rock fragments on the soil surface. Examples of upland wild herbaceous plants are little bluestem, indiangrass, brownseed paspalum, gayfeather, tickclover, and lespedeza.

Ratings for *upland shrubs and vines* indicate the limitation of the soils as a growing medium for a diverse upland shrub and vine community. This community is adapted to soils that are drier than those common in the moist riparian and wetland zones but that are not as dry as those in upland desert areas. The soil properties and features that affect the ability of these species to thrive include soil texture, content of organic matter, available water capacity, depth to bedrock or a cemented pan, the presence of excess salts in the soil, soil moisture and temperature regimes, depth to a high water table, and rock fragments on the soil surface. Examples of upland shrubs and vines are coral berry, grape, and greenbriar.

Ratings for *upland deciduous trees* indicate the limitation of the soils as a growing medium for a diverse upland deciduous tree community that meets specific local habitat requirements for targeted and nontargeted wildlife species. Typically, deciduous trees require better soil conditions than geographically related conifers. The soil properties and features that affect the ability of upland deciduous trees to thrive include available water capacity, depth to a high water table, depth to bedrock or a cemented pan, and soil moisture and temperature regimes. Examples of upland deciduous trees are live oak, bumelia, bois d'arc, hackberry, and cedar elm.

Ratings for *riparian herbaceous plants* indicate the limitation of the soils as a growing medium for herbaceous plants that are adapted to soil conditions that are wetter than those common in the drier upland areas. The soils suitable for this habitat generally are on flood plains, in depressions, on bottomland, in drainageways adjacent to streams, or in any other area where the soil is either saturated for some period during the year or is subject to periodic overflow from ponding or flooding. The soil properties and features that affect the ability of riparian herbaceous plants to persist include soil texture, content of organic matter, depth to a high water table, the frequency and duration of ponding and flooding, the presence of excess salts in the soil, rock fragments, and the soil temperature regime. Examples of riparian herbaceous plants are Virginia wildrye, eastern gamagrass, switchgrass, whitegrass, broadleaf woodoats, switch cane, ice plant, mist flower, and white clover.

Ratings for *riparian shrubs, vines, and trees* indicate the limitation of the soils as a growing medium for shrubs, vines, and trees that are adapted to soil conditions that are wetter than those common in the drier upland areas. The soils suitable for this habitat generally are on flood plains, in depressions, on bottomland, in drainageways adjacent to streams, in areas of springs and seeps, or in any other area where the soil is either saturated for some period during the year or is subject to periodic overflow from ponding or flooding. The soil properties and features that affect the ability of riparian shrubs, vines, and trees to persist include available water capacity, depth to a high water table, the frequency and duration of ponding and flooding, the presence of excess salts in the soil, and the soil temperature regime. Examples of riparian shrubs, vines, and trees are cottonwood, willow, green ash, hackberry, burr oak, cedar elm, hawthorne, poison ivy, trumpet creeper, greenbriar, and grape.

Ratings for *freshwater wetland plants* indicate the limitation of the soils as a growing medium for plants that are adapted to wet soil conditions. The soils suitable for this habitat generally are in marshes, in depressions, on bottomland, in backwater areas on flood plains, in drainageways adjacent to streams, in areas of springs and seeps, or in any other area where the soil is not directly affected by moving floodwater but may be ponded during some part of the year. The soil properties and features that affect the ability of freshwater wetland plants to persist include soil texture, content of organic matter, depth to a high water table, the frequency and duration of ponding, the presence of excess salts in the soil, and soil reaction (pH). Examples of freshwater wetland plants are smartweed, wild millet, cattails, cut grass, giant cane, rattle box, sesbania, rushes, sedges, and reeds.

Hydric Soils

In this section, hydric soils are defined and described.

The three essential characteristics of wetlands are hydrophytic vegetation, hydric soils, and wetland hydrology (4,12,18,19). Criteria for each of the characteristics must be met for areas to be identified as wetlands.

Hydric soils are defined by the National Technical Committee for Hydric Soils (NTCHS) as soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (6). These soils are either saturated or inundated long enough during the growing season to support the growth and reproduction of hydrophytic vegetation.

The NTCHS definition identifies general soil properties that are associated with wetness. In order to determine whether a specific soil is a hydric soil or nonhydric soil, however, more specific information, such as information about the depth and duration of the water table, is needed. Thus, criteria that identify those estimated soil properties unique to hydric soils have been established (6). The criteria are used to identify a phase of a soil series that normally is also a hydric soil. The criteria used are selected estimated soil properties that are described in "Soil Taxonomy" (16) and "Keys to Soil Taxonomy" (14,15), and in the "Soil Survey Manual" (13).

If soils are wet enough for a long enough period to be considered hydric, they generally exhibit certain properties that can be observed in the field. These visible properties are indicators of hydric soils. The indicators used to make onsite determinations of hydric soils in this survey area are specified in "Field Indicators of Hydric Soils in the United States" (10).

For information regarding hydric soils in the soil survey area, refer to the USDA Natural Resources Conservation Service Soil Data Mart at http://soildatamart.nrcs.usda.gov.

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 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 between the surface and a depth of 5 to 7 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 particle-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 7 feet of the surface, soil wetness, depth to a water table, ponding, 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

Soil properties influence the development of building sites, including the selection of the site, the design of the structure, construction, performance after construction, and maintenance. Table 15 and table 16 shows the degree and kind of soil limitations that affect dwellings with and without basements, small commercial buildings, local roads and streets, shallow excavations, and lawns and landscaping.

Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect building site development. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the tables indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

Dwellings are single-family houses of three stories or less. For dwellings without basements, the foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of 2 feet or at the depth of maximum frost penetration, whichever is deeper. For dwellings with basements, the foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of about 7 feet. The ratings for dwellings are based on the soil properties that affect the capacity of the soil to support a load without movement and on the properties that affect excavation and construction costs. The properties that affect the load-supporting capacity include depth to a water table, ponding, flooding, subsidence, linear extensibility (shrink-swell potential), and compressibility. Compressibility is inferred from the Unified classification. The properties that affect the ease and amount of excavation include depth to a water table, ponding, flooding, slope, depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, and the amount and size of rock fragments.

Small commercial buildings are structures that are less than three stories high and do not have basements. The foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of 2 feet or at the depth of maximum frost penetration, whichever is deeper. The ratings are based on the soil properties that affect the capacity of the soil to support a load without movement and on the properties that affect excavation and construction costs. The properties that affect the load-supporting capacity include depth to a water table, ponding, flooding, subsidence, linear extensibility (shrink-swell potential), and compressibility (which is inferred from the Unified classification). The properties that affect the ease and amount of excavation include flooding, depth to a water table, ponding, slope, depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, and the amount and size of rock fragments.

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 soil material stabilized by lime or cement; and a surface of flexible material (asphalt), rigid material (concrete), or gravel with a binder. The ratings are based on the soil properties that affect the ease of excavation and grading and the traffic-supporting capacity. The properties that affect the ease of excavation and grading are depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, depth to a water table, ponding, flooding, the amount of large stones, and slope. The properties that affect the traffic-supporting capacity are soil strength (as inferred from the AASHTO group index number), subsidence, linear extensibility (shrink-swell potential) (fig. 24), the potential for frost action, depth to a water table, and ponding.

Figure 24.—Cracking and separation of road surface on U.S. Highway 77 North, just north of Texas Highway 21 on the Cook Mountain geologic formation. Luling clay, 1 to 3 percent slopes, of the Cook Mountain formation has very high shrink-swell properties.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for graves, utility lines, open ditches, or other purposes. The ratings are based on the soil properties that influence the ease of digging and the resistance to sloughing. Depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, the amount of large stones, and dense layers influence the ease of digging, filling, and compacting. Depth to the seasonal high water table, flooding, and ponding may restrict the period when excavations can be made. Slope influences the ease of using machinery. Soil texture, depth to the water table, and linear extensibility (shrink-swell potential) influence the resistance to sloughing.

Lawns and landscaping require soils are on which turf and ornamental trees and shrubs can be established and maintained. Irrigation is not considered in the ratings. The ratings are based on the soil properties that affect plant growth and trafficability after vegetation is established. The properties that affect plant growth are reaction; depth to a water table; ponding; depth to bedrock or a cemented pan; the available water capacity in the upper 40 inches; the content of salts, sodium, or calcium carbonate; and sulfidic materials. The properties that affect trafficability are flooding, depth to a water table, ponding, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer.

Sanitary Facilities

Table 17 and Table 18 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, sanitary landfills, and daily cover for landfill. The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect these uses. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the tables indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

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 60 inches is evaluated. The ratings are based on the soil properties that affect absorption of the effluent, construction and maintenance of the system, and public health. Permeability, depth to a water table, ponding, depth to bedrock or a cemented pan, and flooding affect absorption of the effluent. Stones and boulders, ice, and bedrock or a cemented pan interfere with installation. Subsidence interferes with installation and maintenance. Excessive slope may cause lateral seepage and surfacing of the effluent in down slope areas.

Some soils are underlain by loose sand and gravel or fractured bedrock at a depth of less than 4 feet below the distribution lines. In these soils the absorption field may not adequately filter the effluent, particularly when the system is new. As a result, the ground water may become contaminated.

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. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water. Considered in the ratings are slope, permeability, depth to a water table, ponding, depth to bedrock or a cemented pan, flooding, large stones, and content of organic matter.

Soil permeability is a critical property affecting the suitability for sewage lagoons. Most porous soils eventually become sealed when they are used as sites for sewage lagoons. Until sealing occurs, however, the hazard of pollution is severe. Soils that have a permeability rate of more than 2 inches per hour are too porous for the proper functioning of sewage lagoons. In these soils, seepage of the effluent can result in contamination of the ground water. Ground-water contamination is also a hazard if fractured bedrock is within a depth of 40 inches, if the water table is high enough to raise the level of sewage in the lagoon, or if floodwater overtops the lagoon.

A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor. If the lagoon is to be uniformly deep throughout, the slope must be gentle enough and the soil material must be thick enough over bedrock or a cemented pan to make land smoothing practical.

A *trench sanitary landfill* is an area where solid waste is placed in successive layers in an excavated trench. The waste is spread, compacted, and covered daily with a thin layer of soil excavated at the site. When the trench is full, a final cover of soil material at least 2 feet thick is placed over the landfill. The ratings in the table are based on the soil properties that affect the risk of pollution, the ease of excavation, trafficability, and revegetation. These properties include permeability, depth to bedrock or a cemented pan, depth to a water table, ponding, slope, flooding, texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, onsite investigation may be needed.

Hard, nonrippable bedrock, creviced bedrock, or highly permeable strata in or directly below the proposed trench bottom can affect the ease of excavation and the hazard of ground-water pollution. Slope affects construction of the trenches and the movement of surface water around the landfill. It also affects the construction and performance of roads in areas of the landfill.

Soil texture and consistence affect the ease with which the trench is dug and the ease with which the soil can be used as daily or final cover. They determine the workability of the soil when dry and when wet. Soils that are plastic and sticky when wet are difficult to excavate, grade, or compact and are difficult to place as a uniformly thick cover over a layer of refuse.

The soil material used as the final cover for a trench landfill should be suitable for plants. It should not have excess sodium or salts and should not be too acid. The surface layer generally has the best workability, the highest content of organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

In an *area sanitary landfill*, solid 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. A final cover of soil material at least 2 feet thick is placed over the completed landfill. The ratings in the table are based on the soil properties that affect trafficability and the risk of pollution. These properties include flooding, permeability, depth to a water table, ponding, slope, and depth to bedrock or a cemented pan.

Flooding is a serious problem because it can result in pollution in areas downstream from the landfill. If permeability is too rapid or if fractured bedrock, a fractured cemented pan, or the water table is close to the surface, the leachate can contaminate the water supply. Slope is a consideration because of the extra grading required to maintain roads in the steeper areas of the landfill. Also, leachate may flow along the surface of the soils in the steeper areas and cause difficult seepage problems.

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. The ratings in the table also apply to the final cover for a landfill. They are based on the soil properties that affect workability, the ease of digging, and the ease of moving and spreading the material over the refuse daily during wet and dry periods. These properties include soil texture, depth to a water table, ponding, rock fragments, slope, depth to bedrock or a cemented pan, reaction, and content of salts, sodium, or lime.

Loamy or silty soils that are free of large stones and excess gravel are the best cover for a landfill. Clayey soils may be sticky and difficult to spread; sandy soils are subject to wind erosion.

Slope affects the ease of excavation and of moving the cover material. Also, it can influence runoff, erosion, and reclamation of the borrow area.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as the final cover for a landfill should be suitable for plants. It should not have excess sodium, salts, or lime and should not be too acid.

Construction Materials

Table 19 and Table 20 provides information about the soils as potential sources of gravel, sand, topsoil, reclamation material, and roadfill. Normal compaction, minor processing, and other standard construction practices are assumed.

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 19, only the likelihood 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 Unified classification of the soil), the thickness of suitable material, and the content of rock fragments. If the bottom layer of the soil contains sand or gravel, the soil is considered a likely source regardless of thickness. The assumption is that the sand or gravel layer below the depth of observation exceeds the minimum thickness.

The soils are rated *good, fair*, or *poor* as potential sources of sand and gravel. A rating of good or fair means that the source material is likely to be in or below the soil. The bottom layer and the thickest layer of the soils are assigned numerical ratings. These ratings indicate the likelihood that the layer is a source of sand or gravel. The number 0.00 indicates that the layer is a poor source. The number 1.00 indicates that the layer is a good source. A number between 0.00 and 1.00 indicates the degree to which the layer is a likely source.

The soils are rated *good, fair*, or *poor* as potential sources of topsoil, reclamation material, and roadfill. The features that limit the soils as sources of these materials are specified in the tables. The numerical ratings given after the specified features indicate the degree to which the features limit the soils as sources of topsoil, reclamation material, or roadfill. The lower the number, the greater the limitation.

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. The ratings are based on the soil properties that affect plant growth; the ease of excavating, loading, and spreading the material; and reclamation of the borrow area. Toxic substances, soil reaction, and the properties that are inferred from soil texture, such as available water capacity and fertility, affect plant growth. The ease of excavating, loading, and spreading is affected by rock fragments, slope, depth to a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, depth to a water table, rock fragments, depth to bedrock or a cemented pan, and toxic material.

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.

Reclamation material is used in areas that have been drastically disturbed by surface mining or similar activities. When these areas are reclaimed, layers of soil material or unconsolidated geological material, or both, are replaced in a vertical sequence. The reconstructed soil favors plant growth. The ratings in the table do not apply to quarries and other mined areas that require an offsite source of reconstruction material. The ratings are based on the soil properties that affect erosion and stability of the surface and the productive potential of the reconstructed soil. These properties include the content of sodium, salts, and calcium carbonate; reaction; available water capacity; erodibility; texture; content of rock fragments; and content of organic matter and other features that affect fertility.

Roadfill is soil material that is excavated in one place and used in road embankments in another place (fig. 25). In table 20, 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 whole soil, from the surface to a depth of about 5 feet. It is assumed that soil layers will be mixed when the soil material is excavated and spread.

The ratings are based on the amount of suitable material and on soil properties that affect the ease of excavation and the performance of the material after it is in

Figure 25.—A road cut through an area of Luling clay, 1 to 3 percent slopes. The darker material in the upper part of the road cut is indicative of the microlows, and the lighter colored areas are indicative of the microhighs. Areas of microlows and microhighs are known as gilgai microrelief.

place. The thickness of the suitable material is a major consideration. The ease of excavation is affected by large stones, depth to a 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 AASHTO classification of the soil) and linear extensibility (shrink-swell potential).

Water Management

Table 21 provides information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed excavated ponds. The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect these uses. Not limited indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. Somewhat limited indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. Very limited indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the tables indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

Pond reservoir areas hold water behind a dam or embankment (fig. 18). Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. The underlying material is not rated and should be evaluated during an onsite investigation. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. Embankments that have zoned construction (core and shell) are not considered. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

Soil Properties

Soil properties are ascertained 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 particle-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

The estimates of soil properties are shown in tables. They include physical and chemical properties, and clay mineralogy.

Engineering Index Properties

Table 22 provides the engineering classifications and the range of index properties for the layers of each soil in the survey area.

Depth to the upper and lower boundaries of each layer is indicated.

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 across. "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 15 percent or more, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (2) and the system adopted by the American Association of State Highway and Transportation Officials (1).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to particle-size distribution of the fraction less than 3 inches across 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 across is classified in one of seven groups from A-1 through A-7 on the basis of particle-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 10 inches across and 3 to 10 inches across 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 across 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 particle-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 generally omitted in the table.

Physical Soil Properties

Table 23 shows estimates of some physical characteristics and features that affect soil behavior. These estimates are given for the 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.

Particle-size is the effective diameter of a soil particle as measured by sedimentation, sieving, or micrometric methods. Particle-sizes are expressed as classes with specific effective diameter class limits. The broad classes are sand, silt, and clay, ranging from the larger to the smaller.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In table 23, the estimated clay content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of sand, silt, and clay affects the physical behavior of a soil. Particle-size is important for engineering and agronomic interpretations, for determination of soil hydrologic qualities, and for soil classification.

The amount and kind of clay affect the fertility and physical condition of the soil and 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- or 1/10-bar (33kPa or 10kPa) moisture tension. Weight is determined after the soil is dried at 105 degrees C. In the table, the estimated moist bulk density of each 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. Depending on soil texture, a bulk density of more than 1.4 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 (*K-sat*)* refers to the ability of a soil to transmit water or air. The term "permeability," as used in soil surveys, indicates saturated hydraulic conductivity (K-sat). The estimates in the table indicate the rate of water movement, in inches per hour, 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 soil layer. The capacity varies, depending on soil properties that affect retention of water. 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.

Linear extensibility refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. It is an expression of the volume change between the water content of the clod at 1/3- or 1/10-bar tension (33kPa or 10kPa tension) and oven dryness. The volume change is reported in the table as percent change for the whole soil. Volume change is influenced by the amount and type of clay minerals in the soil.

Linear extensibility is used to determine the shrink-swell potential of soils. The shrink-swell potential is low if the soil has a linear extensibility of less than 3 percent; moderate if 3 to 6 percent; high if 6 to 9 percent; and very high if more than 9 percent. If the linear extensibility is more than 3, shrinking and swelling can cause damage to buildings, roads, and other structures and to plant roots. Special design commonly is needed.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 23, 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 by returning crop residue to the soil. Organic matter has a positive effect on available water capacity, water infiltration, soil organism activity, and tilth. It is a source of nitrogen and other nutrients for crops and soil organisms.

Erosion factors are shown in table 23 as the K factor (Kw and Kf) and the T factor. Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of several factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) 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 and on soil structure and permeability. Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor Kw indicates the erodibility of the whole soil. The estimates are modified by the presence of rock fragments.

Erosion factor Kf indicates the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

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.

Wind erodibility groups are made up of soils that have similar properties affecting their susceptibility to wind erosion in cultivated areas. The soils assigned to group 1 are the most susceptible to wind erosion, and those assigned to group 8 are the least susceptible. The groups are as follows:

1. Coarse sands, sands, fine sands, and very fine sands.

2. Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, ash material, and sapric soil material.

3. Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams.

4L. Calcareous loams, silt loams, clay loams, and silty clay loams.

4. Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay.

5. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material.

6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay.

7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material.

8. Soils that are not subject to wind erosion because of rock fragments on the surface or because of surface wetness.

Wind erodibility index is a numerical value indicating the susceptibility of soil to wind erosion, or the tons per acre per year that can be expected to be lost to wind erosion. There is a close correlation between wind erosion and the texture of the surface layer, the size and durability of surface clods, rock fragments, organic matter, and a calcareous reaction. Soil moisture and frozen soil layers also influence wind erosion.

Chemical Soil Properties

Table 24 shows estimates of some chemical characteristics and features that affect soil behavior. These estimates are given for the 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.

Cation-exchange capacity is the total amount of extractable bases 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. Soils having a low cation-exchange capacity hold fewer cations and may require more frequent applications of fertilizer than soils having a high cation-exchange capacity. The ability to retain cations reduces the hazard of ground-water pollution.

Effective cation-exchange capacity refers to the sum of extractable bases plus aluminum expressed in terms of milliequivalents per 100 grams of soil. It is determined for soils that have pH of less than 5.5.

Soil reaction is a measure of acidity or alkalinity. The pH of each soil 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.

Calcium carbonate equivalent is the percent of carbonates, by weight, in the fraction of the soil less than 2 millimeters in size. The availability of plant nutrients is influenced by the amount of carbonates in the soil. Incorporating nitrogen fertilizer into calcareous soils helps to prevent nitrite accumulation and ammonium-N volatilization.

Gypsum is expressed as a percent, by weight, of hydrated calcium sulfates in the fraction of the soil less than 20 millimeters in size. Gypsum is partially soluble in water. Soils that have a high content of gypsum may collapse if the gypsum is removed by percolating water.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter (mmhos/cm) or decisiemens per meter (dS/m) at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Sodium adsorption ratio (SAR) is a measure of the amount of sodium (Na) relative to calcium (Ca) and magnesium (Mg) in the water extract from saturated soil paste. It is the ratio of the Na concentration divided by the square root of one-half of the Ca + Mg concentration. Soils that have SAR values of 13 or more may be characterized by an increased dispersion of organic matter and clay particles, reduced permeability and aeration, and a general degradation of soil structure.

Water Features

Table 25 gives estimates of various 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 deep and very deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep to very deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

The *months* in the table indicate the portion of the year in which the feature is most likely to be a concern.

Water table refers to a saturated zone in the soil. Table 25 indicates, by month, depth to the top (*upper limit*) and base (*lower limit*) of the saturated zone in most years. Estimates of the upper and lower limits are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely gray colors or mottles (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table.

Ponding is standing water in a closed depression. Unless a drainage system is installed, the water is removed only by percolation, transpiration, or evaporation. Table 25 indicates *surface water depth* and the *duration* and *frequency* of ponding. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, *long* if 7 to 30 days, and *very long* if more than 30 days. Frequency is expressed as none, rare, occasional, and frequent. *None* means that ponding is not probable; *rare* that it is unlikely but possible under unusual weather conditions (the chance of ponding 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 ponding 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 ponding is more than 50 percent in any year).

Flooding is the temporary inundation of an area 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.

Duration and *frequency* are estimated. Duration is expressed as *extremely brief* if 0.1 hour to 4 hours, *very brief* if 4 hours to 2 days, *brief* if 2 to 7 days, *long* if 7 to 30 days, and *very long* if more than 30 days. Frequency is expressed as none, very rare, rare, occasional, frequent, and very frequent. *None* means that flooding is not probable; *very rare* that it is very unlikely but possible under extremely unusual weather conditions (the chance of flooding is less than 1 percent in any year); *rare* that it is unlikely but possible under unusual weather conditions (the chance of flooding is 1 to 5 percent in any year); *occasional* that it occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year); *frequent* that it is likely to occur often under normal weather conditions (the chance of flooding is more than 50 percent in any year but is less than 50 percent in all months in any year); and *very frequent* that it is likely to occur very often under normal weather conditions (the chance of flooding is more than 50 percent in all months of any year).

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 is 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.

Soil Features

Table 26 gives estimates of various soil features. The estimates are used in land use planning that involves engineering considerations.

A *restrictive layer* is a nearly continuous layer that has one or more physical, chemical, or thermal properties that significantly impede the movement of water and air through the soil or that restrict roots or otherwise provide an unfavorable root environment. Examples are bedrock, cemented layers, dense layers, and frozen layers. The table indicates the hardness and thickness of the restrictive layer, both of which significantly affect the ease of excavation. *Depth to top* is the vertical distance from the soil surface to the upper boundary of the restrictive layer.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that corrodes 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 or concrete in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than the steel or concrete 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, Chemical, and Clay Mineralogy Analyses of Selected Soils

The results of physical analysis of several typical pedons in the survey area are given in table 27 the results of chemical analysis in table 28, and the results of clay mineralogy are given in table 29. 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 Soil Characterization Laboratory, Texas Agricultural Experiment Station, College Station, Texas, and the USDA-NRCS, National Soil Survey Laboratory at Lincoln, Nebraska.

Most determinations, except those for grain-size analysis and bulk density, were made on soil material smaller than 2 millimeters across. 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 (22).

Depth to the upper and lower boundaries of each layer is indicated.

Sand—(0.05- to 2.0-millimeter fraction) weight percentages of material less than 2 millimeters (3A1).
Silt—(0.002- to 0.05-millimeter fraction) pipette extraction, weight percentages of all material less than 2 millimeters (3A1).
Clay—(fraction less than 0.002 millimeter) pipette extraction, weight percentages of material less than 2 millimeters (3A1).
Water retained—pressure extraction, percentage of ovendry weight of less than 2-millimeter material; 1/3 or 1/10 bar (3C1), 15 bars (3C2).
Bulk density—1 of less than 2-millimeter material, saran-coated clods field moist (4A1a), 1/3 bar (4A1d), ovendry (4A1h).
Coefficient of linear extensibility—change in clod dimension based on whole soil (3D4).
Extractable bases—ammonium acetate pH 7.0, ICP; calcium (6N2i), magnesium (6O2h), sodium (6P2f), potassium (6Q2f).
Base saturation—sum of cations, TEA, pH 8.2 (5C3).
Organic carbon—wet combustion. Walkley-Black modified acid-dichromate, ferric sulfate titration (6A1c).
Reaction (pH)—1:1 water dilution (4C1a2a1).
Electrical conductivity—saturation extract (8A3a).
Sodium adsorption ratio (5E).
Exchangeable Sodium Percentage (ESP)—NH_4OAc, pH 7.0.
X-Ray Diffraction—(7A2i).

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (14,16). 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 30 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, meaning burnt or dry, 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. The adjective Typic identifies the subgroup that typifies the great group. An example is Typic 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-loamy, mixed, semiactive, thermic Typic 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" (13). Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" (16) and in "Keys to Soil Taxonomy" (14). Unless otherwise indicated, colors in the descriptions are for dry soil. Following the pedon description is the range of important characteristics of the soils in the series.

Arenosa Series

The Arenosa series consists of very deep, somewhat excessively drained, rapidly permeable soils on interfluves and broad ridges. These soils formed in sandy residuum weathered from Eocene sandstones, including Sparta, Queen City, Carrizo, and Simsboro Sands. Slope ranges from 1 to 8 percent. The soils of the Arenosa series are thermic, uncoated Ustic Quartzipsamments.

Typical pedon of Arenosa fine sand, 1 to 8 percent slopes; from the intersection of Farm Road 1624 and Loop 123 in Lexington; 8.9 miles west and south on Farm Road 1624, 2.4 miles west and north on County Road 309, 1.2 mile west on County Road 331, 2.3 miles west on County Road 333, 0.5 mile north on ranch road, and 20 feet west in rangeland.

A—0 to 5 inches; yellowish brown (10YR 5/4) fine sand, dark yellowish brown (10YR 4/4) moist; single grained; loose; common fine roots; very strongly acid; clear smooth boundary.

C1—5 to 30 inches; light yellowish brown (10YR 6/4) fine sand, yellowish brown (10YR 5/4) moist; single grained; loose; few fine roots; very strongly acid; clear smooth boundary.

C2—30 to 70 inches; very pale brown (10YR 7/4) fine sand, light yellowish brown (10YR 6/4) moist; single grained; loose; very strongly acid; clear smooth boundary.

C3—70 to 80 inches; very pale brown (10YR 8/4) fine sand, very pale brown (10YR 7/4) moist; single grained; loose; very strongly acid.

Depth of the sand exceeds 80 inches. Texture is fine sand or sand throughout, with less than 5 percent silt plus clay.

The A horizon has hue of 10YR, value of 4 to 7, and chroma of 2 to 4. Reaction ranges from very strongly acid to slightly acid.

The C horizon has hue of 10YR, value of 6 to 8, and chroma of 3 or 4. Reaction ranges from very strongly acid to moderately acid.

Benchley Series

The Benchley series consists of very deep, moderately well drained, slowly permeable soils on lower backslope and footslope positions on ridges. These soils formed in residuum and colluvium weathered from shales in the Cook Mountain and Weches Formations of Eocene age. Slope ranges from 1 to 5 percent. The soils of the Benchley series are fine, smectitic, thermic Udertic Argiustolls.

Typical pedon of Benchley clay loam, 1 to 3 percent slopes; from the intersection of Texas Highway 21 and County Road 430 in Old Dime Box; 1.3 miles southeast on County Road 430, and 500 feet southwest in improved pasture.

Ap—0 to 9 inches; dark gray (10YR 4/1) clay loam, very dark gray (10YR 3/1) moist; weak fine subangular blocky structure; very hard, firm; common fine roots; about 1 percent fine ironstone gravel; slightly acid; clear smooth boundary.

Bt—9 to 15 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; very hard, firm; 1 percent few very fine roots; few very fine pores; common fine distinct yellowish brown (10YR 5/8) and few fine prominent yellowish red (5YR 4/6) iron concentrations; slightly acid; gradual smooth boundary.

Btss1—15 to 26 inches; brownish yellow (10YR 6/8) clay, yellowish brown (10YR 5/8) moist; moderate medium subangular blocky structure parting to weak coarse prismatic; very hard, very firm; few very fine roots; few distinct clay films along prism faces; few distinct slickensides; about 2 percent fine ironstone gravel; very dark grayish brown (10YR 3/2) coatings on ped faces; common fine prominent red (2.5YR 5/8) iron concentrations; slightly acid; gradual smooth boundary.

Btss2—26 to 49 inches; light olive brown (2.5Y 5/3) clay, olive brown (2.5Y 4/3) moist; moderate coarse angular blocky structure parting to weak medium prismatic; very hard, very firm; few very fine roots; common distinct pressure faces; common distinct slickensides; few iron-manganese concretions; about 2 percent fine ironstone gravel; very dark grayish brown (10YR 3/2) coatings on ped faces; common medium distinct yellowish brown (10YR 5/8) iron concentrations; neutral; gradual smooth boundary.

Btkss—49 to 66 inches; olive yellow (2.5Y 6/6) clay, light olive brown (2.5Y 5/6) moist; weak medium angular blocky structure; very hard, very firm; few distinct slickensides; common calcium carbonate concretions; few iron-manganese concretions; about 3 percent fine ironstone gravel; moderately alkaline; gradual smooth boundary.

BCtk—66 to 80 inches; yellowish brown (10YR 5/6) clay, dark yellowish brown (10YR 4/6) moist; weak moderate subangular blocky structure; very hard, very firm; common calcium carbonate concretions; common iron-manganese concretions; about 5 percent fine ironstone gravel; moderately alkaline.

The thickness of the solum ranges from 60 to more than 80 inches. Siliceous and ironstone gravel ranges from 0 to 10 percent by volume in the upper part of the solum. This soil has cracks during extended dry periods 0.5 inch or more that extend to a depth of at least 20 inches. The weighted-average clay content of the upper 20 inches of the Bt horizon is 40 to 55 percent.

The A has hue of 7.5YR or 10YR, value of 2 or 3, and chroma of 1 to 3. Reaction ranges from moderately acid to neutral.

The Bt horizon has hue of 7.5YR to 2.5Y, value of 2 or 3, and chroma of 1 to 3. Redoximorphic features in shades of red, brown, yellow, or gray range from few to many. Texture is clay loam or clay. Reaction ranges from moderately acid to neutral. Slickensides range from none to few.

The Btss horizons have hue of 7.5YR to 2.5Y, value of 3 to 6, and chroma of 2 to 8. Redoximorphic features in shades of red, brown, yellow, olive, or gray range from few to many. Slickensides range from few to common. Reaction ranges from moderately acid to neutral.

The BCtk horizon has hue of 7.5YR to 2.5Y, value of 4 to 7, and chroma of 3 to 8. Redoximorphic features in shades of red or gray range from few to common. Texture is clay loam or clay. Reaction ranges from moderately acid to moderately alkaline. Concretions of calcium carbonate and calcium sulfate crystals range from none to common.

The C horizon, where present, is stratified shale, sandstone, and soil material, with texture of clay loam or clay. Redoximorphic features in shades of brown, yellow, olive, or gray range from few to many. Reaction ranges from slightly acid to moderately alkaline.

Boonville Series

The Boonville series consists of very deep, somewhat poorly drained, very slowly permeable soils on footslopes and toeslopes of ridges. These soils formed in clayey colluvium overlying shale in the Yegua Formation of Eocene age. Slope ranges from 0 to 3 percent. Soils of the Boonville series are fine, smectitic, thermic Chromic Vertic Albaqualfs.

Typical pedon of Boonville fine sandy loam, 0 to 2 percent slopes; from the intersection of Farm Road 141 and Texas Highway 21 in Old Dime Box; 12.6 miles southeast and southwest on Farm Road 141, 0.6 mile west on private road, and 450 feet south in improved pasture.

Ap—0 to 10 inches; brown (10YR 5/3) fine sandy loam, brown (10YR 4/3) moist; weak medium granular structure; hard, friable; common fine roots; common fine pores; common medium distinct yellowish brown (10YR 5/6) iron concentrations; moderately acid; abrupt wavy boundary.

E—10 to 18 inches; light gray (10YR 7/2) fine sandy loam, light brownish gray (10YR 6/2) moist; weak medium granular structure; hard, friable; common fine and medium roots; common fine pores; about 1 percent siliceous gravel; few medium distinct yellowish brown (10YR 5/6) iron concentrations; moderately acid; abrupt wavy boundary.

Btg1—18 to 24 inches; light brownish gray (10YR 6/2) clay, grayish brown (10YR 5/2) moist; moderate medium angular blocky structure; very hard, very firm; common fine and medium roots; few distinct clay films on faces of peds; about 1 percent siliceous gravel; common fine distinct strong brown (7.5YR 5/6) and few fine prominent red (2.5YR 4/8) iron concentrations; strongly acid; gradual wavy boundary.

Btg2—24 to 34 inches; light brownish gray (10YR 6/2) clay, grayish brown (10YR 5/2) moist; moderate medium angular blocky structure parting to weak coarse prismatic; very hard, very firm; common fine and medium roots; few distinct pressure faces; about 1 percent siliceous gravel; common medium distinct light olive brown (2.5Y 5/6) iron concentrations; neutral; gradual wavy boundary.

Btss—34 to 49 inches; light yellowish brown (2.5Y 6/4) clay, light olive brown (2.5Y 5/4) moist; moderate medium angular blocky structure parting to weak coarse prismatic; very hard, very firm; few fine roots; few distinct slickensides; few distinct pressure faces; about 1 percent siliceous gravel; slightly alkaline; gradual wavy boundary.

BCtg—49 to 64 inches; light gray (2.5Y 7/2) clay loam, light brownish gray (2.5Y 6/2) moist; weak coarse prismatic structure; very hard, very firm; few fine faint olive yellow (2.5Y 6/6) iron concentrations; moderately alkaline; gradual wavy boundary.

2C—64 to 80 inches; light gray (2.5Y 7/2) shale; massive; moderately alkaline.

The thickness of the solum ranges from 60 to more than 80 inches. The surface layer varies in thickness from 3 to 24 inches, due to the amplitude of waviness of the argillic horizon. Pressure faces and small slickensides range from few to many in some part of the argillic horizon. Siliceous gravel ranges from 0 to 25 percent throughout.

The A horizon has hue of 10YR, value of 3 to 5, and chroma of 2 or 3. Texture is fine sandy loam or gravelly fine sandy loam. Reaction ranges from strongly acid to neutral.

The E horizon has hue of 10YR, value of 5 or 6, and chroma of 1 to 3. Texture is fine sandy loam. Reaction ranges from strongly acid to slightly acid.

The Btg horizons have hue of 10YR or 2.5Y, value of 3 to 5, and chroma of 1 or 2. Iron concentrations in shades of red, brown, and yellow, range from few to common. Texture is clay loam or clay with weighted-average clay content of 35 to 55 percent in the upper 20 inches of the Bt horizons. The reaction of the Btg1 ranges from strongly acid to slightly acid. Lower Btg horizons range from slightly acid to moderately alkaline.

The Btss horizon has hue of 10YR or 2.5Y, value 4 to 7, and chroma 2 to 6. Redoximorphic features in shades of red or yellow range from none to common. Texture is clay loam or clay. Reaction ranges from slightly acid to moderately alkaline.

The BCtg horizon has hue of 10YR or 2.5Y, value 4 to 7, and chroma 2 to 6. Redoximorphic features in shades of red, yellow, or gray range from few to common. Texture is loam, sandy clay loam, or clay loam. Reaction is slightly alkaline or moderately alkaline.

In some pedons, a 2C horizon is present below a depth of 60 inches. It has hue of 10YR to 5Y, value of 4 to 7, and chroma of 2 to 4. It is stratified siltstone or shale of the Yegua Formation. Texture is sandy clay loam, clay loam, or clay. Reaction ranges from moderately acid to moderately alkaline.

Burlewash Series

The Burlewash series consists of moderately deep, well drained, very slowly permeable soils that formed in residuum weathered from tuffaceous shales, siltstones, and sandstones in the Jackson Group of Eocene age. These soils are on very gently sloping to steep summits, shoulders, and upper backslopes of ridges. Slope ranges from 1 to 45 percent. The soils in the Burlewash series are fine, smectitic, thermic Ultic Paleustalfs.

Typical pedon of Burlewash fine sandy loam, 1 to 5 percent slopes; from the intersection of U.S. Highway 290 and Farm Road 180, 6.6 miles east of Giddings; 3.4 miles north on Farm Road 180, 0.5 mile south on private farm road to pond spillway, and 530 feet southwest in improved pasture.

Ap—0 to 5 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 4/3) moist; weak fine granular structure; hard, friable; common fine and medium roots; strongly acid; clear smooth boundary.

E—5 to 9 inches; very pale brown, (10YR 7/3) fine sandy loam, pale brown (10YR 6/3) moist; weak fine granular structure; hard, friable; common fine and medium roots; strongly acid; abrupt smooth boundary.

Bt1—9 to 18 inches; reddish brown (5YR 4/3) clay, dark reddish brown (5YR 3/3) moist; moderate medium angular blocky structure; extremely hard, very firm; common fine roots; few distinct clay films on faces of peds; few small pressure faces; very strongly acid; clear smooth boundary.

Bt2—18 to 27 inches; reddish brown (5YR 4/4) clay, dark reddish brown (5YR 3/4) moist; strong medium angular blocky structure; extremely hard, very firm; few fine roots; few distinct clay films on faces of peds; few small pressure faces; very strongly acid; clear smooth boundary.

Bt/Cr—27 to 32 inches; 60 percent of horizon is brown (7.5YR 4/3) clay, dark brown (7.5YR 3/3) moist (Bt part); weak medium angular blocky structure; extremely hard, very firm; 40 percent of horizon is weakly cemented tuffaceous sandstone and siltstone; massive; few fine roots; few fine distinct strong brown (7.5YR 5/8) iron concentrations (Cr part); very strongly acid; clear smooth boundary.

Cr—32 to 60 inches; brown (7.5YR 5/3) weakly cemented tuffaceous sandstone, siltstone and clay.

The thickness of the solum ranges from 20 to 40 inches and corresponds to depth to paralithic contact with weakly cemented tuffaceous sandstone, siltstone, and clay. Base saturation ranges from 35 to 75 percent throughout the argillic horizon. The weighted-average clay content of the upper 20 inches of the Bt horizon is 40 to 55 percent. Siliceous gravel ranges from 0 to 35 percent by volume in the surface and subsurface layers. Reaction ranges from very strongly acid to moderately acid.

The A horizon has hue of 10YR, value of 5 to 7, and chroma of 2 or 3. Texture is fine sandy loam or gravelly fine sandy loam.

The E horizon has hue of 10YR, value of 5 to 7, and chroma of 2 or 3. Texture is fine sandy loam or gravelly fine sandy loam.

The Bt horizons have hue of 2.5YR to 7.5YR, value of 3 to 6, and chroma of 2 to 6. Redoximorphic features in shades of brown or yellow range from none to few. Texture is sandy clay or clay. Reaction ranges from extremely acid to strongly acid.

The Bt portion of the Bt/Cr horizon has hue of 7.5YR or 10YR, value 4 to 6, and chroma 2 to 4. Texture is clay loam or clay. The Cr portion is weakly cemented tuffaceous sandstone, siltstone, or clay. Redoximorphic features in shades of brown or yellow range from few to common. Reaction is very strongly acid or strongly acid.

The Cr horizon consists of beds of weakly cemented tuffaceous sandstone, siltstone, or tuffaceous clay. Colors are in shades of brown, yellow, and gray.

Chazos Series

The Chazos series consists of very deep, moderately well drained, slowly permeable soils formed in sandy alluvium of Quaternary age. These soils are on gently sloping stream terraces. Slope ranges from 1 to 5 percent. The soils of the Chazos series are fine, smectitic, thermic Udic Paleustalfs.

Typical pedon of Chazos loamy fine sand, 1 to 5 percent slopes; from the intersection of Loop 123 and Farm Road 696 in Lexington; 12.3 miles west on Farm Road 696, 4.0 miles north on County Road 304, 0.5 mile west on farm trail, and 80 feet north in improved pasture.

A—0 to 8 inches; brown (10YR 5/3) loamy fine sand, brown (10YR 4/3) moist; weak fine granular structure; soft, very friable; many fine roots; slightly acid; clear smooth boundary.

E—8 to 17 inches; pale brown (10YR 6/3) loamy fine sand, brown (10YR 5/3) moist; weak fine granular structure; soft, very friable; many fine roots; slightly acid; abrupt wavy boundary.

Bt1—17 to 27 inches; yellowish brown (10YR 5/6) clay, dark yellowish brown (10YR 4/6) moist; moderate fine parting to medium angular blocky structure; very hard, firm; common fine roots; common fine and medium clay films on faces of peds; few iron-manganese concretions; many medium distinct grayish brown (10YR 5/2) iron depletions; common fine and medium prominent red (2.5YR 4/8) and common fine faint strong brown (7.5YR 5/8) iron concentrations; slightly acid; clear wavy boundary.

Bt2—27 to 39 inches; light gray (10YR 7/2) clay, light brownish gray (10YR 6/2) moist; weak coarse prismatic structure parting to strong medium angular blocky; very hard, firm; common fine roots; common fine and medium clay films on faces of peds; many fine and medium distinct brownish yellow (10YR 6/8) and common fine and medium prominent red (2.5YR 4/8) iron concentrations; slightly acid; gradual wavy boundary.

Bt3—39 to 56 inches; light gray (10YR 7/2) clay, light brownish gray (10YR 6/2) moist; weak coarse prismatic structure parting to moderate medium angular blocky; very hard, firm; few fine roots; common fine and medium clay films on faces of peds; many medium distinct brownish yellow (10YR 6/6), common fine and medium distinct yellowish red (5YR 5/6), and few fine prominent red (2.5YR 4/6) iron concentrations; slightly acid; gradual wavy boundary.

Bt4—56 to 68 inches; light gray (10YR 7/2) clay loam, light brownish gray (10YR 6/2) moist; weak coarse prismatic structure parting to weak medium angular blocky; very hard, firm; few fine roots; few fine clay films on faces of peds;

many medium prominent red (2.5YR 5/6) and common fine and medium faint brownish yellow (10YR 6/6) iron concentrations; slightly alkaline; clear wavy boundary.

BCt—68 to 80 inches; light yellowish brown (10YR 6/4) sandy clay loam, yellowish brown (10YR 5/4) moist; weak coarse prismatic structure parting to weak fine and medium subangular blocky; hard, firm; few fine clay films on faces of peds; common fine and medium distinct light brownish gray (10YR 6/2) iron depletions and common fine and medium prominent reddish brown (5YR 5/4) iron concentrations; slightly alkaline.

The thickness of the solum is more than 80 inches. The weighted-average clay content of the upper 20 inches of the Bt horizon ranges from 40 to 50 percent. Siliceous gravel ranges from 0 to 5 percent by volume throughout the solum.

The combined thickness of the A and E horizons ranges from 10 to 20 inches. The A horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 2 to 4. Reaction ranges from moderately acid to neutral.

The E horizon has hue of 7.5YR or 10YR, value of 5 to 7, and chroma of 2 to 4. Reaction ranges from moderately acid to neutral.

The Bt1 horizon has hue of 2.5YR to 10YR, value of 4 to 6, and chroma of 4 to 8. Redoximorphic features in shades of red, brown, yellow, and gray range from few to many. Some pedons have a mixed matrix of these colors. Texture is sandy clay or clay. Reaction is moderately acid or slightly acid.

The lower Bt horizons have hue of 10YR or 2.5Y, value of 4 to 7, and chroma of 2 to 6. Redoximorphic features in shades of red, brown, yellow, or gray range from common to many. Texture is clay loam, sandy clay, or clay. Reaction ranges from moderately acid to neutral.

The BCt horizon has hue of 10YR or 2.5Y, value of 4 to 7, and chroma of 2 to 6. Redoximorphic features in shades of red or yellow range from none to common. Texture is fine sandy loam or sandy clay loam. Reaction ranges from slightly acid to moderately alkaline.

Crockett Series

The Crockett series consists of very deep, moderately well drained, very slowly permeable soils on summit and shoulder positions on broad ridges. They formed in clayey residuum weathered from shales and thin interbedded sandstones in the Cook Mountain and Wilcox Formations of Eocene age. Slope ranges from 1 to 5 percent. The soils of the Crockett series are fine, smectitic, thermic Udertic Paleustalfs.

Typical pedon of Crockett fine sandy loam, 1 to 5 percent slopes; from the intersection of Texas Highway 21 and Farm Road 141 in Old Dime Box; 2.4 miles southeast on Farm Road 141, 1.2 miles southwest on County Road 424, and 1,600 feet northwest in improved pasture.

Ap—0 to 7 inches; brown (7.5YR 4/3) fine sandy loam, dark brown (7.5YR 3/3) moist; weak fine granular structure; very hard, friable; common fine roots and pores and few medium roots; moderately acid; abrupt smooth boundary.

A—7 to 10 inches; brown (7.5YR 5/4) fine sandy loam, brown (7.5YR 4/4) moist; weak fine subangular blocky structure; very hard, friable; common medium roots; moderately acid; abrupt wavy boundary.

Bt—10 to 21 inches; reddish brown (5YR 5/4) clay, reddish brown (5YR 4/4) moist; moderate medium subangular blocky structure; extremely hard, very firm; few fine and medium roots; few fine and medium pores; few distinct clay films on faces of peds; few pressure faces; common fine distinct brown (10YR 4/3) and few medium distinct brownish yellow (10YR 6/6) iron concentrations; moderately acid; clear wavy boundary.

Btss1—21 to 29 inches; yellow (10YR 7/6) clay, brownish yellow (10YR 6/6) moist; moderate medium angular blocky structure; extremely hard, very firm; few fine roots; common distinct clay films on faces of peds; common pressure faces; common distinct slickensides; vertical cracks and root channels filled with very dark grayish brown (10YR 3/2) soil; about 1 percent siliceous gravel; common medium distinct yellowish red (5YR 4/6) iron concentrations; moderately acid; gradual wavy boundary.

Btss2—29 to 49 inches; light yellowish brown (2.5Y 6/4) clay, light olive brown (2.5Y 5/4), moist; moderate medium angular blocky structure; extremely hard, very firm; few fine roots; common large slickensides; common distinct clay films on faces of peds; few iron-manganese concretions; vertical cracks and root channels filled with very dark grayish brown (10YR 3/2) soil; moderately alkaline; gradual wavy boundary.

BCtss—49 to 58 inches; pale yellow (2.5Y 7/4) clay, light yellowish brown (2.5Y 6/4) moist; weak medium angular blocky structure; extremely hard, very firm; few fine roots; few distinct slickensides; few distinct clay films on faces of peds; common iron-manganese concretions; vertical cracks and root channels filled with very dark grayish brown (10YR 3/2) soil; about 25 percent light gray (2.5Y 7/1) weathered shale fragments; common fine distinct brownish yellow (10YR 6/8) and few fine prominent red (2.5YR 4/6) iron concentrations; moderately alkaline; clear wavy boundary.

C—58 to 80 inches; light gray (2.5Y 7/1) weathered shale, moist; massive; very hard, firm; moderately alkaline.

The thickness of the solum ranges from 40 to 60 inches. Pressure faces and slickensides range few to common throughout the Bt and Btss horizons. The weighted-average clay content of the upper 20 inches of the Bt horizons ranges from 40 to 50 percent.

The thickness of the A horizon averages less than 10 inches in 50 percent or more of the pedon but ranges up to 15 inches in subsoil troughs. The A horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 or 4. Texture is fine sandy loam or gravelly fine sandy loam. Ironstone gravel ranges from 0 to 5 percent by volume. Siliceous gravel ranges from 0 to 35 percent by volume. Reaction ranges from moderately acid to slightly alkaline.

The Bt horizon has hue of 5YR to 10YR, value of 4 to 6, and chroma of 3 to 6. Redoximorphic features in shades of red, brown, yellow, and olive range from few to many. Texture is clay loam or clay. Ironstone gravel ranges from 0 to 5 percent by volume. Siliceous gravel ranges from 0 to 10 percent by volume. Reaction ranges from moderately acid to neutral.

The Btss horizons have hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 4 to 6. Redoximorphic features in shades of brown, yellow, red, or gray range from few to many. Texture is clay loam or clay. Siliceous gravel ranges from 0 to 5 percent by volume. Some pedons have concretions of calcium carbonate and calcium sulfate crystals. Reaction ranges from slightly acid to moderately alkaline.

The BCtss horizon has hue of 10YR or 2.5Y, value of 5 to 6, and chroma of 4 to 6. Redoximorphic features in shades of brown, yellow, olive, or gray range from few to many. Texture is clay loam or clay with or without weathered shale fragments or strata of siltstone. Reaction ranges from slightly acid to moderately alkaline.

The C horizon is in shades of brown, olive, or gray. It is mainly weathered shale with clay texture or siltstone with strata of weakly cemented sandstone. Masses of calcium sulfate crystals and concretions of calcium carbonate range from none to many. Reaction ranges from slightly acid to moderately alkaline.

Davilla Series

The Davilla series consists of very deep, moderately well drained, very slowly permeable soils on nearly level anastomosing mounds on broad relict stream terraces. These soils formed in loamy alluvium of Pleistocene age. Slope ranges from 0 to 2 percent. The soils of the Davilla series are fine-loamy, siliceous, semiactive, thermic Udic Haplustalfs.

Typical pedon of Davilla fine sandy loam, in an area of Davilla-Wilson complex, 0 to 2 percent slopes; from intersection of U.S. Highway 77 and Farm Road 1624, 0.9 mile west on Farm Road 1624, and 1,500 feet southeast in cropland.

Ap—0 to 9 inches; pale brown (10YR 6/3), fine sandy loam brown (10YR 4/3) moist; moderate medium subangular blocky structure; very hard, friable; common very fine and fine roots; very few distinct strong brown (7.5YR 5/6), dry organic coats in root channels and/or pores; moderately acid; abrupt wavy boundary.

Bt—9 to 18 inches; dark grayish brown (10YR 4/2), clay loam, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure; extremely hard, very firm; common very fine and fine roots; common very fine pores; many fine prominent red (2.5YR 4/6) and few fine faint yellow (10YR 7/6) iron concentrations; common distinct clay films on faces of peds; common distinct pressure faces on faces of peds; common fine rounded black (10YR 2/1) hard iron-manganese concretions; about 1 percent siliceous gravel; slightly acid; clear wavy boundary.

Btg1—18 to 28 inches; grayish brown (10YR 5/2) clay loam, grayish brown (10YR 5/2) moist; moderate medium angular blocky structure parting to moderate coarse prismatic; extremely hard, very firm; common very fine and fine roots; common very fine pores; common coarse distinct brownish yellow (10YR 6/8) and few fine prominent red (2.5YR 4/8) iron concentrations; few distinct clay films on vertical and horizontal faces of peds; common fine rounded black (10YR 2/1) hard iron-manganese concretions; about 1 percent siliceous gravel; neutral; clear wavy boundary.

Btg2—28 to 49 inches; light brownish gray (10YR 6/2) clay loam, light brownish gray (10YR 6/2) moist; moderate coarse prismatic structure; extremely hard, very firm; common very fine roots; common very fine pores; common coarse distinct brownish yellow (10YR6/8) and common medium distinct brown (7.5YR 5/4) iron concentrations; common distinct, clay films on faces of peds; few distinct pressure faces on faces of peds; common fine rounded black (10YR 2/1) hard iron-manganese concretions and few fine and medium irregular black (10YR 2/1) iron-manganese masses; about 1 percent siliceous gravel; neutral; clear wavy boundary.

Btkg1—49 to 63 inches; gray (10YR 6/1) clay loam, gray (10YR 6/1) moist; moderate medium subangular blocky structure; very hard, firm; common very fine roots; common very fine pores; common coarse distinct brownish yellow (10YR 6/8) and few fine distinct reddish yellow (7.5YR 6/8) iron concentrations; few distinct clay films on faces of peds; common fine rounded black (10YR 2/1) hard iron-manganese concretions and common fine and medium irregular black (10YR 2/1) iron-manganese masses; common fine and medium threads of calcium carbonate; slightly alkaline; gradual wavy boundary.

Btkg2—63 to 80 inches; light brownish gray (2.5Y 6/2), clay loam, light brownish gray (2.5Y 6/2) moist weak medium subangular blocky structure parting to weak coarse prismatic; hard, firm; common very fine roots; common very fine pores; common medium distinct brownish yellow (10YR 6/8) and few fine distinct yellow (10YR 7/6) iron concentrations; few distinct clay films on faces of peds; common fine rounded black (10YR 2/1) hard iron-manganese concretions and few fine and medium irregular black (10YR 2/1) soft iron-manganese accumulations; common fine irregular calcium carbonate masses; few fine threads of calcium carbonate; few very coarse rounded very hard calcium carbonate concretions; about 1 percent siliceous gravel; slightly alkaline.

The thickness of the solum is more than 80 inches. The weighted-average clay content of the upper 20 inches of the Bt horizon ranges from 27 to 35 percent. Ironstone and siliceous gravel ranges from 0 to 5 percent by volume on the surface or throughout the solum.

The Ap horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 2 to 4. Reaction is slightly acid or neutral.

The Bt horizon has hue of 7.5YR to 2.5Y, value of 4 to 7, and chroma of 2 to 6. Redoximorphic features in shades of red, brown, yellow, or gray range from few to many. Texture is sandy clay loam or clay loam in the upper part and clay in the lower part. Reaction ranges from slightly acid to slightly alkaline.

The Btg horizon has hue of 7.5YR to 2.5Y, value of 4 to 7, and chroma of 2 to 6. Redoximorphic features in shades of red, brown, yellow, or gray range from few to many. Texture is sandy clay loam, clay loam, or clay. Concretions and masses of calcium carbonate range from none to common. Reaction ranges from slightly acid to moderately alkaline.

Dutek Series

The Dutek series consists of very deep, well drained, moderately permeable soils on stream terraces. These soils formed in sandy alluvium of Quaternary age. Slope ranges from 1 to 5 percent. The soils of the Dutek series are loamy, siliceous, active, thermic Arenic Haplustalfs.

Typical pedon of Dutek loamy fine sand, 1 to 5 percent slopes; from the intersection of Farm Road 696 and Loop 123 in Lexington; 12.3 miles west on Farm Road 696, 4.2 miles north on County Road 304, and 200 feet west in improved pasture.

Ap—0 to 8 inches; brown (10YR 5/3) loamy fine sand, dark brown (10YR 4/3) moist; weak fine granular structure; soft, very friable; common fine and medium roots; slightly acid; clear smooth boundary.

E1—8 to 14 inches; pale brown (10YR 6/3) loamy fine sand, brown (10YR 5/3) moist; weak fine granular structure; soft, very friable; common fine and medium roots; about 1 percent fine siliceous gravel; slightly acid; clear smooth boundary.

E2—14 to 24 inches; very pale brown (10YR 7/3) loamy fine sand, pale brown (10YR 6/3) moist; weak fine granular structure; soft, very friable; common fine roots; slightly acid; clear smooth boundary.

Bt1—24 to 35 inches; red (2.5YR 5/6) sandy clay loam, red (2.5YR 4/6) moist; weak coarse prismatic structure parting to weak fine and medium subangular blocky; hard, friable; common fine roots; few distinct clay films on faces of peds; moderately acid; gradual smooth boundary.

Bt2—35 to 44 inches; red (2.5YR 5/8) sandy clay loam, red (2.5YR 4/8) moist; weak coarse prismatic structure parting to weak fine and medium subangular blocky; hard, friable; few fine roots; few distinct clay films on faces of peds; moderately acid; gradual smooth boundary.

BCt—44 to 56 inches; yellowish red (5YR 5/6) fine sandy loam, yellowish red (5YR 4/6) moist; weak coarse prismatic structure; hard, friable; few fine roots;

few faint clay films on the faces of peds; moderately acid; clear smooth boundary.

C—56 to 80 inches; reddish yellow (7.5YR 6/6) sandy loam, strong brown (7.5YR 5/6) moist; massive; slightly hard, very friable; few mica flakes; slightly 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.

The A horizon has hue of 7.5YR or 10YR, value of 5 to 7, and chroma of 3 to 6. Reaction ranges from moderately acid to neutral.

The E horizon has hue of 7.5YR or 10YR, value of 6 to 8, and chroma of 3 to 6. Reaction ranges from moderately acid to neutral.

The Bt horizon has hue of 2.5YR to 7.5YR, value of 4 to 6, and chroma of 6 or 8. The weighted-average clay content of the upper 20 inches of the Bt horizon average 18 to 35 percent. Texture is sandy clay loam or clay loam in the Bt1 horizon and fine sandy loam, loam, or sandy clay loam in the Bt2 horizon. Some pedons have iron concentrations in shades of red or yellow. Reaction ranges from very strongly acid to slightly acid.

Some pedons have a BCt horizon. Texture is fine sandy loam.

The C or 2C horizon has hue of 2.5YR to 7.5YR, value of 4 to 6, and chroma of 6 or 8. Texture is loamy fine sand, sandy loam, or fine sandy loam. Reaction ranges from very strongly acid to slightly acid.

Edge Series

The Edge series consists of deep, well drained, very slowly permeable soils on summit, shoulder, and upper backslopes positions on broad ridges. These soils formed in residuum weathered from shales, siltstones, and sandstones in the Wilcox Group of Eocene age. Slope ranges from 1 to 8 percent. The soils of the Edge series are fine, mixed, active, thermic Udic Paleustalfs.

Typical pedon of Edge fine sandy loam, 1 to 3 percent slopes; from the intersection of Farm Road 696 and Loop 123 in Lexington; 1.1 miles west on Farm Road 696, 4.4 miles northwest on Farm Road 112, 3.3 miles north on County Road 315, and 1,200 feet southwest in improved pasture.

Ap—0 to 6 inches; brown (7.5YR 5/4) fine sandy loam, brown (7.5YR 4/4) moist; weak fine subangular blocky parting to weak fine granular structure; slightly hard, friable; common fine roots; strongly acid; clear smooth boundary.

E—6 to 13 inches; light brown (7.5YR 6/4) fine sandy loam, brown (7.5YR 5/4) moist; weak fine subangular blocky parting to weak fine granular structure; slightly hard, friable; common fine roots; strongly acid; abrupt smooth boundary.

Bt1—13 to 26 inches; red (2.5YR 4/6) clay, dark red (2.5YR 3/6) moist; moderate fine and medium angular blocky structure; extremely hard, very firm; common fine roots; common distinct clay films on faces of peds; common fine and medium faint dark reddish brown (2.5YR 3/4) iron concentrations; very strongly acid; clear smooth boundary.

Bt2—26 to 39 inches; red (2.5YR 5/6) clay, red (2.5YR 4/6) moist; moderate fine and medium angular blocky structure; extremely hard, very firm; few fine roots; common distinct clay films on faces of peds; common fine and medium distinct strong brown (7.5YR 5/6) iron concentrations; strongly acid; gradual wavy boundary.

BCt—39 to 47 inches; reddish yellow (7.5YR 6/6) clay loam, strong brown (7.5YR 5/6) moist; weak coarse prismatic parting to weak fine and medium subangular blocky structure; extremely hard, very firm; few fine roots; few faint clay films along the faces of peds; many fine and medium distinct red (2.5YR

4/6) and few fine prominent yellowish brown (10YR 5/8) iron concentrations; strongly acid; gradual wavy boundary.

CBt—47 to 65 inches; brownish yellow (10YR 6/6) weakly consolidated siltstone, yellowish brown (10YR 5/6) moist; massive; hard, firm; few fine roots; few fine faint clay films along root channels; few fine and medium prominent dark red (2.5YR 3/6) iron concentrations; fine strata of brown (10YR 5/3) and brownish yellow (10YR 6/8) clay loam; slightly acid; clear smooth boundary.

C—65 to 80 inches; brownish yellow (10YR 6/6) weakly consolidated siltstone stratified with strong brown (7.5YR 4/6) and light brownish gray (10YR 6/2) fine sandy loam; massive; hard, firm; neutral.

The thickness of the solum ranges from 40 to 60 inches. The weighted-average clay content of the upper 20 inches of the Bt horizon ranges from 35 to 50 percent. Base saturation is more than 75 percent in some part of the argillic horizon.

The A horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 2 to 4. The E horizon, where present, has hue of 7.5YR or 10YR, value of 5 to 7, and chroma of 2 to 4. Ironstone gravel ranges from 0 to 10 percent. Reaction ranges from strongly acid to neutral.

The Bt horizon has hue of 2.5YR or 5YR, value of 3 to 5, and chroma of 4 to 8. The lower Bt horizons typically have redoximorphic features in shades of brown or yellow that range from few to many. Some pedons contain colors with chroma of 2 or less but they are considered to be inherited from parent material or relict redoximorphic features. Texture of the Bt horizon is clay loam or clay. Reaction ranges from very strongly acid to moderately acid in the upper Bt horizon and very strongly acid to neutral for lower Bt horizons.

The BCt horizon has hue of 2.5YR to 10YR, value of 3 to 7, and chroma of 2 to 8. Redoximorphic features in shades of red, brown, yellow, or gray range from few to many. Thin strata of sandstone, ironstone, or shale make up less than 15 percent. Texture is fine sandy loam, sandy clay loam, or clay loam. Reaction ranges from very strongly acid to slightly alkaline.

The CB and C horizons have colors mainly in shades of brown, yellow, and gray with strata or redoximorphic features in shades of red or yellow. Texture is fine sandy loam, silt loam, sandy clay loam, clay loam, or stratified siltstone with these textures. Reaction ranges from strongly acid to moderately alkaline.

Faula Series

The Faula series consists of very deep, somewhat excessively drained, rapidly permeable soils on stream terraces (fig. 26). These soils formed in sandy alluvium of Quaternary age. Slope ranges from 0 to 5 percent. The soils of the Faula series are sandy, siliceous, thermic Lamellic Paleustalfs.

Typical pedon of Faula fine sand, 0 to 5 percent slopes; from the intersection of Texas Highway 21 and Farm Road 21 in Old Dime Box; 7.9 miles southeast on Farm Road 141, 2.6 miles northeast and southeast on Farm Road 1697, 1.1 miles southeast on County Road 125, 1.5 miles northeast and northwest on County Road 140, 0.8 miles northeast on Texas Parks and Wildlife park road, and 50 feet north in rangeland.

A—0 to 10 inches; yellowish brown (10YR 5/4) fine sand, dark yellowish brown (10YR 4/4) moist; weak coarse prismatic structure parting to weak fine granular; loose, very friable; common fine and medium roots; neutral; clear wavy boundary.

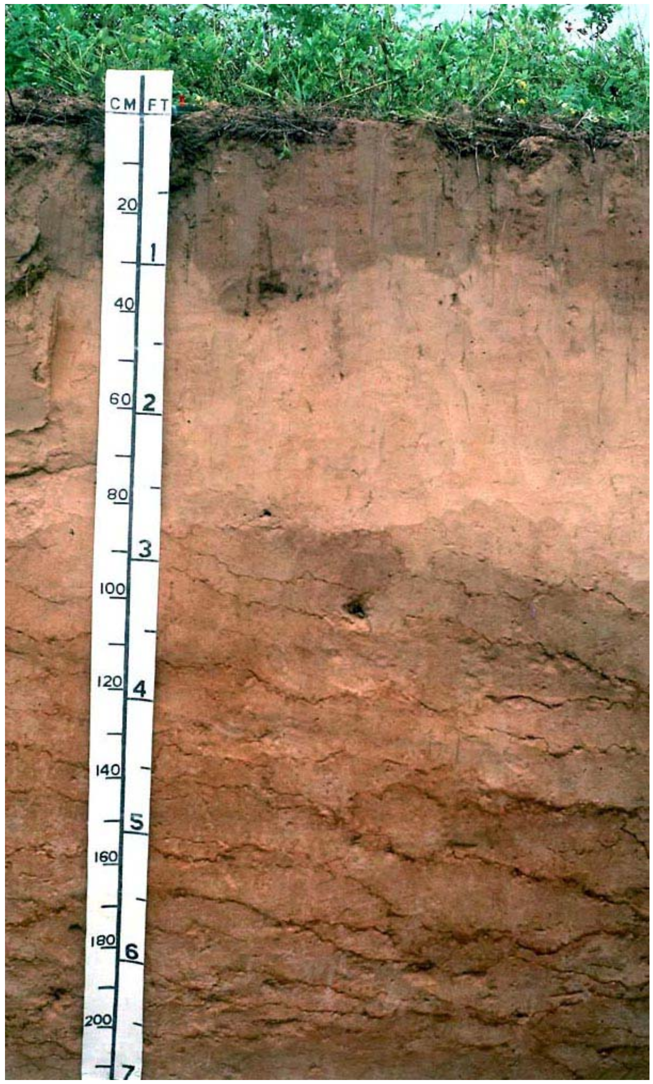


Figure 26.—Profile of Faula fine sand, 0 to 5 percent slopes. The thin brown bands located at 36 inches, are accumulations of finer material, and are known as lamellae.

E—10 to 21 inches; very pale brown (10YR 7/4) fine sand, light yellowish brown (10YR 6/4) moist; weak medium prismatic structure parting to weak fine granular; loose, very friable; common fine roots; strong brown (7.5YR 4/6) iron concentrations; neutral; clear wavy boundary.

E and Bt1—21 to 31 inches; 95 percent of horizon is yellow (10YR 7/6) fine sand, brownish yellow (10YR 6/6) moist (E part); weak coarse prismatic structure parting to weak coarse subangular blocky; soft, friable; 5 percent of horizon is lamellae of reddish yellow (7.5YR 6/6) fine sandy loam, strong brown (7.5YR 5/6) moist; lamellae are massive; slightly hard, friable (Bt part); common fine roots; lamellae are thin, wavy, and continuous horizontally about 1/8 inch in thickness; neutral; clear wavy boundary.

E and Bt2—31 to 40 inches; 80 percent of horizon is light yellowish brown (10YR 6/4) fine sand, yellowish brown (10YR 5/4) moist (E part); weak coarse subangular blocky structure; soft, friable; 20 percent of horizon is lamellae of brown (7.5YR 5/4) fine sandy loam, brown (7.5YR 4/4) moist; lamellae are massive; slightly hard, friable (Bt part); common fine roots; lamellae are wavy and continuous horizontally about 0.25 inch to 0.5 inch in thickness; neutral; clear wavy boundary.

E and Bt3—40 to 68 inches; 65 percent of horizon is yellow (10YR 7/6) fine sand, brownish yellow (10YR 6/6) moist (E part); weak coarse subangular blocky structure; soft, friable; 35 percent of horizon is lamellae of strong brown (7.5YR 5/6) fine sandy loam, strong brown (7.5YR 4/6) moist; lamellae are massive; slightly hard friable (Bt part); common fine roots; lamellae are wavy, continuous horizontally 0.5 inch to 3 inches in thickness; few fine rounded black (10YR 2/1) slightly hard iron-manganese nodules; common medium distinct very pale brown (10YR 7/4) iron concentrations; neutral; clear wavy boundary.

E and Bt4—68 to 80 inches; 85 percent of horizon is very pale brown (10YR 8/3) fine sand, very pale brown (10YR 7/3) moist (E part); weak coarse subangular blocky structure; soft, friable; 15 percent of horizon is lamellae of reddish yellow (7.5YR 6/8) fine sandy loam, strong brown (7.5YR 5/8) moist; lamellae are massive; slightly hard, friable (Bt part); common fine roots; lamellae are wavy, continuous horizontally 0.5 inch to 2 inches in thickness; few medium faint brownish yellow (10YR 6/6) iron concentrations; neutral.

The thickness of the solum is greater than 80 inches.

The A horizon has hue of 7.5YR or 10YR, value of 4 to 7, and chroma of 2 to 4. Reaction ranges from moderately acid to neutral.

The E horizon has hue of 5YR to 10YR, value of 5 to 8, and chroma of 2 to 4. Texture is fine sand or loamy fine sand. Reaction ranges from moderately acid to neutral.

The E part of the E and Bt horizon has hue of 5YR to 10YR, value of 5 to 8, and chroma of 2 to 4. Texture is fine sand or loamy fine sand. The E material makes up about 65 to 95 percent of the horizon.

The Bt part (lamellae) of the E and Bt horizon has hue of 2.5YR to 7.5YR, value of 4 to 6, and chroma of 4 to 8. Texture is loamy fine sand or fine sandy loam. The lamellae range from 1/8 inch to 3 inches in thickness and are wavy and continuous horizontally. Reaction ranges from strongly acid to slightly acid.

Gasil Series

The Gasil series consists of very deep, well drained, moderately permeable soils on summit, shoulder, and upper and lower backslopes on ridges. These soils formed in sandy residuum weathered Eocene sandstones, including Sparta, Queen City, Carrizo, and Simsboro Sands. Slope ranges from 1 to 8 percent. The soils of the Gasil series are fine-loamy, siliceous, semiactive, thermic Ultic Paleustalfs.

Typical pedon of Gasil fine sandy loam, 1 to 3 percent slopes; from the intersection of U.S. Highway 77 and Farm Road 696 in Lexington; 0.9 mile south on U.S. Highway 77, 1.1 miles east on County Road 405, and 2,000 feet northeast in improved pasture.

Ap—0 to 9 inches; yellowish brown (10YR 5/4) fine sandy loam, dark yellowish brown (10YR 4/4) moist; weak fine subangular blocky structure; soft, very friable; many fine roots; moderately acid; abrupt smooth boundary.

E—9 to 17 inches; very pale brown (10YR 7/4) fine sandy loam, light yellowish brown (10YR 6/4) moist; weak fine subangular blocky structure; soft, very friable; many fine roots; moderately acid; abrupt smooth boundary.

Bt1—17 to 30 inches; brownish yellow (10YR 6/8) sandy clay loam, yellowish brown (10YR 5/8) moist; moderate medium subangular blocky structure; hard, firm; common fine roots; common distinct clay films on faces of peds; common medium distinct yellowish red (5YR 5/8) iron concentrations; strongly acid; gradual smooth boundary.

Bt2—30 to 42 inches; yellow (10YR 7/8) sandy clay loam, brownish yellow (10YR 6/8) moist; moderate coarse prismatic structure parting to moderate medium subangular blocky; hard, firm; few fine roots; common distinct clay films on faces of peds; common medium prominent red (2.5YR 5/8) iron concentrations; moderately acid; gradual smooth boundary.

Bt3—42 to 58 inches; red (2.5YR 5/8) sandy clay loam, red (2.5YR 4/8) moist; moderate coarse prismatic structure; hard, firm; common distinct clay films on faces of peds; common medium prominent brownish yellow (10YR 6/8) iron concentrations; common medium prominent light brownish gray (10YR 6/2) iron depletions; moderately acid; gradual smooth boundary.

BCt—58 to 80 inches; reddish yellow (7.5YR 7/8) sandy clay loam, reddish yellow (7.5YR 6/8) moist; weak coarse prismatic structure; hard, firm; few faint clay films; pockets of light gray (10YR 7/2) uncoated sand grains on faces of peds; common medium distinct brownish yellow (10YR 6/8) iron concentrations; moderately acid.

The thickness of the solum ranges from 60 to more than 80 inches. The weighted-average clay content of the upper 20 inches of the Bt horizon ranges from 18 to 35 percent. Base saturation throughout the argillic ranges from 35 to 65 percent. Siliceous and ironstone gravel ranges from 0 to 5 percent throughout the solum.

The combined thickness of the A and E horizons ranges from 10 to 20 inches. The Ap horizon has hue of 10YR or 7.5YR, value of 4 to 6 and chroma of 2 to 4. The E horizon is 1 to 2 units higher in value than the A horizon. Texture is loamy fine sand or fine sandy loam. Reaction ranges from moderately acid to slightly alkaline.

The Bt horizons have hue of 7.5YR to 2.5Y, value of 5 to 7 and chroma of 4 to 8. Iron concentrations in shades of red, brown, or yellow range from few to common. Iron depletions in shades of gray range from none to few below a depth of 30 inches. Texture is sandy clay loam or loam. Reaction ranges from strongly acid to slightly acid.

The BCt horizon has hue of 7.5YR to 2.5Y, value of 5 to 7 and chroma of 4 to 8. Redoximorphic features in shades of brown, yellow, red, or gray range from few to many. Texture is fine sandy loam, or sandy clay loam. Reaction ranges from strongly acid to slightly acid.

Gredge Series

The Gredge series consists of very deep, well drained, very slowly permeable soils on dissected relict stream terraces. These soils formed in Pleistocene alluvium overlying shales in the Yegua Formation of Eocene age. Slope ranges from 1 to 5 percent. The soils of the Gredge series are fine, smectitic, thermic Udic Paleustalfs.

Typical pedon of Gredge fine sandy loam, 1 to 5 percent slopes; from intersection of Texas Highway 21 and Farm Road 141 in Old Dime Box; 12.3 miles southeast on Farm Road 141, 0.2 mile northwest on private farm road, and 75 feet northeast in improved pasture.

Ap—0 to 7 inches; grayish brown (10YR 5/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; hard, friable; common fine roots; moderately acid; abrupt wavy boundary.

Bt1—7 to 15 inches; red (2.5YR 5/6) clay, red (2.5YR 4/6) moist; moderate medium subangular blocky structure parting to weak coarse prismatic; very hard, very firm; common fine roots; common fine pores; common distinct clay films on faces of peds; common fine faint yellowish red (5YR 4/6) iron concentrations; very strongly acid; clear wavy boundary.

Bt2—15 to 21 inches; reddish yellow (5YR 6/6) clay, yellowish red (5YR 5/6) moist; moderate medium subangular blocky structure parting to weak coarse prismatic; very hard, very firm; few fine roots; few fine pores; common distinct clay films on faces of peds; common small pressure faces; common medium distinct grayish brown (10YR 5/2) iron depletions; strongly acid; clear wavy boundary.

Bt3—21 to 31 inches; very pale brown (10YR 8/2) clay loam, light gray (10YR 7/2) moist; moderate coarse prismatic structure; hard, firm; few fine roots; few fine pores; common distinct clay films on vertical faces of peds; few fine distinct yellowish red (5YR 4/6) iron concentrations; few calcium carbonate masses; slightly acid; clear wavy boundary.

BCt1—31 to 42 inches; light gray (10YR 7/2) sandy clay loam, light brownish gray (10YR 6/2) moist; moderate coarse prismatic structure; hard, firm; few faint clay films on vertical faces of peds; few medium distinct olive yellow (2.5Y 6/6) iron concentrations; slightly alkaline; clear wavy boundary.

BCt2—42 to 53 inches; very pale brown (10YR 8/2) fine sandy loam, light gray (10YR 7/2) moist; weak coarse prismatic structure; slightly hard, friable; few faint clay films on vertical faces of peds; few medium distinct yellowish brown (10YR 5/8) iron concentrations; neutral; clear smooth boundary.

C—53 to 70 inches; light yellowish brown (2.5Y 6/3) fine sandy loam; massive; slightly hard, friable; common distinct olive yellow (2.5Y 6/8) horizontal strata of iron concentrations; neutral; clear smooth boundary.

2C—70 to 80 inches; stratified pale yellow (2.5Y 8/3) siltstone and mudstone; massive; hard, firm; neutral.

The thickness of the solum ranges from 60 to more than 80 inches. The weighted-average clay content of the upper 20 inches of the Bt horizon ranges from 40 to 55 percent. Clay content decreases by 20 percent or more within a depth of 20 to 35 inches of the surface. Colors with chromas of 2 or less are lithochromic or relict, and the soil does not have aquic soil conditions.

The A horizon has hue of 7.5YR or 10YR, value of 4 to 7, and chroma of 2 to 4. Texture is fine sandy loam or gravelly fine sandy loam. A thin E horizon is present in some pedons. Siliceous gravel ranges from 0 to 35 percent by volume. Reaction ranges from very strongly acid to slightly acid.

The Bt1 horizon has hue of 2.5YR or 5YR, value of 3 to 5, and chroma of 4 to 8. Redoximorphic features in shades of brown, yellow, or gray range from few to many. Texture is sandy clay or clay. Reaction ranges from very strongly acid to moderately acid.

The lower Bt horizons have hue of 2.5YR to 10YR, value of 4 to 6, and chroma of 1 to 8. Redoximorphic features in shades of red, yellow, brown, or gray range from few to many. Texture is clay, clay loam, or sandy clay loam. Reaction ranges from strongly acid to slightly alkaline.

The BCt horizons have hue of 2.5YR to 10YR, value of 4 to 6, and chroma of 1 to 8. Redoximorphic features in shades of these colors range from none to common. Texture is fine sandy loam, loam, sandy clay loam, or clay loam. Reaction ranges from moderately acid to moderately alkaline.

Some pedons have a geologic 2C horizon of shale, mudstone, or stratified soil materials below a depth of 60 inches. The texture of these materials is mainly loam, clay loam, or clay. Reaction ranges from moderately acid to moderately alkaline.

Jedd Series

The Jedd series of moderately deep, well drained, moderately slowly permeable soils on summit, shoulder, and upper backslopes on narrow ridges. These soils formed in residuum weathered from sandstones and shale in the Cook Mountain, Reklaw, and Weches Formations of Eocene age. Slope ranges from 2 to 20 percent. The soils of the Jedd series are fine, mixed, semiactive, thermic Ultic Paleustalfs.

Typical pedon of Jedd fine sandy loam, 3 to 8 percent slopes; from the intersection of Loop 123 and Farm Road 1624 in Lexington; 5.6 miles southwest on Farm Road 1624, 1.5 miles west on County Road 322, 0.25 miles south on private road, and 85 feet west of private road in improved pasture.

Ap—0 to 5 inches; brown (7.5YR 5/4) fine sandy loam, brown (7.5YR 4/4) moist; weak fine granular structure; hard, friable; common very fine and fine and few medium roots; common fine pores; about 3 percent ironstone gravel; strongly acid; clear smooth boundary.

E—5 to 8 inches; light brown (7.5YR 6/4) fine sandy loam, brown (7.5YR 5/4) moist; weak fine granular structure; hard, friable; common very fine and fine and few medium roots; common fine pores; strongly acid; abrupt smooth boundary.

Bt—8 to 26 inches; red (2.5YR 4/6) clay, dark red (2.5YR 3/6) moist; strong medium subangular blocky structure; very hard, firm; common distinct clay films on faces of peds; few very fine and fine roots; few very fine and fine pores; about 2 percent brownish yellow (10YR 6/8) ironstone fragments; very strongly acid; clear smooth boundary.

Cr—26 to 60 inches; red (2.5YR 4/6) weakly cemented sandstone, dark red (2.5YR 3/6) moist; massive; thin layers of light gray (10YR 7/1) stratified shale; very strongly acid.

Depth to stratified weakly cemented sandstone and shale is 20 to 40 inches. The weighted-average clay content of the upper 20 inches of the Bt horizon ranges from 35 to 50 percent. The base saturation of the Bt horizon ranges from 35 to 75 percent. Fragments of ironstone and sandstone from less than 4 inches to about 48 inches across, cover less than 1 percent to about 15 percent of the surface in some areas.

The A horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 2 to 4. In some pedons, a thin E horizon is present with hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 2 to 4. Ironstone gravel and fragments range from 0 to 10 percent in the surface layer of some pedons. Reaction ranges from moderately acid to neutral.

The Bt horizon has hue of 2.5YR or 5YR, value of 4 to 6, and chroma of 4 to 8. Redoximorphic features in shades of red or yellow range from few to many. Texture is clay loam or clay. Reaction ranges from very strongly acid to moderately acid.

The Cr horizon is stratified weakly cemented sandstone and shale interbedded with strata of fine sandy loam. Matrix colors are in shades of red, brown, or yellow.

Koether Series

The Koether series consists of shallow, or very shallow, somewhat excessively drained, rapidly permeable soils on summit, shoulder, and upper backslopes on narrow ridges. They formed in sandy residuum weathered from tuffaceous sandstones in the Jackson Group of Eocene age. Slope ranges from 8 to 45 percent. The soils of the Koether series are sandy-skeletal, siliceous, thermic Lithic Ustorthents.

Typical pedon of Koether very stony loamy fine sand, in an area of Burlewash-Koether soils, 8 to 45 percent slopes, very stony; from the intersection of U.S. Highway 290 and Farm Road 180, 6.6 miles east of Giddings; 6.3 miles north on

Farm Road 180, 0.3 mile west on private farm road, 800 feet north in improved pasture, and 200 feet east in wooded area.

A1—0 to 10 inches; brown (10YR 5/3) very stony loamy fine sand, brown (10YR 4/3) moist; single grained; loose; common medium and coarse roots; about 40 percent fragments of sandstone greater than 3 inches in diameter; strongly acid; clear wavy boundary.

A2—10 to 16 inches; pale brown (10YR 6/3) stony loamy fine sand, brown (10YR 5/3) moist; single grained; loose; common medium and coarse roots; about 30 percent fragments of sandstone greater than 3 inches in diameter; strongly acid; abrupt wavy boundary.

R—16 to 20 inches; slightly fractured strongly cemented tuffaceous sandstone.

The thickness of the solum ranges from 7 to 20 inches which corresponds to the depth to a lithic contact. Angular sandstone fragments range from 30 to 70 percent on the surface and within the solum.

The A horizon has hue of 10YR, value of 5 or 6, and chroma of 2 or 3. Fragments of sandstone greater than 3 inches in diameter range from 30 to 70 percent by volume. Fragments of sandstone less than 3 inches in diameter range from 2 to 15 percent by volume. Reaction is very strongly acid or strongly acid.

The R layer is strongly cemented, slightly fractured tuffaceous sandstone.

Kurten Series

The Kurten series consists of deep, well drained, very slowly permeable soils on summit, shoulder, and upper backslopes on narrow ridges. These soils formed in residuum weathered from shales in the Cook Mountain Formation of Eocene age. Slope ranges from 1 to 5 percent. The soils of the Kurten series are fine, smectitic, thermic Udertic Paleustalfs.

Typical pedon of Kurten fine sandy loam, 1 to 5 percent slopes; from the intersection of U.S. Highway 77 and Texas Highway 21, 0.4 miles south on U.S. Highway 77, 4.0 miles east and south on County Road 327, 0.3 mile northeast on ranch road, and 120 feet east in improved pasture.

Ap—0 to 4 inches; brown (7.5YR 4/2) fine sandy loam, dark brown (7.5YR 3/2) moist; moderate fine granular structure; hard, very friable; many fine roots; slightly acid; clear smooth boundary.

E—4 to 10 inches; brown (7.5YR 5/3) fine sandy loam, brown (7.5YR 4/3) moist; weak fine granular structure; hard, very friable; many fine roots; moderately acid; abrupt wavy boundary.

Btss1—10 to 23 inches; reddish brown (2.5YR 4/4) clay, dark reddish brown (2.5YR 3/4) moist; moderate coarse angular blocky structure; very hard, very firm; common fine roots; few distinct clay films on faces of peds; common distinct pressure faces; common distinct slickensides; few fine prominent dark reddish gray (5YR 4/2) relict iron depletions; moderately acid; gradual wavy boundary.

Btss2—23 to 42 inches; red (2.5YR 5/8) clay, red (2.5YR 4/8) moist; moderate coarse angular blocky structure; very hard, very firm; few fine roots; few distinct clay films on faces of peds; common distinct slickensides; common medium prominent grayish brown (10YR 5/2) relict iron depletions; very strongly acid; gradual wavy boundary.

Btss3—42 to 56 inches; red (2.5YR 5/8) clay, red (2.5YR 4/8) moist; weak coarse angular blocky structure; very hard, firm; very few fine roots; few faint clay films on faces of peds; common distinct slickensides; many medium prominent grayish brown (10YR 5/2) relict iron depletions; very strongly acid; gradual wavy boundary.

C—56 to 80 inches; brown (7.5YR 5/2) shale; massive; very hard, very firm; very strongly acid.

The thickness of the solum ranges from 40 to 60 inches. Ironstone gravel ranges from 0 to 10 percent by volume, with or without ironstone fragments up to 10 inches across on the surface. Some areas contain siliceous gravel that ranges from 35 to 60 percent by volume in the surface layer. The average clay content of the upper 20 inches of the Bt horizon ranges from 40 to 60 percent.

The A horizon has hue of 7.5YR or 10YR, value of 3 to 6, and chroma of 2 to 6. The E horizon, where present, has hue of 7.5YR or 10YR, value of 4 to 7, and chroma of 2 to 6. Texture is fine sandy loam or very gravelly fine sandy loam. Reaction ranges from strongly acid to neutral.

The Btss horizon has hue of 2.5YR to 10YR, value of 3 to 6, and chroma of 2 to 8. Redoximorphic features in shades of red, brown, yellow, or gray range from few to many in most pedons. Texture is clay. Reaction ranges from very strongly acid to moderately acid.

The BCt horizon, where present, has hue of 2.5YR to 2.5Y, value of 3 to 6, and chroma of 2 to 8. Iron concentrations of red, brown, or yellow range from few to common. Texture is clay loam or clay. Reaction ranges from very strongly acid to neutral.

The C horizon has matrix colors in shades of brown or gray. Mottles in shades of brown or gray range from few to common. Texture is shale. Some pedons contain thin layers of weakly cemented sandstone. Reaction ranges from very strongly acid to slightly alkaline.

Lexton Series

The Lexton series consists of very deep, well drained, very slowly permeable soils on summit, shoulder, and upper backslopes on ridges (fig. 27). These soils formed in residuum weathered from glauconitic sandstones and shales in the Weches Formation of Eocene age. Slope ranges from 1 to 3 percent. The soils of the Lexton series are very-fine, mixed, active, thermic Chromic Udic Haplusterts.

Typical pedon of Lexton clay, 1 to 3 percent slopes; from intersection of U.S. Highway 77 and Farm Road 696 in Lexington; 0.1 mile south on U.S. Highway 77, and 150 feet east in improved pasture.

Ap—0 to 9 inches; brown (7.5YR 4/2) clay, dark brown (7.5YR 3/2) moist; moderate medium subangular blocky structure; very hard, firm; slightly sticky and slightly plastic; common fine roots; few fine dark brown (7.5YR 3/2) hard wormcasts; about 3 percent ironstone gravel; moderately acid; clear smooth boundary.

A—9 to 15 inches; reddish brown (2.5YR 5/4) clay, reddish brown (2.5YR 4/4) moist; moderate medium angular blocky structure parting to strong coarse prismatic; extremely hard, very firm; very sticky, very plastic; common fine roots; very few distinct pressure faces on faces of peds; about 1 percent ironstone gravel; few fine distinct light yellowish brown (2.5Y 6/4) iron concentrations; neutral; gradual wavy boundary.

Bss—15 to 37 inches; reddish brown (2.5YR 5/4) clay, reddish brown (2.5YR 4/4) moist; moderate medium angular blocky structure; extremely hard, very firm; very sticky and very plastic; common fine roots in cracks; few prominent slickensides; few rounded iron-manganese nodules; about 1 percent ironstone gravel; common medium prominent light olive brown (2.5Y 5/4) iron concentrations; neutral; gradual wavy boundary.

Bkss—37 to 58 inches; olive (5Y 5/4) clay, olive (5Y 4/4) moist; moderate medium angular blocky structure parting to strong coarse prismatic; extremely hard,

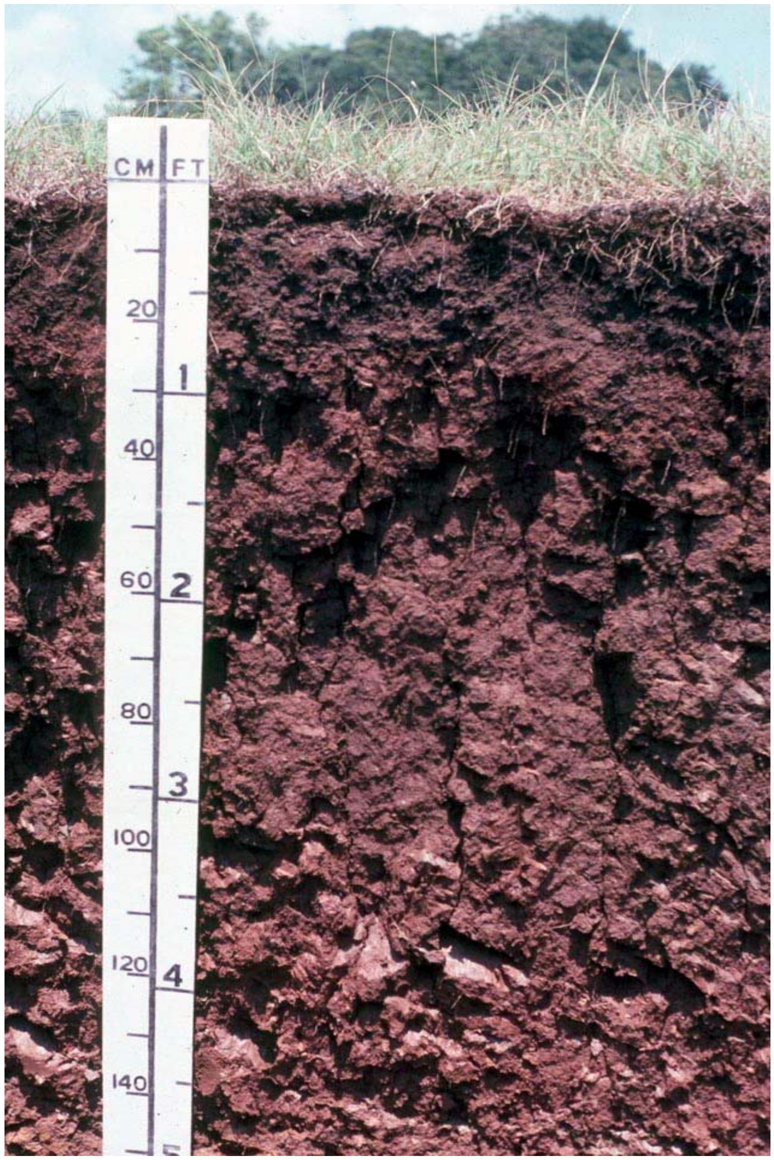


Figure 27.—Profile of Lexton clay, 1 to 3 percent slopes. The red colors are due to the glauconitic sandstones and shales in the Weches Formation.

extremely firm; very sticky, very plastic; common prominent slickensides; common medium and coarse calcium carbonate concretions; common fine rounded iron-manganese concretions; common medium distinct reddish brown (2.5YR 5/4) and few fine prominent red (2.5YR 4/8) iron concentrations; moderately alkaline; abrupt smooth boundary.

Cr/Bkss—58 to 68 inches; 80 percent yellow (10YR 7/8) slightly cemented, horizontally bedded glauconitic material, marl and ironstone with common marine shell fossils (Cr); 20 percent yellowish red (5YR 5/6) clay, yellowish red (5YR 4/6) moist (B); massive; very hard, firm; slightly sticky and slightly plastic; about 3 percent fine roots on faces of wedge-shaped aggregates; about 5 percent marine shell fossils; about 5 percent medium calcium carbonate concretions; moderately alkaline; gradual wavy boundary

C—68 to 80 inches; olive (5Y 5/3) horizontally bedded glauconitic marl, greensand, and shale with common marine shell fossils; massive; about 1 percent ironstone gravels; moderately alkaline.

The thickness of the solum ranges from 40 to 60 inches. The weighted-average clay content of the control section ranges from 60 to 70 percent. Slickensides begin at a depth of 12 to 24 inches. When dry, cracks 1 to 2 inches wide extend to depths of 40 inches or more. Ironstone gravel and fragments range from 0 to about 10 percent throughout the solum.

The A horizon has hue of 2.5YR to 7.5YR, value of 3 to 5, and chroma of 2 to 6. Reaction ranges from moderately acid to neutral.

The Bss horizon has hue of 2.5YR or 5YR, value of 3 to 5, and chroma of 4 to 8. Iron concentrations in shades of brown and yellow range from none to common in the lower part. Texture is clay. Reaction ranges from strongly acid to neutral.

The Bkss horizon has hue of 5YR to 2.5Y, value of 3 to 5, and chroma of 4 to 8. Iron concentrations in shades of red, brown, or yellow range from few to many. Texture is clay or clay loam with remnants of partially weathered glauconite. Reaction ranges from moderately acid to moderately alkaline.

The Cr or C horizon is variable in color with shades of brown, yellow, olive or black. It ranges from partially weathered glauconite sandstone and greensand marl to sandy loam or clay loam materials. Marine shell fossils range from none to common. Reaction ranges from slightly acid to moderately alkaline.

Lufkin Series

The Lufkin series consists of very deep, moderately well drained, very slowly permeable soils on stream terraces. These soils formed in loamy alluvium of Quaternary age. Slopes are 0 to 1 percent. The soils of the Lufkin series are fine, smectitic, thermic Oxyaquic Vertic Paleustalfs.

Typical pedon of Lufkin fine sandy loam, 0 to 1 percent slopes; from the intersection of U.S. Highway 77 and Farm Road 696 in Lexington; 3.6 miles south on U.S. Highway 77, 2.7 miles east on Farm Road 3403, 750 feet south, and 0.5 mile west on private farm road in improved pasture.

Ap—0 to 7 inches; light brownish gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak fine subangular blocky structure; hard, friable; common fine and medium roots; common fine distinct strong brown (7.5YR 4/6) iron concentrations along root channels; strongly acid; abrupt smooth boundary.

Btg—7 to 13 inches; gray (10YR 5/1) clay, dark gray (10YR 4/1) moist; moderate coarse angular blocky structure; extremely hard, very firm; common fine and medium roots; common distinct clay films on faces of peds; few pressure faces on faces of peds; very strongly acid; gradual smooth boundary.

Btssg1—13 to 25 inches; gray (10YR 5/1) clay, dark gray (10YR 4/1) moist; moderate coarse angular blocky structure; extremely hard, very firm; few fine and medium roots; common distinct clay films on faces of peds; few pressure faces on faces of peds; few small slickensides; very strongly acid; gradual smooth boundary.

Btssg2—25 to 33 inches; gray (10YR 6/1) clay, gray (10YR 5/1) moist; weak medium prismatic structure parting to moderate medium angular blocky; extremely hard, very firm; few fine roots; common distinct clay films on faces of peds; few pressure faces on faces of peds; few small slickensides; dark gray (10YR 4/1) material in cracks; slightly alkaline; gradual smooth boundary.

B’tg1—33 to 41 inches; gray (10YR 6/1) clay, gray (10YR 5/1) moist; weak medium prismatic structure parting to moderate medium angular blocky;

extremely hard, very firm; few fine roots; common distinct clay films on faces of peds; few pressure faces on faces of peds; few fine faint light brownish gray (10YR 6/2) iron depletions; slightly alkaline; gradual smooth boundary.

B’tg2—41 to 59 inches; light gray (10YR 7/2) clay loam, light grayish brown (10YR 6/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky; extremely hard, very firm; few fine roots; few distinct clay films on faces of peds; few pressure faces on faces of peds; few fine iron-manganese concretions; few calcium carbonate concretions; slightly alkaline; gradual smooth boundary.

BCtg—59 to 80 inches; light gray (10YR 7/2) clay loam, light brownish gray (10YR 6/2) moist; weak medium prismatic structure parting to weak medium subangular; very hard, firm; few faint clay films on faces of peds; few fine iron-manganese concretions; common medium distinct yellowish brown (10YR 5/6) iron concentrations; slightly alkaline.

The thickness of the solum ranges from 60 to more than 80 inches. The weighted-average clay content of the upper 20 inches of the Bt horizon ranges from 35 to 45 percent. Pressure faces and slickensides range from few to common throughout the subsoil. Most pedons contain secondary carbonates, gypsum crystals, or iron-manganese concretions below a depth of 40 inches. Siliceous gravel ranges from 0 to 10 percent by volume in the surface layer of some pedons.

The A horizon has hue of 10YR, value of 3 to 6, and chroma of 1 to 3. It is massive and hard when dry, but has weak granular structure when moist. Some pedons which have not been disturbed, contain a thin E horizon which has hue of 10YR or 2.5Y, value of 5 to 8, and chroma of 1 or 2. Iron concentrations in shades of brown or yellow range from few to many. Reaction ranges from strongly acid to slightly acid.

The Btg horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 or 2. Iron concentrations in shades of brown or yellow, range from none to common. Texture is clay loam or clay. Reaction is very strongly acid or strongly acid.

The Btssg and B’tg horizons have 10YR or 2.5Y, value of 4 to 7, and chroma of 1 or 2. Iron concentrations in shades of brown or yellow, range from few to common. Texture is clay loam or clay. Reaction ranges from moderately acid to slightly alkaline.

The BCtg has hue of 10YR or 2.5Y, value of 4 to 7, and chroma of 1 or 2. Iron concentrations in shades of brown or yellow range from none to common. Texture is sandy clay loam or clay loam. Reaction ranges from moderately acid to slightly alkaline.

Luling Series

The Luling series consists of soils that are very deep, well drained, very slowly permeable soils on summit, shoulder, and upper backslopes on ridges (fig. 28). These soils formed in residuum weathered from shales in the Cook Mountain Formation of Eocene age. Slope ranges from 1 to 5 percent. The soils of the Luling series are fine, smectitic, thermic Udic Haplusterts.

Typical pedon of Luling clay, 1 to 3 percent slopes; from intersection of Texas Highway 21 and County Road 430 in Old Dime Box, Texas; 0.5 miles southeast on County Road 430; 270 feet southwest in hayland.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; moderate fine subangular blocky structure; extremely hard, very firm; common very fine and fine roots; about 2 percent siliceous gravel; neutral; gradual wavy boundary.

Figure 28.—Profile of Luling clay, 1 to 3 percent slopes. The white masses at a depth of 48 inches are carbonate masses.

A—8 to 17 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; weak medium angular blocky structure; extremely hard, very firm; common fine and medium roots; few medium pressure faces; few iron-manganese concretions; about 2 percent siliceous gravel; neutral; gradual wavy boundary.

Bss1—17 to 42 inches; grayish brown (2.5Y 5/2) clay; dark grayish brown (2.5Y 4/2) moist; moderate coarse angular blocky structure; extremely hard, very firm; few fine roots; common distinct slickensides; few iron-manganese concretions; about 2 percent siliceous gravel; common fine faint very dark grayish brown (10YR 3/2) iron concentrations; moderately alkaline; gradual wavy boundary.

Bss2—42 to 61 inches; olive yellow (2.5Y 6/6) clay, light olive brown (2.5Y 5/6) moist; weak coarse angular blocky structure; extremely hard, very firm; common distinct slickensides; few fine calcium carbonate concretions; few fine distinct dark grayish brown (2.5Y 4/2) iron concentrations; moderately alkaline; gradual wavy boundary.

Bkss—61 to 73 inches; olive yellow (2.5Y 6/6) clay, light olive brown (2.5Y 5/6) moist; weak coarse angular blocky structure; extremely hard, very firm; common distinct slickensides; common calcium carbonate concretions and masses; moderately alkaline; gradual wavy boundary.

C—73 to 80 inches; light gray (2.5Y 7/2) shale, light brownish gray (2.5Y 6/2) moist; massive; very hard, very firm; about 5 percent brownish yellow (10YR 6/8) weakly consolidated sandstone; moderately alkaline.

The thickness of the solum ranges from 60 to 75 inches. The weighted-average clay content of the 10- to 40-inch control section ranges from 40 to 55 percent. Iron-manganese concretions range from none to few throughout. Fine ironstone gravel and fragments range from 0 to 3 percent on the surface. Medium and coarse gravel occurs in some pedons and ranges from 0 to 35 percent by volume. Undisturbed areas have gilgai microrelief with a distance of 6 to 40 feet between highs. The height of the microhigh is approximately 6 to 14 inches above the microlow. When dry, the soil has cracks 0.5 to 2 inches wide at the surface and commonly 0.5 inch wide cracks extend to a depth of more than 40 inches. Slickensides are at a depth of 12 to 24 inches and extend throughout the solum. Reaction of the soil ranges from neutral to moderately alkaline throughout. It is typically noncalcareous in the A horizon and calcareous or noncalcareous below.

The A horizon has hue of 10YR to 5Y, value of 3 to 5, and chroma of 2 or 3 in more than half of each pedon for at least a depth of 12 inches. It is clay or gravelly clay. The amplitude of waviness between the A and the Bss horizon is 4 to 24 inches.

The Bss and Bkss horizons have hue of 10YR to 5Y, value of 4 to 6, and chroma of 2 to 6. Redoximorphic features in shades of brown, yellow, gray, or olive range from none to common. Gray colors are related to parent material. Concretions and masses of calcium carbonate range from none to common.

The C horizon has matrix colors in shades of gray, brown, yellow, or olive. Mottles in shades of brown, yellow, olive, or gray range from few to common. It is weathered shale or clay stratified with shale and weakly cemented sandstone.

Mabank Series

The Mabank series consists of very deep, moderately well drained, very slowly permeable soils on stream terraces (fig. 29). These soils formed in clayey alluvium of Quaternary age. Slopes are 0 to 1 percent. Soils of the Mabank series are fine, smectitic, thermic Oxyaquic Vertic Paleustalfs.

Typical pedon of Mabank fine sandy loam, 0 to 1 percent slopes; from the intersection of Texas Highway 21 and Farm Road 141 in Old Dime Box; 7.9 miles southeast on Farm Road 141, 3.1 miles southeast on Farm Road 1697, and 250 feet southwest in improved pasture.

Ap—0 to 6 inches; light brownish gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; massive; hard, friable; common very fine and fine roots; faint iron-manganese masses lining pores; moderately acid; abrupt wavy boundary.

Btssg1—6 to 17 inches; black (10YR 2/1) clay, black (10YR 2/1) moist; moderate medium angular blocky structure; very firm, very hard; many very fine and fine roots and common coarse roots; few distinct slickensides; few distinct clay films on faces of peds; moderately acid; clear smooth boundary.

Btssg2—17 to 30 inches; black (10YR 2/1) clay, black (10YR 2/1) moist; strong coarse angular blocky structure; very firm; very hard; common fine roots; common fine pores; common distinct clay films on faces of peds; few distinct slickensides; few distinct pressure faces; about 1 percent siliceous gravel; slightly acid; gradual smooth boundary.

Btgy—30 to 50 inches; very dark gray (10 YR 3/1) clay, black (10YR 2/1) moist; moderate medium subangular blocky structure; very firm, very hard; many very fine and fine roots; common calcium sulfate crystals; few faint pressure faces; common distinct clay films; slightly acid; clear wavy boundary;

BCtgy—50 to 68 inches; dark grayish brown (10 YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; very firm, very hard; common medium distinct yellowish brown (10YR 5/4) iron concentrations; very few faint clay films on faces of peds; common calcium sulfate crystals; slightly acid; gradual wavy boundary.

2C—68 to 80 inches; light yellowish brown (10YR 6/4) sandy clay loam, yellowish brown (10YR 5/4) moist; massive; firm, very hard; few calcium sulfate crystals; slightly acid.

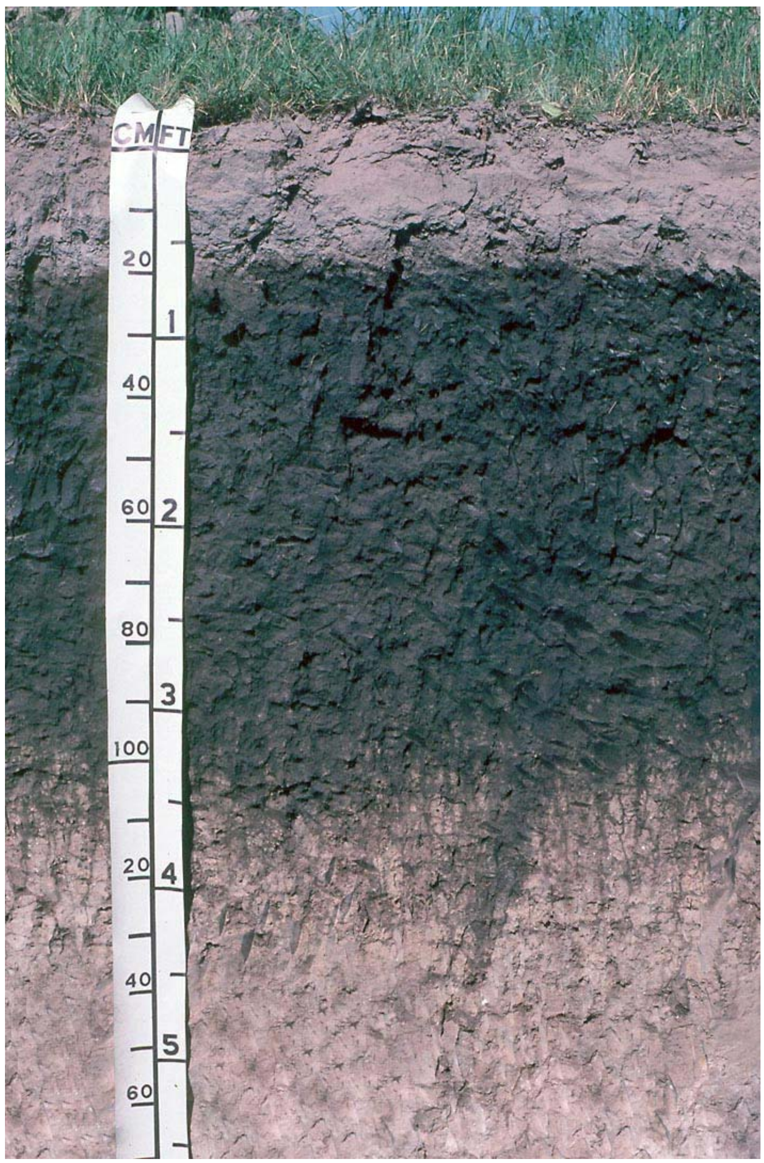


Figure 29.—Profile of Mabank fine sandy loam, 0 to 1 percent slopes. The contact of the light-colored surface layer and the dark-colored subsoil is abrupt.

The thickness of the solum ranges from 60 to more than 80 inches. The clay content of the control section of the upper Bt horizons ranges from 35 to 50 percent. Slickensides and pressure faces range from few to common throughout the argillic horizon. When the soil is dry, cracks at least 0.25 inch wide extend from the top of the Btg horizon to a depth of 24 inches or more.

The Ap horizon has hue of 10YR or 2.5Y, value of 2 to 4, and chroma of 1 or 2. It is hard or very hard and massive when dry. Siliceous gravel ranges from 0 to 5 percent in some pedons. Reaction ranges from moderately acid to neutral.

The Btssg horizons have hue of 10YR, value of 2 or 3, and chroma of 1. Texture is clay loam or clay. Redoximorphic features in shades of brown or yellow range from none to few. Reaction ranges from moderately acid to slightly alkaline.

The Btgy and BCtgy horizons have hue of 10YR or 2.5Y, value of 3 to 6, and chroma of 1 or 2. Redoximorphic features in shades of brown, yellow, or gray range from few to common. Texture is clay loam or clay. Some pedons contain 1 to 5 percent calcium sulfate crystals. Reaction ranges from moderately acid to moderately alkaline.

The 2C horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 to 6. They consist of sediments of fine sandy loam or sandy clay loam with fragments of shale. Reaction ranges from moderately acid to moderately alkaline.

Margie Series

The Margie series consists of very deep, well drained, moderately slowly permeable soils on upper and lower backslopes on ridges. These soils formed in residuum weathered from glauconitic sandstones and shales in the Weches Formation of Eocene age. Slope ranges from 1 to 3 percent. The soils of the Margie series are fine, mixed, semiactive, thermic Udic Haplustalfs.

Typical pedon of Margie fine sandy loam, 1 to 3 percent slopes; from the intersection of U.S. Highway 77 and Farm Road 696 in Lexington; 3.7 miles east on Farm Road 696, 1.0 mile south on County Road 407, 0.2 mile east on County Road 405, 0.2 mile south on ranch road, and 528 feet east in improved pasture.

Ap—0 to 9 inches; strong brown (7.5YR 5/6) fine sandy loam, strong brown (7.5YR 4/6) moist; weak fine granular structure; slightly hard, friable; many fine and few medium roots; many fine pores; moderately acid; clear smooth boundary.

Bt1—9 to 25 inches; red (2.5YR 5/6) clay, red (2.5YR 4/6) moist; moderate medium angular blocky structure parting to weak coarse prismatic; hard, firm; few fine roots; few fine pores; few distinct clay films on faces of peds; few iron-manganese concretions; about 1 percent fine ironstone gravel; neutral; gradual smooth boundary.

Bt2—25 to 34 inches; red (2.5YR 5/8) clay, red (2.5YR 4/8) moist; strong medium subangular blocky structure; very hard, firm; few fine roots; common distinct clay films on faces of peds; few iron-manganese concretions; few fine distinct yellowish brown (10YR 5/8) iron concentrations; about 2 percent fine ironstone gravel; neutral; gradual smooth boundary.

Bt3—34 to 48 inches; brownish yellow (10YR 6/8) clay, yellowish brown (10YR 5/8) moist; moderate medium subangular blocky structure; very hard, firm; few very few roots; common distinct clay films on faces of peds; few small slickensides; few red (2.5YR 4/8) iron concentrations; about 5 percent fine ironstone gravel; neutral; gradual smooth boundary.

Bt4—48 to 58 inches; brownish yellow (10YR 6/8) clay, yellowish brown (10YR 5/8) moist; moderate medium subangular blocky structure; very hard, firm; few very few roots; common distinct clay films on faces of peds; few small slickensides; few iron-manganese concretions; few dark yellowish brown (10YR 4/6) iron concentrations; neutral; gradual smooth boundary.

BCt—58 to 70 inches; brownish yellow (10YR 6/6) clay, yellowish brown (10YR 5/6) moist; weak fine subangular blocky structure; very hard, firm; few small slickensides; few faint clay films on faces of peds; few yellowish red (5YR 4/6) iron concentrations; about 30 percent partially weathered glauconitic material; neutral; gradual smooth boundary.

C—70 to 80 inches; brownish yellow (10YR 6/6) partially weathered glauconitic material, yellowish brown (10YR 5/6) moist; massive; hard, firm; few iron-manganese concretions; neutral.

The thickness of the solum ranges from 60 to 80 inches. The weighted-average clay content ranges from 35 to 50 percent. Fine ironstone gravel ranges from 0 to 10 percent throughout.

The A horizon has hue of 2.5YR to 7.5YR, value of 3 or 4, and chroma of 2 to 6. Reaction ranges from moderately acid to neutral.

The upper Bt horizon has hue of 2.5YR or 5YR, value of 3 or 4, and chroma of 4 to 6. Redoximorphic features in shades of brown or yellow range from none to common. Texture is clay loam or clay. Reaction ranges from moderately acid to neutral.

The lower Bt horizons have hue of 10R to 5YR, value of 3 to 5, and chroma of 4 to 8. Redoximorphic features in shades of red, brown, or yellow range from none to common. Texture is clay loam or clay. Reaction ranges from strongly acid to neutral.

The BCt horizon has a hue of 2.5YR to 10YR, value of 3 to 6, and chroma of 6 to 8. Redoximorphic features in shades of red, brown, or yellow range from none to common. Texture is sandy clay loam, clay loam, or clay. Reaction ranges from strongly acid to slightly alkaline.

The C horizon has colors in shades of brown or yellow. It is partially weathered glauconite sandstone, greensand, or glauconitic loamy materials. Reaction ranges from strongly acid to slightly alkaline.

Navasota Series

The Navasota series consists of very deep, somewhat poorly drained, very slowly permeable soils on flood plains. These soils formed in clayey alluvium of Holocene age. Slopes are 0 to 1 percent. The soils of the Navasota series are fine, smectitic, thermic Aeric Endoaquerts.

Typical pedon of Navasota clay, 0 to 1 percent slopes, frequently flooded; from the intersection of Texas Highway 21 and Farm Road 141 in Old Dime Box; 7.9 miles southeast on Farm Road 141, 2.6 miles northeast and southwest on Farm Road 1697, 1.1 miles southeast on County Road 125, 1.5 miles northeast and northwest on County Road 140, 0.6 mile northeast on Texas Parks and Wildlife road, and 1,000 feet north in flood plain.

A—0 to 6 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; moderate fine and medium subangular blocky structure; extremely hard, very firm; common fine roots; common fine and medium prominent strong brown (7.5YR 5/8) iron concentrations between ped faces; moderately acid; clear wavy boundary.

Bg—6 to 16 inches; gray (10YR 5/1) clay, dark gray (10YR 4/1) moist; moderate medium angular blocky structure; extremely hard, very firm; few fine roots; few fine iron-manganese concretions; many fine distinct dark yellowish brown (10YR 4/4) and few fine distinct strong brown (7.5YR 4/6) iron concentrations between ped faces; slightly acid; gradual wavy boundary.

Bssg1—16 to 31 inches; gray (10YR 6/1) clay, gray (10YR 5/1) moist; moderate medium angular blocky structure; extremely hard, very firm; few fine roots; common prominent slickensides; many fine and medium distinct dark yellowish brown (10YR 4/4) and few fine distinct strong brown (7.5YR 4/6) iron concentrations between ped faces and along old root channels; moderately acid; gradual wavy boundary.

Bssg2—31 to 55 inches; gray (10YR 6/1) clay, gray (10YR 5/1) moist; moderate medium angular blocky structure; extremely hard, very firm; few fine roots; common prominent slickensides; common fine and distinct yellowish brown (10YR 5/4) iron concentrations between ped faces; common fine faint dark gray (10YR 4/1) iron depletions between ped faces and along old root channels; slightly acid; gradual wavy boundary.

Bssgy—55 to 80 inches; gray (10YR 6/1) clay, gray (10YR 5/1) moist; weak medium angular blocky structure; extremely hard, very firm; common fine gypsum crystals; few prominent slickensides; many fine distinct yellowish brown (10YR 5/4) iron concentrations between ped faces; few medium faint grayish brown (10YR 5/2) iron depletions between ped faces and along old root channels; slightly alkaline

The thickness of the solum is more than 80 inches. The weighted-average clay content of the 10- to 40-inch control section ranges from 40 to 60 percent. Iron-manganese concretions and masses range from few to about 3 percent by volume in most pedons. When dry, the soil has cracks 0.5 to 2 inches wide that extend to a depth of 20 inches or more. Slickensides begin at a depth of 10 to 24 inches and extend throughout the solum

The A horizon has hue of 10YR, value of 2 to 5, and chroma of 1 or 2. Redoximorphic features in shades of brown or yellow range from few to common. Reaction ranges from strongly acid to neutral.

The Bg horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 3. Texture is clay. Redoximorphic features in shades of brown, yellow, or gray range from few to many. Reaction ranges from strongly acid to slightly acid.

The Bssg or Bssgy horizons have hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 3. Texture is clay. Redoximorphic features in brown, yellow, or gray range from few to many. Gypsum crystals range from none to common. Reaction ranges from strongly acid to slightly alkaline.

Normangee Series

The Normangee series consists of deep, moderately well drained, very slowly permeable soils on upper and lower backslopes on ridges. These soils formed in clayey residuum weathered from shales and thin interbedded sandstones in the Cook Mountain and Wilcox Formations of Eocene age. Slope ranges from 1 to 5 percent. The soils of the Normangee series are fine, smectitic, thermic Udertic Haplustalfs.

Typical pedon of Normangee clay loam, 1 to 5 percent slopes; from the intersection of Texas Highway 21 and Farm Road 141 in Old Dime Box; 1.3 miles southeast on Farm Road 141, 0.4 mile southwest on County Road 428, and 90 feet north in cropland.

Ap—0 to 5 inches; brown (10YR 4/3) clay loam, dark brown (10YR 3/3) moist; moderate medium subangular blocky structure; hard, firm; few fine roots; moderately acid; clear wavy boundary.

Bt—5 to 18 inches; brown (10YR 5/3) clay, brown (10YR 4/3) moist; moderate medium angular blocky structure; very hard, very firm; few fine roots; few distinct clay films on faces of peds; common distinct pressure faces; about 1 percent ironstone gravel; few fine faint yellowish brown (10YR 5/8) and few fine distinct reddish brown (5YR 4/4) iron concentrations; moderately acid; gradual wavy boundary.

Btss—18 to 32 inches; light olive brown (2.5Y 5/3) clay, olive brown (2.5Y 4/3) moist; moderate medium angular blocky structure; very hard, very firm; few very fine roots; few distinct clay films on faces of peds; common distinct slickensides; few fine distinct brown (10YR 4/3) iron concentrations; common calcium carbonate concretions and masses; about 2 percent ironstone gravel; moderately alkaline; gradual wavy boundary.

Btkss—32 to 43 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 distinct clay films on faces of peds; common distinct slickensides; few fine distinct yellowish brown (10YR 5/8) iron concentrations; common calcium carbonate concretions and masses; about 2 percent ironstone gravel; moderately alkaline; clear wavy boundary.

C—43 to 80 inches; light brownish gray (10YR 6/2) shale with thin layers of brownish yellow (10YR 6/8) weakly cemented sandstone; massive; very hard, firm; moderately alkaline.

The thickness of the solum ranges from 40 to 60 inches. The clay content of the control section ranges from 40 to 50 percent. The soil has cracks 0.5 inch wide to a depth of more than 20 inches when dry. Siliceous and ironstone gravel ranges from 0 to 10 percent throughout. Depth to secondary carbonates is greater than 30 inches.

The A horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 2 to 4. Reaction ranges from moderately acid to neutral.

The upper part of the Bt horizon has hue of 5YR to 10YR, value of 4 or 5, and chroma of 3 or 4. Redoximorphic features in shades of red or brown range from few to common. Texture is clay. Reaction ranges from moderately acid to moderately alkaline.

The lower Btss and Btkss horizons have hue of 10YR or 2.5Y, value of 3 to 6, and chroma of 3 to 6. Redoximorphic features in shades of yellow, brown, or red range from few to common. Texture is clay or clay loam. Reaction ranges from slightly acid to moderately alkaline.

The C horizon has colors in shades of brown, yellow, or gray. It is weakly consolidated shale. Some pedons contain thin layers of weakly cemented sandstone. Reaction ranges from neutral to moderately alkaline.

Padina Series

The Padina series consists of very deep, well drained, moderately permeable soils on summit, shoulder, and upper backslopes on broad ridges. These soils formed in sandy residuum weathered from Eocene sandstones, including Sparta, Queen City, Carrizo, and Simsboro Sands. Slope ranges from 1 to 15 percent. The soils of the Padina series are loamy, siliceous, active, thermic Grossarenic Paleustalfs.

Typical pedon of Padina loamy fine sand, 1 to 5 percent slopes; from intersection of U.S. Highway 77 and Farm Road 696 in Lexington; 2.5 miles east on Farm Road 696, 1.1 miles south on County Road 408, 1.2 miles east on County Road 405, 0.25 mile south on oilfield road, and 110 feet east in improved pasture.

A—0 to 7 inches; brown (10YR 5/3) loamy fine sand, dark grayish brown (10YR 4/2) moist; weak fine granular structure; soft, very friable; common fine and medium roots; slightly acid; clear smooth boundary.

E1—7 to 26 inches; very pale brown (10YR 7/3) loamy fine sand, pale brown (10YR 6/3) moist; weak fine granular structure; soft, very friable; common fine and medium roots; neutral; clear smooth boundary.

E2—26 to 57 inches; very pale brown (10YR 8/3) loamy fine sand, light yellowish brown (10YR 6/4) moist; weak fine granular structure; soft, very friable; few medium roots; neutral; clear wavy boundary.

Bt1—57 to 72 inches; very pale brown (10YR 8/2) sandy clay loam, light gray (10YR 7/2) moist; moderate medium subangular blocky structure; hard, firm; few fine roots; few distinct clay films on faces of peds; common coarse prominent red (2.5YR 4/6) and few fine distinct strong brown (7.5YR 5/8) iron concentrations; very strongly acid; clear wavy boundary.

Bt2—72 to 80 inches; reddish yellow (5YR 6/8) sandy clay loam, yellowish red (5YR 5/8) moist; moderate medium subangular blocky structure; hard, friable; few distinct clay films on faces of peds; common fine distinct reddish yellow (5YR 6/6) iron concentrations; few fine prominent light brownish gray (10YR 6/2) iron depletions; very strongly acid.

The thickness of the solum is more than 80 inches. The combined thickness of the A and E horizons is 40 to 80 inches. Reaction ranges from moderately acid to neutral.

The A horizon has hue of 10YR, value of 4 to 7, and chroma of 2 to 4.

The E horizons have hue of 7.5YR or 10YR, value of 5 to 8, and chroma of 2 to 6. Texture is fine sand or loamy fine sand.

The Bt horizons have hue of 5YR to 10YR, value of 5 to 8, and chroma of 1 to 8. Redoximorphic features in shades of red, brown, yellow, or gray range from few to many. Texture is fine sandy loam or sandy clay loam with weighted-average clay content ranging from 18 to 35 percent. Reaction ranges from strongly acid to slightly acid.

Rader Series

The Rader series consists of very deep, moderately well drained, very slowly permeable soils on high stream terraces. These soils formed in loamy alluvium of Quaternary age. Slope ranges from 1 to 3 percent. The soils of the Rader series are fine-loamy, mixed, semiactive, thermic Aquic Paleustalfs.

Typical pedon of Rader fine sandy loam, 1 to 3 percent slopes; from the intersection of Loop 123 and Farm Road 1624 in Lexington, Texas; 5.5 miles southwest on Farm Road 1624; 2.2 miles southwest on County Road 322; 0.8 miles southwest on County Road 331; 150 feet north in hayland.

Ap—0 to 7 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 5/3) moist; weak fine granular structure; slightly hard, very friable; common fine roots; common pores; few fine distinct strong brown (7.5YR 5/6) iron concentrations; slightly acid; clear smooth boundary.

E1—7 to 20 inches; very pale brown (10YR 7/4) fine sandy loam, light yellowish brown (10YR 6/4) moist; weak medium subangular structure; slightly hard, very friable; common fine roots; common pores; common fine faint pale brown (10YR 6/3) iron concentrations; moderately acid; gradual wavy boundary.

E2—20 to 27 inches; very pale brown (10YR 8/3) fine sandy loam, very pale brown (10YR 7/3) moist; weak medium subangular blocky structure; slightly hard, very friable; few fine roots; few pores; moderately acid; gradual wavy boundary.

Bt/E—27 to 32 inches; yellow (10YR 7/6) sandy clay loam (Bt part), brownish yellow (10YR 6/6) moist; 30 percent of horizon is tongues of light brownish gray (10YR 6/2) fine sandy loam (E part); moderate medium subangular blocky structure; hard, firm; few fine roots; common medium distinct yellowish brown (10YR 5/6) iron concentrations; very strongly acid; gradual wavy boundary.

Btg1—32 to 54 inches; light brownish gray (10YR 6/2) clay loam, grayish brown (10YR 5/2) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; very hard, very firm; few prism faces coated with dark grayish brown (10YR 4/2) distinct clay films; few fine roots on prism faces; few pressure faces; common medium prominent red (2.5YR 4/6) and yellowish brown (10YR 5/8) iron concentrations; very strongly acid; gradual wavy boundary.

Btg2—54 to 80 inches; very pale brown (10YR 8/2) clay loam, light gray (10YR 7/2) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; very hard, very firm; few prism faces coated with dark grayish brown (10YR 4/2) and light brownish gray (10YR 6/2) distinct clay films; few fine roots on prism faces; common coarse distinct brownish yellow (10YR 6/8) and few fine prominent red (2.5YR 4/6) iron concentrations; very strongly acid;

The thickness of the solum is more than 80 inches. The weighted-average clay content of the upper 20 inches of the Bt horizons ranges from 28 to 35 percent.

The A horizon has hue of 10YR, value of 4 to 6, and chroma of 2 to 4.

The E horizon has hue of 10YR, with value of 6 to 8, and chroma of 2 to 4. Reaction of the A and E horizons ranges from very strongly acid to slightly acid.

The Bt/E horizon is 70 to 85 percent Bt materials. The Bt portion has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 4 to 8. Texture is loam or sandy clay loam. The E portion has hue of 10YR, value of 6 to 8, and chroma of 1 to 4. Texture is fine sandy loam or loam. The E material occurs as coatings on peds and in pockets. Reaction ranges from very strongly acid to slightly acid.

The Btg horizons have hue of 7.5YR or 10YR, value of 5 to 7, and chroma of 1 to 4. Redoximorphic features in shades of red, brown, yellow, or gray range from few to many. Texture is clay loam, sandy clay, or clay. Reaction is very strongly acid or strongly acid.

Rehburg Series

The Rehburg series consists of deep, moderately well drained, very slowly permeable soils on summit, shoulder, and upper backslopes on ridges. These soils formed in residuum weathered from tuffaceous shales, sandstones, and siltstones in the Jackson Group of Eocene age. Slope ranges from 1 to 5 percent. The soils of the Rehburg series are loamy, mixed, active, thermic Aquic Arenic Paleustalfs.

Typical pedon of Rehburg loamy fine sand, 1 to 5 percent slopes; from the intersection of U.S. Highway 290 and Farm Road 180, 6.8 miles east of Giddings; 9.3 miles northeast on Farm Road 180, 750 feet northwest on oilfield road, and 300 feet north in improved pasture.

Ap—0 to 5 inches; pale brown (10YR 6/3) loamy fine sand, brown (10YR 4/3) moist; weak fine granular structure; loose, very friable; many fine and medium roots; moderately acid; clear smooth boundary.

E1—5 to 17 inches; pale brown (10YR 6/3) loamy fine sand, brown (10YR 5/3) moist; single grained; loose, very friable; common fine and medium roots; strongly acid; clear smooth boundary.

E2—17 to 25 inches; very pale brown (10YR 7/3) loamy fine sand, pale brown (10YR 6/3) moist; single grained; loose, very friable; common fine and medium roots; strongly acid; abrupt wavy boundary.

Btg1—25 to 37 inches; light brownish gray (2.5Y 6/2) sandy clay loam, grayish brown (2.5Y 5/2) moist; moderate medium subangular blocky structure; hard, firm; few fine roots; few distinct clay films on faces of peds; common medium distinct dark yellowish brown (10YR 4/4) and common fine prominent red (2.5YR 5/8) iron concentrations; very strongly acid; clear wavy boundary.

Btg2—37 to 44 inches; light gray (2.5Y 7/2) sandy clay loam, light brownish gray (10YR 6/2) moist; moderate medium subangular structure; hard, firm; few fine roots; few distinct clay films on faces peds; common medium prominent red (2.5YR 4/6) and few medium distinct strong brown (7.5YR 5/6) iron concentrations; very strongly acid; clear wavy boundary.

Cr—44 to 60 inches; weakly cemented tuffaceous sandstone and siltstone; massive; very hard, very firm.

The thickness of the solum ranges from 40 to 60 inches which corresponds to depth to paralithic contact. The combined thickness of the A and E horizons ranges from 20 to 40 inches.

The A horizon has hue of 10YR, value 4 to 7, and chroma of 1 to 3. Reaction ranges from strongly acid to neutral.

The E horizon has hue of 10YR, value of 4 to 7, and chroma of 1 to 3. Texture is loamy fine sand. Some pedons contain few redoximorphic features in shades of brown or yellow in the lower portion. Reaction ranges from strongly acid to neutral.

The Btg horizons have hue of 10YR or 2.5Y, value of 4 to 7, and chroma of 2. Redoximorphic features in shades of red, brown, or yellow range from few to many. Texture is sandy clay loam or clay loam. The weighted-average clay content of the control section ranges from 25 to 35 percent. Reaction ranges from very strongly acid to slightly acid.

The Cr horizon is weakly cemented tuffaceous sandstone, siltstone and tuffaceous clays.

Robco Series

The Robco series consists of very deep, moderately well drained, slowly permeable soils on footslopes and toeslopes of ridges. These soils formed in sandy residuum and colluvium weathered from Eocene sandstones, including Sparta, Queen City, Carrizo, and Simsboro Sands. Slope ranges from 1 to 3 percent. The soils of the Robco series are loamy, siliceous, active, thermic Aquic Arenic Paleustalfs.

Typical pedon of Robco loamy fine sand, 1 to 3 percent slopes; from the intersection of Farm Road 696 and Loop 123 in Lexington; 1.1 miles west on Farm Road 696, 4.4 miles northwest on Farm Road 112, 2.6 miles north on County Road 315, 0.8 mile southeast on County Road 318, and 500 feet southwest in improved pasture.

Ap—0 to 6 inches; brown (10YR 5/3) loamy fine sand, brown (10YR 4/3) moist; weak fine granular structure; soft, very friable; many fine roots; moderately acid; clear smooth boundary.

E1—6 to 13 inches; pale brown (10YR 6/3) loamy fine sand, brown (10YR 5/3) moist; weak fine granular structure; soft, very friable; many fine roots; strongly acid; gradual smooth boundary.

E2—13 to 23 inches; light gray (10YR 7/2) loamy fine sand, pale brown (10YR 6/3) moist; single grained; loose, very friable; common fine roots; strongly acid; gradual wavy boundary.

Bt/E—23 to 28 inches; brownish yellow (10YR 6/6) sandy clay loam (Bt part), yellowish brown (10YR 5/6) moist; 40 percent of horizon is tongues of light gray (10YR 7/2) loamy fine sand (E part); common fine and medium distinct light brownish gray (10YR 6/2) iron depletions; common fine distinct brownish yellow (10YR 6/6) iron concentrations; weak fine and medium subangular blocky structure; slightly hard, friable; common fine roots; few distinct clay films and sand bridging along the faces of peds; strongly acid; gradual wavy boundary.

Btg1—28 to 36 inches; light brownish gray (10YR 6/2) sandy clay loam, grayish brown (10YR 5/2) moist; weak medium subangular blocky structure; very hard, friable; few fine roots; few distinct clay films and sand bridging along the faces of peds; many fine and medium distinct strong brown (7.5YR 5/8) and few fine prominent red (2.5YR 4/8) iron concentrations; very strongly acid; gradual wavy boundary.

Btg2—36 to 44 inches; light gray (10YR 7/2) sandy clay loam, light brownish gray (10YR 6/2) moist; weak coarse prismatic structure parting to weak medium subangular blocky structure; very hard, friable; few fine roots; few distinct clay films and sand bridging along the faces of peds; common fine and medium distinct brownish yellow (10YR 6/8) and few fine and medium prominent red (2.5YR 4/8) iron concentrations; very strongly acid; clear wavy boundary.

Btg3—44 to 57 inches; light gray (10YR 7/2) sandy clay loam, light brownish gray (10YR 6/2) moist; weak coarse prismatic structure; very hard, friable; few fine roots; few distinct clay films and sand bridging along the faces of peds; few fine faint brownish yellow (10YR 6/6) iron concentrations; very strongly acid; gradual wavy boundary.

BCtg—57 to 80 inches; light gray (10YR 7/2) sandy clay loam, light brownish gray (10YR 6/2) moist; weak coarse prismatic structure; very hard, friable; few faint clay films on faces of peds; common medium and coarse distinct brownish yellow (10YR 6/8) and strong brown (7.5YR 5/8) iron concentrations; very strongly acid.

The thickness of the solum is more than 80 inches. The average clay content of the upper 20 inches of the Bt horizon ranges from 25 to 35 percent. The combined thickness of the A and E horizons ranges from 20 to 40 inches.

The A horizon has hue of 7.5YR or 10YR, value of 4 to 7, and chroma of 3 or 4. Reaction ranges from strongly acid to slightly acid.

The E horizon has hue of 7.5YR or 10YR, value of 5 to 7, and chroma of 2 to 4. Redoximorphic features in shades of yellow or gray range from none to common. Reaction ranges from very strongly acid to moderately acid.

The Bt/E horizon is 60 to 90 percent by volume B material. The Bt part has hue of 10YR, value of 5 to 7, and chroma of 4 to 6. Texture is loam or sandy clay loam. The E material consists of streaks, interfingers, or pockets. The E part has hue of 10YR, value of 6 to 8, and chroma of 1 to 4. Texture is fine sand or loamy fine sand. Redoximorphic features in shades of red, brown, yellow, or gray range from few to common. Reaction ranges from very strongly acid to slightly acid.

The Bt horizons have hue of 7.5YR to 2.5Y, value of 4 to 7, and chroma of 2 to 6. Redoximorphic features in shades of red, yellow, brown, and gray range from few to many. Texture of the upper Bt horizons is sandy clay loam or clay loam. Texture of the lower Bt horizons is sandy clay loam, clay loam, or clay. Reaction ranges from very strongly acid to moderately acid.

The BCt horizon, where present, has hue of 7.5YR to 2.5Y, value of 4 to 7, and chroma of 1 to 8. Redoximorphic features in shades of red, brown, yellow, or gray range from few to many. Texture ranges from sandy clay loam to clay. Reaction ranges from very strongly acid to neutral. Some pedons contain gypsum crystals.

Rosanky Series

The Rosanky series consists of deep, well drained, moderately slowly permeable soils on summit, shoulder, and upper backslopes on ridges. These soils formed in residuum weathered from weakly cemented sandstones with minor shale interbeds in the Reklaw and Cook Mountain Formations. Slope ranges from 1 to 5 percent. The soils of the Rosanky series are fine, mixed, semiactive, thermic Ultic Paleustalfs.

Typical pedon of Rosanky fine sandy loam, 1 to 5 percent slopes; from the intersection of Loop 123 and Farm Road 1624 in Lexington; 6.7 miles southwest on Farm Road 1624, 1.2 miles west on County Road 335, 0.4 mile north west on farm trail, and 1,500 feet west in improved pasture.

Ap—0 to 5 inches; brown (7.5YR 5/4) fine sandy loam, brown (7.5YR 4/4) moist; weak fine granular structure; slightly hard, very friable; many fine and medium roots; slightly acid; clear smooth boundary.

E—5 to 10 inches; very pale brown (10YR 7/4) fine sandy loam, light yellowish brown (10YR 6/4) moist; weak medium subangular blocky structure; slightly hard, very friable; common fine and medium roots; about 1 percent fine ironstone gravel; slightly acid; abrupt smooth boundary.

Bt1—10 to 17 inches; red (2.5YR 5/6) clay, red (2.5YR 4/6) moist; moderate medium subangular blocky structure parting to weak coarse prismatic; very hard, firm; few fine roots; few fine pores; few distinct clay films on faces of peds; few medium distinct yellowish brown (10YR 5/6) iron concentrations; strongly acid; clear smooth boundary.

Bt2—17 to 35 inches; red (2.5YR 5/6) clay, red (2.5YR 4/6) moist; moderate medium subangular blocky structure; very hard, firm; few fine roots; common distinct clay films on faces of peds; few fine distinct yellowish brown (10YR 5/8) iron concentrations; strongly acid; clear smooth boundary.

BCt—35 to 43 inches; reddish yellow (5YR 6/6) clay loam, yellowish red (5YR 5/6) moist; weak fine subangular blocky structure; very hard, firm; few fine roots; few faint clay films on faces of peds; few brownish yellow (10YR 6/6) iron concentrations; about 30 percent thin strata of pinkish gray (7.5YR 6/2) shale and reddish yellow (7.5YR 6/6) weakly cemented sandstone; strongly acid; gradual smooth boundary.

Cr—43 to 80 inches; reddish yellow (7.5YR 6/6) weakly cemented sandstone with thin strata of pinkish gray (7.5YR 6/2) shale; massive; strongly acid.

The thickness of the solum ranges from 40 to 60 inches. The average clay content of the control section ranges from 35 to 50 percent.

The A horizon has hue of 5YR to 10YR, value of 4 or 5, and chroma of 2 to 4. The E horizon has hue of 5YR to 10YR, value of 5 to 7, and chroma of 2 to 4. Ironstone gravel ranges from 0 to 10 percent in the A and E horizons. Reaction ranges from strongly acid to slightly acid.

The Bt horizon has hue of 2.5YR or 5YR, with value of 4 to 6, and chroma of 6 or 8. Redoximorphic features in shades of red, brown, or yellow range from none to few. Texture is clay loam or clay. Reaction is strongly acid or moderately acid.

The BCt horizon has hue of 2.5YR to 10YR, value of 5 to 7, and chroma of 6 or 8. Mottles in shades of red, brown, yellow, or gray range from none to common. Texture is sandy clay loam or clay loam. Reaction is strongly acid or moderately acid.

The Cr horizon is weakly to strongly cemented sandstone. It is in shades of red or brown. Some pedons contain thin strata of shale. Reaction is strongly acid or moderately acid.

Sandow Series

The Sandow series consists of very deep, moderately well drained, moderately slowly permeable soils on flood plains. These soils formed in loamy alluvium of Holocene age. Slopes are 0 to 1 percent. The soils of the Sandow series are fine-loamy, siliceous, superactive, thermic Udifluventic Haplustepts.

Typical pedon of Sandow loam, 0 to 1 percent slopes, frequently flooded; from the intersection of Texas Highway 21 and Farm Road 141 in Old Dime Box; 7.9 miles southeast on Farm Road 141, 3.3 miles northeast and southeast on Farm Road 1697, 300 feet southwest on oil field road, and 250 feet north in flood plain.

A—0 to 7 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; very hard, firm; common fine and medium roots; slightly acid; clear smooth boundary.

Bw—7 to 14 inches; brown (10YR 5/3) clay loam, brown (10YR 4/3) moist; moderate fine subangular blocky structure; very hard, firm; few fine and medium roots; slightly acid; clear smooth boundary.

2Ab—14 to 20 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine subangular blocky structure parting to weak coarse prismatic; hard, firm; few fine and medium roots; slightly acid; clear smooth boundary.

2Bwb—20 to 24 inches; brown (10YR 5/3) sandy clay loam, brown (10YR 4/3) moist; weak coarse prismatic structure; hard, firm; few fine roots; few fine distinct reddish yellow (7.5YR 6/6) iron concentrations; neutral; clear smooth boundary.

3Ab1—24 to 42 inches; dark grayish brown (10YR 4/2) sandy clay loam, very dark grayish brown (10YR 3/2) moist; moderate coarse prismatic structure; slightly hard, friable; few fine roots; few fine distinct reddish yellow (7.5YR 6/8) iron concentrations; slightly acid; clear smooth boundary.

3Ab2—42 to 61 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure; slightly hard, friable; few fine roots; slightly acid; clear smooth boundary.

3Ab3—61 to 80 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular structure; hard, firm; common fine distinct strong brown (7.5YR 5/6) iron concentrations; slightly acid.

The thickness of the solum is more than 80 inches. The average clay content of the 10- to 40-inch control section ranges from 18 to 35 percent. Buried A horizons are in the control section of most pedons.

The A horizons have hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 1 to 3. Horizons with dark colors are less than 9 inches thick. Reaction ranges from moderately acid to neutral.

The Bw or Bwb horizons have hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 3 to 6. Redoximorphic features in shades of red, brown, or yellow range from few to many. Pedons that have iron depletions depicting aquic soil conditions in shades of gray, usually occur below a depth of 40 inches. Texture is fine sandy loam, loam, sandy clay loam, or clay loam. Reaction ranges from moderately acid to slightly alkaline.

Buried A horizons have hue of 10YR, value of 3 or 4, and chroma of 1 to 3. Texture is fine sandy loam, loam, sandy clay loam, or clay loam. Reaction is slightly acid or neutral.

Silawa Series

The Silawa series consists of very deep, well drained, moderately permeable soils on stream terraces. These soils formed in sandy alluvium of Quaternary and Holocene age. Slope ranges from 1 to 5 percent. The soils of the Silawa series are fine-loamy, siliceous, semiactive, thermic Ultic Haplustalfs.

Typical pedon of Silawa loamy fine sand, 1 to 5 percent slopes; from intersection of Texas Highway 21 and U.S. Highway 77, 4.0 miles north on U.S. Highway 77, and 100 feet west in hayland.

Ap—0 to 10 inches; light brown (7.5YR 6/4) loamy fine sand, brown (7.5YR 5/4) moist; weak fine granular structure; slightly hard, very friable; common fine roots; strongly acid; clear smooth boundary.

E—10 to 15 inches; pink (7.5YR 7/4) loamy fine sand, light brown (7.5YR 6/4) moist; weak fine granular structure; slightly hard, very friable; common fine roots; moderately acid; clear smooth boundary.

Bt1—15 to 27 inches; red (2.5YR 5/6) sandy clay loam, red (2.5YR 4/6) moist; moderate medium subangular blocky structure; very hard, firm; common fine roots; few distinct clay films on faces of peds; moderately acid; gradual smooth boundary.

Bt2—27 to 43 inches; red (2.5YR 5/8) sandy clay loam, red (2.5YR 4/8) moist; moderate medium subangular blocky structure; very hard, firm; few fine roots; common distinct clay films on faces of peds; moderately acid; clear smooth boundary.

Bt3—43 to 57 inches; reddish yellow (5YR 6/8) sandy clay loam, yellowish red (5YR 5/8) moist; moderate medium subangular blocky structure; hard, firm; few distinct clay films on faces of peds; moderately acid; clear smooth boundary.

BCt—57 to 80 inches; reddish yellow (7.5YR 6/8) fine sandy loam, strong brown (7.5YR 5/8) moist; weak medium subangular blocky structure; slightly hard, friable; few faint clay films on faces of peds; moderately acid.

The thickness of the solum ranges from 40 to 60 inches. The average clay content of the upper 20 inches of the Bt horizon ranges from 18 to 35 percent. Siliceous gravel ranges from 0 to 10 percent throughout the solum. Base saturation ranges from 53 to 75 percent throughout the Bt horizons.

The A horizon has hue of 7.5YR or 10YR, value of 4 to 6, chroma of 2 to 4. The E horizon has colors with values or chroma, 1 to 2 units higher. Texture is loamy fine sand or fine sandy loam. Reaction ranges from strongly acid to slightly acid.

The Bt horizons have hue of 2.5YR to 7.5YR, value 4 to 6, chroma of 4 to 8. Some pedons have a few iron concentrations in shades of red or brown in the lower horizons. Texture is sandy clay loam or clay loam. Reaction ranges from very strongly acid to moderately acid.

The BCt horizon has hue of 2.5YR to 7.5YR, value 4 to 6, chroma of 4 to 8. Some pedons have a few iron concentrations in shades of red or brown in the lower horizons. Texture is sandy clay loam or fine sandy loam. Reaction ranges from very strongly acid to moderately acid.

Silstid Series

The Silstid series consists of very deep, well drained, moderately permeable soils on summit, shoulder, and upper backslopes on ridges. These soils formed in sandy residuum weathered from Eocene sandstones, including Sparta, Queen City, Carrizo, and Simsboro Sands. Slope ranges from 1 to 8 percent. The soils of the Silstid series are loamy, siliceous, semiactive, thermic Arenic Paleustalfs.

Typical pedon of Silstid loamy fine sand, 1 to 5 percent slopes; from the intersection of U.S. Highway 77 and Farm Road 696 in Lexington; 5.9 miles east on Farm Road 696, 1.3 miles south on County Road 406, 0.9 mile south and southwest on farm trail, and 80 feet east in improved pasture.

Ap—0 to 7 inches; brown (10YR 5/3) loamy fine sand, brown (10YR 4/3) moist; weak fine granular structure; soft, very friable; many fine and medium roots; slightly acid; clear smooth boundary.

E—7 to 23 inches; very pale brown (10YR 7/4) loamy fine sand, light yellowish brown (10YR 6/4) moist; weak fine granular structure; soft, very friable; many fine and common medium roots; slightly acid; abrupt smooth boundary.

Bt1—23 to 37 inches; brownish yellow (10YR 6/8) sandy clay loam, yellowish brown (10YR 5/8) moist; moderate medium subangular blocky structure; slightly hard, firm; common fine roots; few distinct clay films on faces of peds; common medium prominent red (2.5YR 5/8) iron concentrations; moderately acid; gradual smooth boundary.

Bt2—37 to 49 inches; yellow (10YR 7/8) sandy clay loam, brownish yellow (10YR 6/8) moist; moderate medium subangular blocky structure; slightly hard, firm; few fine roots; common distinct clay films on faces of peds; common coarse prominent red (2.5YR 5/8) iron concentrations; strongly acid; gradual smooth boundary.

Bt3—49 to 63 inches; light red (2.5YR 6/8) sandy clay loam, red (2.5YR 5/8) moist; moderate coarse prismatic structure; slightly hard, firm; few fine roots; common distinct clay films on faces of peds; few medium distinct brownish yellow (10YR 6/8) iron concentrations; few fine prominent light brownish gray (10YR 6/2) iron depletions; strongly acid; gradual smooth boundary.

Bt4—63 to 73 inches; light red (2.5YR 6/8) sandy clay loam, red (2.5YR 5/8) moist; weak coarse prismatic structure; slightly hard, friable; common distinct clay films on faces of peds; common medium prominent light brownish gray (10YR 6/2) iron depletions; common fine distinct brownish yellow (10YR 6/8) iron concentrations; strongly acid; gradual smooth boundary.

BCt—73 to 80 inches; light red (2.5YR 6/8) sandy clay loam, red (2.5YR 5/8) moist; weak coarse prismatic structure; slightly hard, friable; few faint clay films on faces of peds; fragments of strong brown (7.5YR 5/8) weakly cemented sandstone makes up about 30 percent of horizon; common medium prominent light brownish gray (10YR 6/2) iron depletions; few medium prominent light gray (10YR 7/2) pockets of uncoated sand; strongly acid.

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.

The A horizon has hue of 7.5YR or 10YR, value of 4 to 7, and chroma of 2 to 4. The E horizon has hue of 7.5YR or 10YR, value of 5 to 7, and chroma of 2 to 4. Reaction ranges from moderately acid to neutral.

The upper Bt horizons have hue of 7.5YR or 10YR, value of 5 to 7, and chroma of 6 to 8. Redoximorphic features in shades of red, brown, or yellow range from few to many. Reaction ranges from strongly acid to slightly acid.

The lower Bt horizons have hue of 2.5YR to 10YR, value of 4 to 8, and chroma of 2 to 6. Redoximorphic features in colors of red, yellow, or gray range from few to many. Texture is loam or sandy clay loam. Reaction ranges from strongly acid to slightly acid.

Singleton Series

The Singleton series consists of moderately deep, moderately well drained, very slowly permeable soils on footslope and toeslopes on broad ridges. These soils formed in residuum weathered from tuffaceous sandstones, shales, and siltstones in the Jackson Group of Eocene age. Slope ranges from 1 to 5 percent. The soils of the Singleton series are fine, smectitic, thermic Udic Paleustalfs.

Typical pedon of Singleton fine sandy loam, 1 to 5 percent slopes; from the intersection of U.S. Highway 290 and Farm Road 180, 6.6 miles east of Giddings; 3.6

miles north on Farm Road 180, 0.4 mile east on oilfield road, and 2,000 feet northeast in improved pasture.

Ap—0 to 5 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; very hard, friable; common fine and medium roots; moderately acid; abrupt smooth boundary.

Bt1—5 to 14 inches; brown (10YR 4/3) clay, dark brown (10YR 3/3) moist; moderate coarse angular blocky structure; extremely hard, very firm; common medium roots; few distinct clay films on faces of peds; few small slickensides; few pressure faces; few fine distinct strong brown (7.5YR 5/6) iron concentrations; very strongly acid; clear smooth boundary.

Bt2—14 to 24 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; moderate coarse angular blocky structure; extremely hard, very firm; few fine and medium roots; few distinct clay films on faces of peds; few small slickensides; few fine faint dark yellowish brown (10YR 4/4) iron concentrations; very strongly acid; clear smooth boundary.

Bt3— 24 to 37 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; few fine roots; few gypsum crystals; few distinct clay films on faces of peds; few fine faint dark yellowish brown (10YR 4/4) iron concentrations; moderately acid; clear smooth boundary.

Cr—37 to 60 inches; pale yellow (2.5Y 7/4) weakly cemented tuffaceous sandstone; massive; very hard, very firm.

The thickness of the solum and the depth to a paralithic contact ranges from 20 to 40 inches. The weighted-average clay content of the upper 20 inches of the Bt horizon ranges from 35 to 45 percent. Siliceous gravel ranges from 0 to 10 percent in the surface layer of some pedons.

The A horizon has hue of 7.5YR or 10YR, value of 4 to 8, and chroma of 2 or 3. Reaction ranges from strongly acid to slightly acid.

The Bt horizon has hue of 7.5YR to 2.5Y, value of 4 to 6, and chroma of 3 or 4. Redoximorphic features in shades of brown or yellow range from few to common. Texture is clay loam or clay. Reaction ranges from very strongly acid to moderately acid.

The Cr horizon is weakly cemented tuffaceous sandstone, mudstone, or siltstone. Concretions of calcium carbonate range from none to few.

Spiller Series

The Spiller series consists of very deep, moderately well drained, slowly permeable soils on summit, shoulder, and upper backslopes on ridges. These soils formed in residuum weathered from interbedded sandstones and shales in the Cook Mountain Formation of Eocene age. Slope ranges from 1 to 5 percent. The soils of the Spiller series are fine, mixed, semiactive, thermic Ultic Paleustalfs.

Typical pedon of Spiller fine sandy loam, 1 to 5 percent slopes; from the intersection of U.S. Highway 77 and U.S. Highway 290 in Giddings; 0.3 mile south on U.S. Highway 77, 4.8 miles southwest on Farm Road 448, 3.7 miles west on Farm Road 2239, 900 feet north on private ranch road, and 75 feet east of road in improved pasture.

Ap—0 to 10 inches; light yellowish brown (10YR 6/4) fine sandy loam, yellowish brown (10YR 5/4) moist; weak fine granular structure; hard, friable; common fine and medium roots; slightly acid; clear smooth boundary.

Bt1—10 to 19 inches; yellowish brown (10YR 5/6) clay, dark yellowish brown (10YR 4/6) moist; moderate medium subangular blocky structure; hard, firm; common fine roots; common distinct clay films on faces of peds; common fine prominent red (2.5YR 4/6) and common fine faint brownish yellow (10YR 6/8) iron concentrations; slightly acid; clear smooth boundary.

Bt2—19 to 27 inches; brownish yellow (10YR 6/6) clay, yellowish brown (10YR 5/6) moist; moderate medium subangular blocky structure; hard, firm; common fine roots; common distinct clay films on faces of peds; common medium prominent red (2.5YR 4/6) iron concentrations; slightly acid; clear smooth boundary.

Bt3—27 to 47 inches; light yellowish brown (10YR 6/4) clay, yellowish brown (10YR 5/4) moist; weak coarse angular blocky structure; very hard, firm; common fine roots; common distinct pressure faces; common distinct clay films on faces of peds; moderately acid; clear smooth boundary.

BCt—47 to 58 inches; light yellowish brown (10YR 6/4) clay loam, yellowish brown (10YR 5/4) moist; weak medium subangular blocky structure; hard, firm; few faint clay films on faces of peds; thin layers of light brownish gray (10YR 6/2) shale; slightly acid; clear smooth boundary.

C—58 to 80 inches; light brownish gray (10YR 6/2) shale with reddish yellow (7.5YR 6/8) loamy strata; massive; moderately alkaline.

The thickness of the solum ranges from 40 to 60 inches. The average clay content of the upper 20 inches of the Bt horizon ranges from 35 to 45 percent. Base saturation ranges from 35 to 75 percent throughout the argillic horizon.

The A horizon has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 3 or 4. Siliceous and ironstone gravel ranges from 0 to 10 percent by volume in some pedons. Where present, the E horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 3 to 6. Reaction ranges from moderately acid to neutral.

The Bt horizon has hue of 10YR, value of 4 to 6, and chroma of 3 to 8. Iron concentrations in shades of red, brown, or yellow range from few to many. Texture is clay loam, sandy clay, or clay. Reaction ranges from strongly acid to neutral.

The BCt horizon has hue of 2.5Y to 10R, value of 4 to 6, and chroma of 1 to 8. Redoximorphic features in shades of red, brown, yellow, or gray range from few to many. Texture is clay loam or clay. Reaction ranges from strongly acid to slightly acid.

The C horizon is shale with texture of loam or sandy clay loam in shades of red, brown, or yellow with thin strata of gray shale 1 to 5 inches thick. Reaction ranges from strongly acid to moderately alkaline.

Tabor Series

The Tabor series consists of very deep, moderately well drained, very slowly permeable soils on stream terraces and dissected relict stream terraces. These soils formed in loamy and clayey alluvium of Quaternary age. Slope ranges from 1 to 3 percent. The soils of the Tabor series are fine, smectitic, thermic Oxyaquic Vertic Paleustalfs.

Typical pedon of Tabor fine sandy loam, 1 to 3 percent slopes; from the intersection of Texas Highway 21 and Farm Road 141 in Old Dime Box; 8.4 miles southeast on Farm Road 141, 1.5 miles southeast on County Road 123, 700 feet northeast on County Road 127, and 280 feet east in improved pasture.

Ap—0 to 9 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 5/3) moist; weak fine granular structure; hard, friable; many fine roots; moderately acid; clear smooth boundary.

E—9 to 15 inches; very pale brown (10YR 7/3) fine sandy loam, pale brown (10YR 6/3) moist; weak fine subangular structure; hard, friable; common fine roots; slightly acid; abrupt wavy boundary.

Btssg1—15 to 27 inches; light brownish gray (10YR 6/2) clay, grayish brown (10YR 5/2) moist; moderate medium angular blocky structure; very hard, very firm; common fine roots; common distinct pressure faces; few small slickensides; common medium distinct yellowish brown (10YR 5/6) and few fine prominent red (2.5YR 4/8) iron concentrations; strongly acid; gradual wavy boundary.

Btssg2—27 to 32 inches; light gray (10YR 7/2) clay, light brownish gray (10YR 6/2) moist; moderate coarse angular blocky structure; very hard very firm; common fine roots; common distinct slickensides; common distinct pressure faces; many coarse distinct brownish yellow (10YR 6/8) iron concentrations; neutral; gradual wavy boundary.

Bt—32 to 50 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; weak coarse prismatic structure parting to moderate coarse angular blocky; very hard, very firm; few fine roots; dark grayish brown (10YR 4/2) clay films on vertical faces of peds; neutral; gradual boundary.

Btg—50 to 70 inches; light gray (10YR 7/2) clay loam; weak coarse prismatic structure parting to moderate coarse angular blocky; very hard, very firm; dark grayish brown (10YR 4/2) clay films on vertical faces of peds; few fine distinct brownish yellow (10YR 6/8) iron concentrations; neutral; gradual wavy boundary.

BCtg—70 to 80 inches; light gray (2.5Y 7/2) sandy clay loam, weak medium subangular blocky structure; hard, firm; few faint clay films on faces of peds; slightly alkaline.

The thickness of the solum is more than 80 inches. The weighted-average clay content of the upper 20 inches of the Bt horizon ranges from 45 to 55 percent. Siliceous gravel ranges from 0 to 10 percent by volume in the surface and subsurface of some pedons.

The A horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 2 or 3. Reaction ranges from strongly acid to slightly acid.

The E horizon has hue of 7.5YR or 10YR, value of 5 to 7, and chroma of 2 or 3. Texture is fine sandy loam. Reaction ranges from strongly acid to slightly acid.

The Btss and Bt horizons have hue of 10YR or 2.5Y, value of 4 to 7, and chroma of 2 to 6. Redoximorphic features in shades of red, brown, yellow, or gray range from few to many. Texture is mainly clay, but some lower Btss and Bt horizons have texture of clay loam. Reaction is very strongly acid or strongly acid but ranges to neutral in the lower horizons.

The Btg horizon has hue of 10YR, value of 5 to 7, and chroma of 1 or 2. Redoximorphic features in shades of red, brown, or yellow range from few to many. Texture is sandy clay loam or clay loam. Reaction ranges from strongly acid to neutral.

The BCtg horizon has hue of 10YR, value of 5 to 7, and chroma of 1 or 2. Redoximorphic features in shades of brown or yellow range from none to common. Texture is sandy clay loam or clay loam. Reaction ranges from moderately acid to slightly alkaline.

Uhland Series

The Uhland series consists of very deep, moderately well drained, moderately slowly permeable soils on flood plains (fig. 30). These soils formed in sandy alluvium of Holocene age. Slopes are 0 to 1 percent. The soils of the Uhland series are coarse-loamy, siliceous, superactive, thermic Aquic Haplustepts.

Typical pedon of Uhland fine sandy loam, 0 to 1 percent slopes, frequently flooded; from the intersection of Farm Road 696 and U.S. Highway 77 in Lexington; 8.0 miles south on U.S. Highway 77, 0.6 mile southwest on Texas Highway 21, 1.5

miles west on County Road 327, 0.4 mile south on ranch road, and 600 feet east in hayland.

Ap—0 to 11 inches; yellowish brown (10YR 5/4) fine sandy loam, dark yellowish brown (10YR 4/4) moist; weak fine granular structure; slightly hard, friable; many fine roots; few medium distinct dark grayish brown (10YR 4/2) iron concentrations; moderately acid; clear smooth boundary.

Bw1—11 to 24 inches; light yellowish brown (10YR 6/4) fine sandy loam, yellowish brown (10YR 5/4) moist; weak coarse prismatic structure parting to weak fine subangular blocky structure; slightly hard, very friable; common fine roots; few medium faint dark yellowish brown (10YR 4/4) iron concentrations; slightly acid; gradual smooth boundary.

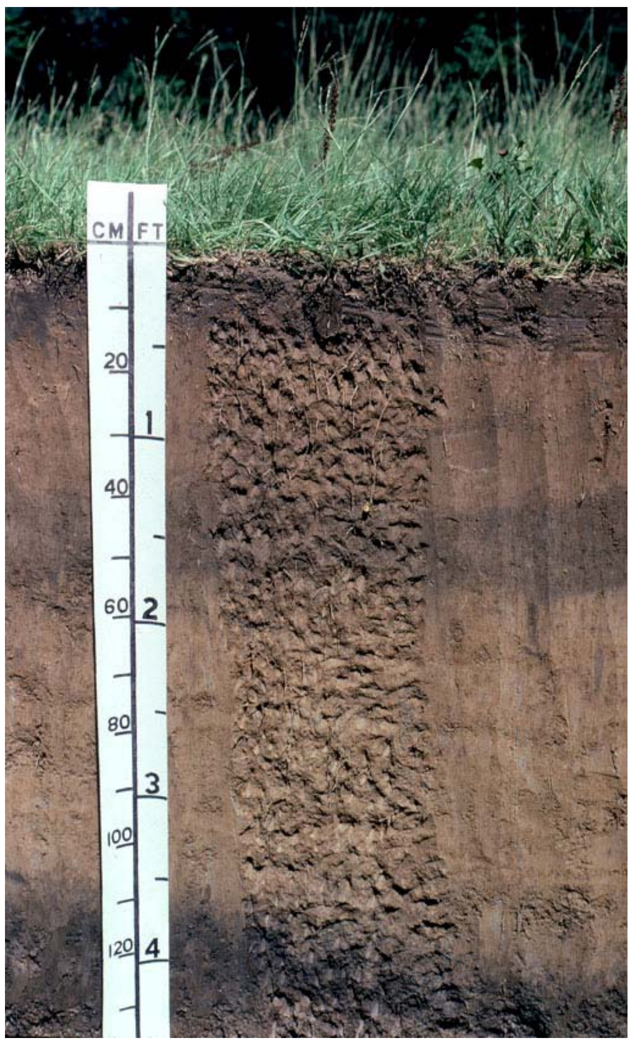


Figure 30.—Profile of Uhland fine sandy loam, 0 to 1 percent slopes, frequently flooded. The different colored layers are related to periods of flooding events.

Bw2—24 to 44 inches; very pale brown (10YR 7/4) fine sandy loam, light yellowish brown (10YR 6/4) moist; weak coarse prismatic structure parting to weak fine subangular blocky structure; slightly hard, very friable; few fine roots; common medium distinct dark yellowish brown (10YR 4/4) iron concentrations; light brownish gray (10YR 6/2) iron depletions; slightly acid; clear smooth boundary.

Bw3—44 to 55 inches; yellow (10YR 7/6) fine sandy loam, brownish yellow (10YR 6/6) moist; weak coarse prismatic structure; slightly hard, very friable; common medium distinct light gray (10YR 7/2) iron depletions; moderately acid; clear smooth boundary.

Bgb—55 to 80 inches; light gray (10YR 7/1) sandy clay loam, gray (10YR 6/1) moist; weak coarse prismatic structure; hard, firm; common medium prominent yellowish red (5YR 4/6) and strong brown (7.5YR 5/8) iron concentrations; moderately acid.

The thickness of the solum is more than 80 inches. The clay content of the 10- to 40-inch control section ranges from 10 to 18 percent. Reaction ranges from moderately acid to slightly alkaline throughout.

The Ap and A horizons have hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 2 to 4. Some pedons have redoximorphic features in shades of brown that range from few to common. Texture is fine sandy loam or clay loam.

The Bw and Bwb horizons have hue of 7.5YR or 10YR, value of 4 to 6, chroma of 3 to 6. Redoximorphic features in shades of red, brown, or yellow range from few to many. Redoximorphic features in shades of brown or gray with chroma of 2 or less range from few to common in some subhorizons within 30 inches of the soil surface. Texture is fine sandy loam or loam with or without subhorizons of loamy fine sand, sandy clay loam, or clay loam.

The Bg and Bgb horizons, where present, have hue of 10YR or 2.5Y, value of 5 to 7, and chroma of 1 or 2. Redoximorphic features in shades of red, brown, or yellow range from few to many. Texture is fine sandy loam, loam, sandy clay loam, or clay loam.

Some pedons contain buried A horizons below depths of 40 inches. These horizons have hue of 10YR, value of 3 or 4, and chroma of 1 to 3. Texture is fine sandy loam, loam, sandy clay loam, or clay loam.

Whitesboro Series

The Whitesboro series consists of very deep, moderately well drained, moderately permeable soils on flood plains. These soils formed in loamy alluvium of Holocene age. Slopes are 0 to 1 percent. Soils of the Whitesboro series are fine-loamy, mixed, superactive, thermic Cumulic Haplustolls.

Typical pedon of Whitesboro loam, 0 to 1 percent slopes, frequently flooded; from the intersection of Texas Highway 21 and Farm Road 1624 in Lincoln; 0.5 miles southwest on Texas Highway 21, and 1.1 miles southeast on farm trail in cropland.

Ap—0 to 6 inches; brown (10YR 4/3) loam, dark brown (10YR 3/3) moist; moderate fine subangular blocky structure; hard, firm; many fine roots; many fine pores; slightly acid; clear smooth boundary.

Bw1—6 to 15 inches; dark grayish brown (10YR 4/2) sandy clay loam, very dark grayish brown (10YR 3/2) moist; weak coarse subangular blocky structure; very hard, firm; common fine roots; slightly acid; clear smooth boundary.

Bw2—15 to 35 inches; dark grayish brown (10YR 4/2) sandy clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure parting to moderate coarse prismatic; very hard, firm; few fine roots;

few dark brown (10YR 3/3) coatings on ped faces; slightly acid; clear smooth boundary.

Bw3—35 to 60 inches; brown (10YR 5/3) sandy clay loam, brown (10YR 4/3) moist; weak medium prismatic structure; hard, firm; few fine roots; few fine pores; few fine faint dark yellowish brown (10YR 4/6) iron concentrations; few very dark grayish brown (10YR 3/2) coatings along prism faces; slightly acid; gradual smooth boundary.

Bw4—60 to 80 inches; yellowish brown (10YR 5/4) sandy clay loam, dark yellowish brown (10YR 4/4) moist; weak coarse prismatic structure; hard, firm; few fine roots, few fine pores along prism faces; neutral.

The thickness of the solum is more than 60 inches. The mollic epipedon ranges from 20 to 50 inches thick. The average clay content of the control section ranges from 22 to 35 percent.

The A horizon has hue of 7.5YR or 10YR, value of 2 to 5, and chroma of 1 to 3. Some pedons have few redoximorphic features in shades of brown or gray in the lower part. Reaction ranges from slightly acid to slightly alkaline.

The Bw horizon has hue of 7.5YR to 2.5Y, value of 4 or 5, and chroma of 1 to 4. Redoximorphic features in shades of red, brown, yellow, and gray range from few to many. In some pedons, the matrix is mottled in these colors. Texture is loam, sandy clay loam, or clay loam. Reaction ranges from moderately acid to moderately alkaline.

Wilson Series

The Wilson series consists of very deep, moderately well drained, very slowly permeable soils on stream terraces and relict stream terraces (fig. 31). These soils formed in clayey alluvium of Quaternary age. Slope ranges from 0 to 2 percent. The soils of the Wilson series are fine, smectitic, thermic Oxyaquic Vertic Haplustalfs.

Typical pedon of Wilson clay loam, 0 to 2 percent slopes; from the intersection of U.S. Highway 77 and U.S. Highway 290 in Giddings; 5.9 miles west on U.S. Highway 290, 0.5 miles southwest on private farm road, and 300 feet south in cropland.

Ap—0 to 4 inches; dark gray (10YR 4/1) clay loam, very dark gray (10YR 3/1) moist; weak fine granular structure; very hard, firm; many fine and common medium roots; few medium pores; moderately acid; abrupt wavy boundary.

Btss1—4 to 18 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; moderate medium subangular blocky structure; extremely hard, very firm; common fine and medium roots; few distinct clay films on faces of peds; few distinct slickensides; many pressure faces; neutral; gradual wavy boundary.

Btss2—18 to 27 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; moderate medium angular blocky structure; extremely hard, very firm; few fine and medium roots along faces of peds; few distinct clay films on faces of peds; common distinct slickensides; many pressure faces; slightly alkaline; gradual wavy boundary.

Btssgy1—27 to 41 inches; light brownish gray (2.5Y 6/2) clay, grayish brown (2.5Y 5/2) moist; moderate medium angular blocky structure; extremely hard, very firm; few distinct clay films on faces of peds; common distinct slickensides; many very dark gray (10YR 3/1) clay coatings on ped surfaces; common calcium sulfate crystals and threads; moderately alkaline; gradual wavy boundary.

Btssgy2—41 to 50 inches; light brownish gray (2.5Y 6/2) clay, grayish brown (2.5Y 5/2) moist; moderate medium angular blocky structure parting to weak coarse prismatic; extremely hard, very firm; common distinct clay films on

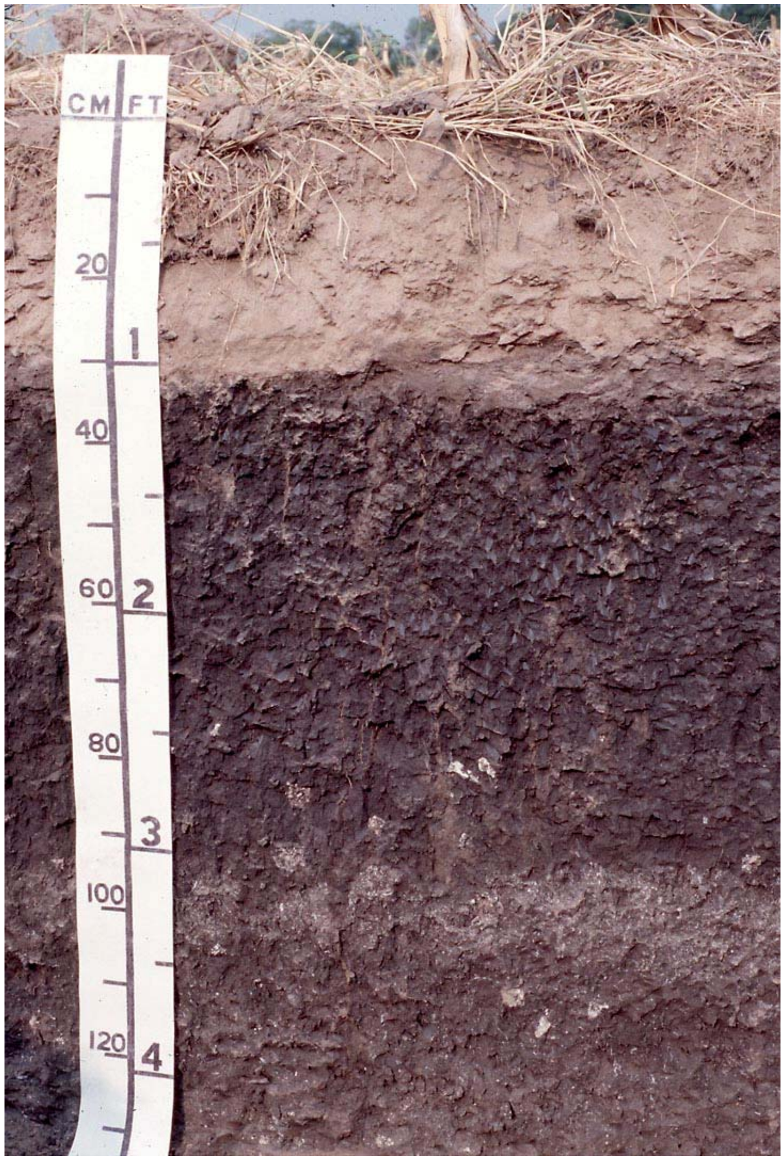


Figure 31.—Profile of Wilson clay loam in an area of Davilla-Wilson complex, 0 to 2 percent slopes. The abrupt contact of the surface layer and the subsoil is readily evident.

faces of peds; few distinct slickensides; very dark gray (10YR 3/1) clay coatings on ped surfaces; common calcium sulfate crystals, masses and threads; common medium distinct yellowish brown (10YR 5/6) iron concentrations; moderately alkaline; gradual wavy boundary.

BCty1—50 to 70 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure; extremely hard, very firm; common distinct clay films faces of peds; few medium iron-manganese concretions; common gypsum crystals, threads and masses; common fine distinct yellowish brown (10YR 5/6) iron concentrations; moderately alkaline; gradual wavy boundary.

BCty2—70 to 80 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure; extremely hard, very firm; many fine iron-manganese concretions; common calcium sulfate crystals, threads and masses; common medium faint light brownish gray (2.5Y 6/2) iron depletions; moderately alkaline.

The thickness of the solum ranges from 60 to more than 80 inches. The average clay content of the upper 20 inches of the Bt horizon ranges from 35 to 45 percent.

The A horizon has hue of 10YR or 2.5Y, value of 3 to 5, and chroma of 1 or 2. Texture is loam or clay loam. It is massive and hard when dry. Siliceous gravel ranges from 0 to 10 percent in some pedons. Reaction ranges from slightly acid to neutral.

The upper Btss horizons have hue of 10YR or 2.5Y, value of 2 to 4, and chroma of 1 or less. Redoximorphic features in shades of brown or yellow range from none to common. Texture is clay loam or clay. Reaction ranges from slightly acid to slightly alkaline.

The lower Btss horizons have hue of 10YR to 5Y, value of 3 to 7, and chroma of 1 or 2. Redoximorphic features in shades of brown or yellow range from none to common. Texture is clay loam or clay. Reaction ranges from slightly acid to moderately alkaline.

The BCt horizons have hue of 10YR to 5Y, value of 4 to 7, and chroma of 1 or 2. Redoximorphic features in shades of brown, yellow, or gray range from none to common. Texture is sandy clay loam or clay loam. Reaction ranges from neutral to moderately alkaline.

Winedale Series

The Winedale series consists of moderately deep, moderately well drained, very slowly permeable soils on summit, shoulder, and upper backslopes on ridges. These soils formed in residuum weathered from tuffaceous shales in the Caddell Formation of Eocene age overlain by a thin layer of gravelly alluvium of Pleistocene age. Slope ranges from 2 to 8 percent. The soils of the Winedale series are very-fine, smectitic, thermic Udertic Paleustalfs.

Typical pedon of Winedale very gravelly fine sandy loam, 2 to 8 percent slopes; from the intersection of U.S. Highway 290 and U.S. Highway 77 in Giddings; 6.3 miles south on U.S. Highway 77, 0.17 mile east on private road, 0.12 mile south on ranch road, 372 feet southeast along pipe line right of way, and 100 feet west in wooded area.

A—0 to 7 inches; brown (10YR 5/3) very gravelly fine sandy loam, brown (10YR 4/3) moist; weak fine granular structure; slightly hard, very friable; few fine and medium roots; about 40 percent siliceous gravel; strongly acid; abrupt wavy boundary.

Bt—7 to 14 inches; dark reddish brown (2.5YR 3/4) clay, dark reddish brown (2.5YR 3/4) moist; strong medium subangular blocky structure; very hard, firm; few fine roots; few distinct clay films on faces of peds; strongly acid; clear wavy boundary.

Btss1—14 to 26 inches; red (2.5YR 5/6) clay, red (2.5YR 4/6) moist; moderate medium subangular blocky structure; very hard, firm; few fine roots; common distinct clay films on faces of peds; common distinct slickensides; strongly acid; gradual wavy boundary.

Btss2—26 to 34 inches; red (2.5YR 5/6) clay, red (2.5YR 4/6) moist; moderate medium angular blocky structure; very hard, firm; few fine roots; common distinct clay films on faces of peds; common distinct slickensides; many medium prominent light brownish gray (10YR 6/2) iron depletions; strongly acid; gradual wavy boundary.

BCt—34 to 38 inches; reddish yellow (5YR 6/6) clay loam, yellowish red (5YR 5/6) moist; weak medium subangular blocky structure; very hard, firm; few fine roots; few distinct clay films on faces of peds; common medium prominent light brownish gray (10YR 6/2) iron depletions; about 30 percent thin strata of light brownish gray (10YR 6/2) fragments of shale; strongly acid; gradual wavy boundary.

C—38 to 80 inches; light yellowish brown (10YR 6/4) clay with fragments of shale; massive; weakly bedded; strongly acid.

The thickness of the solum ranges from 20 to 40 inches. The average clay content of the control section ranges from 60 to 70 percent. Intersecting slickensides range from few to common below a depth of 12 inches.

The A horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. The E horizon, where present, has hue of 10YR, value of 5 to 7, and chroma of 2 to 4. Siliceous gravel ranges from 35 to 60 percent by volume. Reaction ranges from very strongly acid to slightly acid.

The Bt horizon has hue of 2.5YR to 7.5YR, value of 3 to 6, and chroma of 2 to 8. Redoximorphic features in shades of brown, yellow, or gray range from none to few. Texture is clay. Reaction ranges from extremely acid to strongly acid.

The Btss horizon has hue of 2.5YR to 7.5YR, value of 3 to 6, and chroma of 2 to 8. Redoximorphic features in shades of brown, yellow, or gray range from none to few. Texture is clay. Reaction ranges from extremely acid to strongly acid.

The BCt horizon has hue of 5YR to 10YR, value of 5 to 7, and chroma of 3 or 4. Redoximorphic features in shades of red, brown, yellow, or gray range from none to common. Texture is clay. Reaction ranges from extremely acid to strongly acid.

The C horizon is weakly bedded shale that has clay texture. Mottles in shades of brown, yellow, or gray range from none to common. Reaction ranges from extremely acid to strongly acid.

Zack Series

The Zack series consists of moderately deep, moderately well drained, very slowly permeable soils on summit, shoulder, and upper backslopes on broad ridges (fig. 32). These soils formed in residuum weathered from shales and siltstones in the Yegua Formation of Eocene age. Slope ranges from 1 to 8 percent. The soils of the Zack series are fine, smectitic, thermic Udertic Paleustalfs.

Typical pedon of Zack fine sandy loam, 1 to 5 percent slopes; from the intersection of Texas Highway 21 and Farm Road 141 in Old Dime Box; 10.4 miles southeast and southwest on Farm Road 141, 1,100 feet northeast on oilfield road, and 100 feet east in improved pasture.

Ap—0 to 5 inches; brown (10YR 5/3) fine sandy loam, brown (10YR 4/3) moist; weak fine granular structure; hard, friable; common fine and very fine roots; moderately acid; abrupt smooth boundary.

Bt1—5 to 14 inches; reddish brown (5YR 5/3) clay, reddish brown (5YR 4/3) moist; moderate coarse angular blocky structure; very hard, very firm; common fine roots; few pressure faces; few distinct clay films on faces of peds; common medium distinct yellowish red (5YR 5/6) iron concentrations; moderately acid; clear smooth boundary.

Bt2—14 to 21 inches; brown (7.5YR 5/2) clay, brown (7.5YR 4/2) moist; moderate coarse angular blocky structure; very hard, very firm; few fine roots; few pressure faces; few wedge-shaped peds; few distinct clay films on faces of peds; common medium distinct yellowish red (5YR 4/6) iron concentrations; neutral; clear smooth boundary.

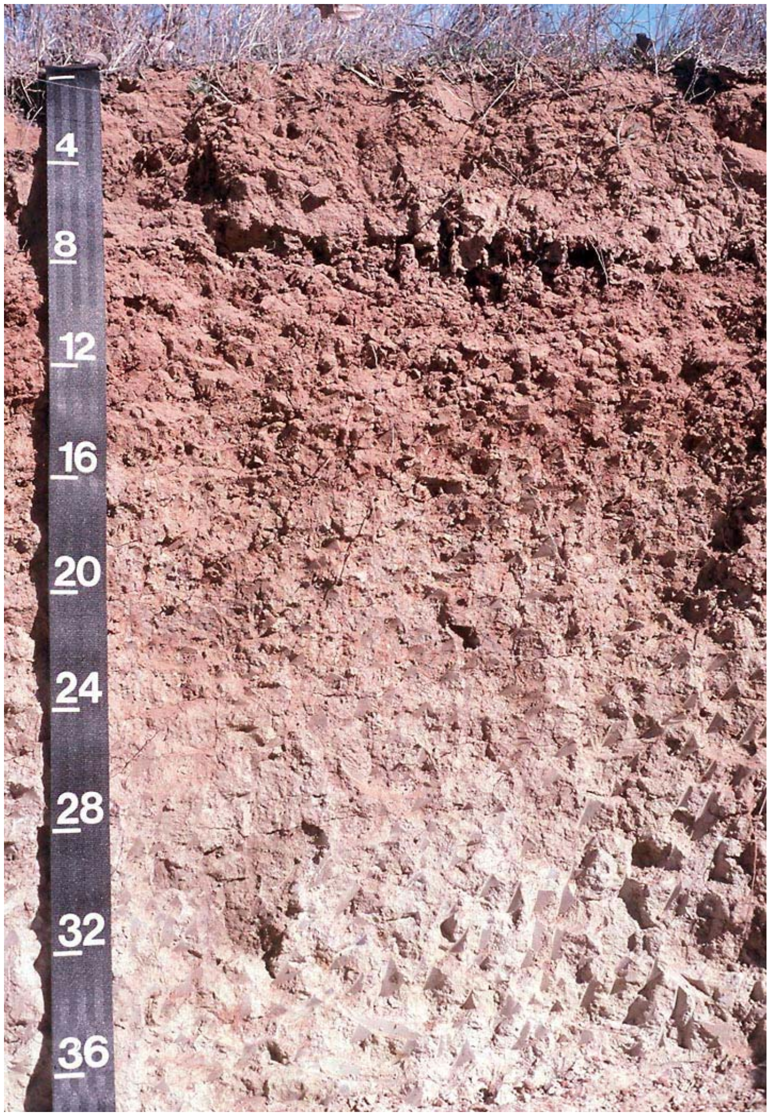


Figure 32.—Profile of Zack fine sandy loam, 1 to 5 percent slopes. The gray colors are related to the shales and siltstones in the Yegua Formation.

2BCk—21 to 33 inches; light gray (2.5Y 7/2) sandy clay loam, light brownish gray (2.5Y 6/2) moist; weak medium subangular blocky structure; slightly hard, firm; common masses and concretions of calcium carbonate; few thin clay films on faces of peds; slightly alkaline; clear smooth boundary.

2Ck—33 to 60 inches; light gray (2.5Y 7/2) thinly bedded mudstones with silty clay loam texture; massive; hard, firm; common masses and concretions of calcium carbonate; moderately alkaline.

The thickness of the solum ranges from 25 to 40 inches to thinly bedded mudstone or siltstone. The average clay content of the upper 20 inches of the Bt horizons ranges from 40 to 55 percent. The soil cracks when dry and the cracks are 0.5 to 1.5 inches wide and extend to 20 inches or more.

The A horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 2 to 4. Texture is fine sandy loam or gravelly fine sandy loam. Siliceous gravel ranges from 0 to 35 percent by volume. Reaction ranges from strongly acid to slightly acid.

The Bt1 horizon has hue of 2.5YR to 10YR, value of 4 or 5, and chroma of 3 to 6. Redoximorphic features in shades of red, brown, yellow, or gray range from few to many. Gray colors are related to parent material. Texture is clay. Pressure faces or small slickensides range from few to common in some pedons. Reaction ranges from moderately acid to neutral.

The Bt2 horizon has hue of 5YR to 10YR, value of 4 to 6, and chroma of 2 to 6. Redoximorphic features in shades of red, brown, yellow, or gray range from few to many. Gray colors are related to parent material. Texture is clay or clay loam. Concretions of calcium carbonate range from none to few. Pressure faces range from few to common in some pedons. Reaction ranges from neutral to moderately alkaline.

The 2BCk horizon has hue of 7.5YR to 2.5Y, value of 4 to 7, and chroma of 2 to 6. Redoximorphic features in shades of brown, yellow, or gray range from none to common. Texture is sandy clay loam or clay loam. Masses and concretions of calcium carbonate range from none to common. Reaction ranges from neutral to moderately alkaline.

The 2Ck horizon has hue of 10YR to 5Y, value of 4 to 7, and chroma of 2 to 4. The materials are thinly bedded mudstones and siltstones with texture of loam, clay loam, or silty clay loam. Masses and concretions of calcium carbonate range from few to many. Reaction ranges from neutral to moderately alkaline.

Zilaboy Series

The Zilaboy series consists of very deep, moderately well drained, very slowly permeable soils on flood plains. These soils formed in clayey alluvium of Holocene age (fig. 33). Slopes are 0 to 1 percent. The soils of the Zilaboy series are fine, smectitic, thermic Oxyaquic Hapluderts.

Typical pedon of Zilaboy clay, 0 to 1 percent slopes, frequently flooded; from the intersection of Texas Highway 21 and Farm Road 141 in Old Dime Box; 5.3 miles south on Farm Road 141, 1.3 miles east on Farm Road 1697, 1.1 miles east on County Road 124, 0.6 mile northwest on oilfield road, and 1,200 feet north in flood plain.

A—0 to 8 inches; dark grayish brown (10YR 4/1) clay, very dark gray (10YR 3/1) moist; moderate fine subangular blocky structure; extremely hard, very firm; many fine and medium roots; few distinct pressure faces; common fine distinct brown (7.5YR 4/4) iron concentrations; neutral; gradual wavy boundary.

Bss1—8 to 22 inches; gray (10YR 5/1) clay, dark gray (10YR 4/1) moist; moderate medium angular blocky structure; extremely hard, very firm; common prominent slickensides; common fine faint dark yellowish brown (10YR 4/4) iron concentrations; slightly acid; gradual wavy boundary.

Bss2—22 to 43 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; moderate medium angular blocky structure; extremely hard, very firm; common fine roots; many prominent slickensides; few iron-manganese concretions; few fine distinct yellowish brown (10YR 5/6) iron concentrations; slightly acid; gradual wavy boundary.

Bss3—43 to 50 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; moderate medium angular blocky structure; very hard, firm; common fine roots; common prominent slickensides; few iron-manganese concretions; moderately acid; gradual wavy boundary.

Bssy—50 to 80 inches: grayish brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; weak coarse angular blocky structure; very hard, firm; common distinct slickensides; common masses and threads of calcium sulfate; moderately acid.

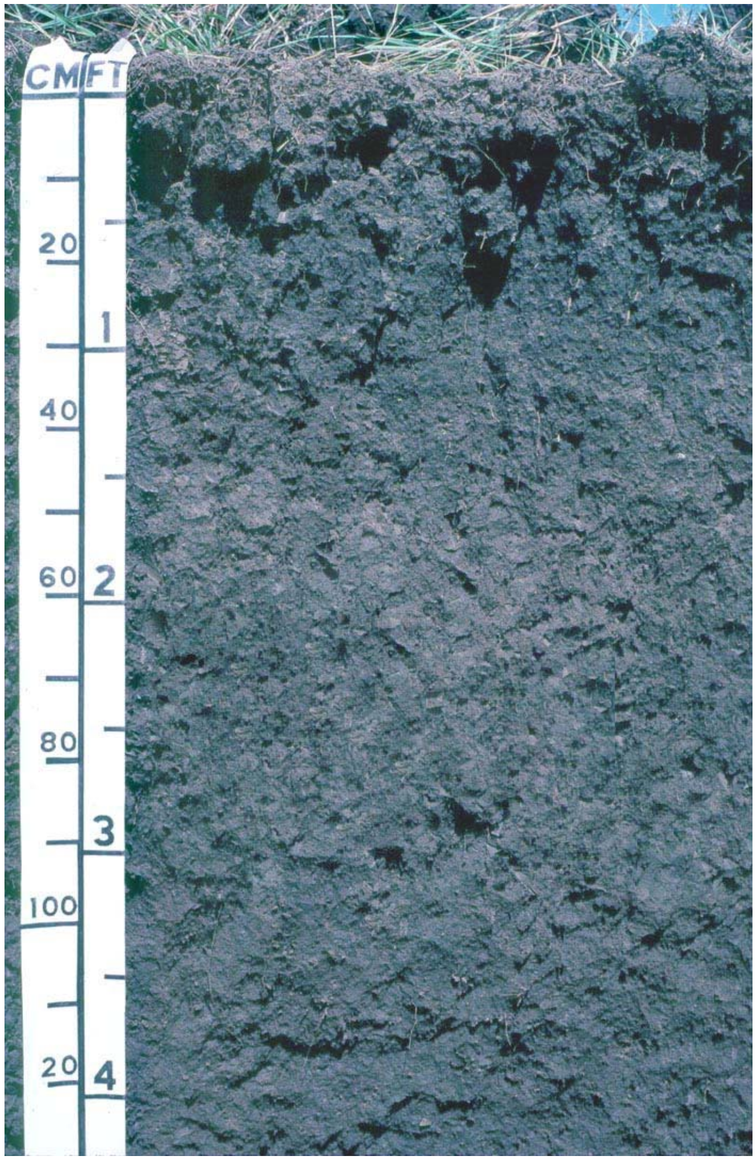


Figure 33.—Profile of Zilaboy clay, 0 to 1 percent slopes, frequently flooded. Zilaboy soils formed in clayey alluvium.

The thickness of the solum is more than 80 inches. The average clay content of the 10- to 40-inch control section ranges from 40 to 60 percent. Cracks 0.5 to 2 inches wide extend from the surface to a depth of 20 inches or more when the soil is dry. Common distinct slickensides begin at a depth of 10 to 24 inches.

The A horizon has hue of 10YR to 5Y, value of 2 or 3, and chroma of 1 or 2. Some pedons contain redoximorphic features in shades of brown or yellow. Reaction ranges from moderately acid to neutral.

The Bss horizon has hue of 10YR to 5Y, value of 3 or 4, and chroma of 1 to 4. Redoximorphic features in shades of brown, yellow, or gray range from few to many. Reaction ranges from moderately acid to neutral.

Some pedons have 2Ab or 2Bw horizons with textures of sandy clay loam or clay loam below a depth of 60 inches. These horizons have hue of 10YR to 5Y, value of 3 or 4, and chroma of 1 to 4. Redoximorphic features in shades of brown, yellow, or gray range from few to many. Reaction ranges from moderately acid to neutral.

Zulch Series

The Zulch series consists of moderately deep, moderately well drained, very slowly permeable soils on broad ridges (fig. 34). These soils formed in residuum weathered from shales in the Yegua Formation of Eocene age. Slope ranges from 1 to 5 percent. The soils of the Zulch series are fine, smectitic, thermic Udertic Paleustalfs.

Typical pedon of Zulch fine sandy loam, 1 to 5 percent slopes; from intersection of Texas Highway 21 and Farm Road 141 in Old Dime Box; 8.6 miles south on Farm Road 141, 0.3 mile east on Farm Road 1697, 1.3 miles south on private ranch road, and 150 feet west in improved pasture.

A—0 to 4 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; hard, friable; common fine roots; common very fine pores; moderately acid; abrupt wavy boundary.

Btg—4 to 12 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; moderate coarse angular blocky structure; extremely hard, very firm; common fine roots; common very fine pores; few distinct clay films on faces of peds; neutral; clear smooth boundary.

Btssg—12 to 20 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; moderate coarse angular blocky structure; extremely hard, very firm; few very fine and fine roots; few distinct clay films on faces of peds; common slickensides; common pressure faces; few fine distinct dark yellowish brown (10YR 4/4) iron concentrations; slightly alkaline; clear smooth boundary.

BCk—20 to 33 inches; light gray (10YR 7/2) clay loam, light brownish gray (10YR 6/2) moist; weak coarse prismatic structure; extremely hard, very firm; common calcium carbonate that occurs in films, threads, and soft masses; few small pressure faces; few distinct strong brown (7.5YR 5/8) iron concentrations; moderately alkaline; gradual smooth boundary.

Ck—33 to 40 inches; light gray (10YR 7/2) stratified siltstone and shale, light brownish gray (10YR 6/2) moist; massive; hard, firm; common calcium carbonate that occurs in films, threads, and soft masses; moderately alkaline; gradual smooth boundary.

C—40 to 80 inches; light gray (10YR 7/2) stratified siltstone and shale, light brownish gray (10YR 6/2) moist; massive; hard, firm; moderately alkaline.

The thickness of the solum ranges from 30 to 40 inches which corresponds to the depth to shale or siltstone. The average clay content of the upper 20 inches of the Bt horizon ranges from 40 to 50 percent. Siliceous gravel ranges from 0 to 10 percent in the surface layer of some pedons.

The A horizon has hue of 10YR, value of 3 to 5, and chroma of 1 or 2. Reaction ranges from moderately acid to neutral.

The Btg horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. Redoximorphic features in shades of brown or yellow range from none to common. Texture is clay. Reaction ranges from moderately acid to slightly alkaline.

The Btssg horizon has hue of 10YR, value of 3 to 5, and chroma of 1 or 2. Redoximorphic features in shades of red, brown, or yellow range from none to common. Texture is clay. Reaction ranges from slightly acid to slightly alkaline.

The BCk horizon has hue of 10YR or 2.5Y, value of 5 to 7, and chroma of 2 to 6. Redoximorphic features in shades of brown or yellow are few or common. Texture is clay or clay loam. Calcium carbonate in forms of films, threads, and soft masses range from 0 to 15 percent. Reaction ranges from neutral to moderately alkaline.

The Ck or C horizon has hue of 10YR, value of 3 to 5, and chroma of 1 or 2. It is weakly consolidated siltstone and shale with redoximorphic features in shades of brown, yellow, or gray. Texture is clay loam or clay and is thinly bedded or has rock structure. Calcium carbonate in threads or soft masses ranges from 0 to 15 percent. Reaction ranges from neutral to moderately alkaline.

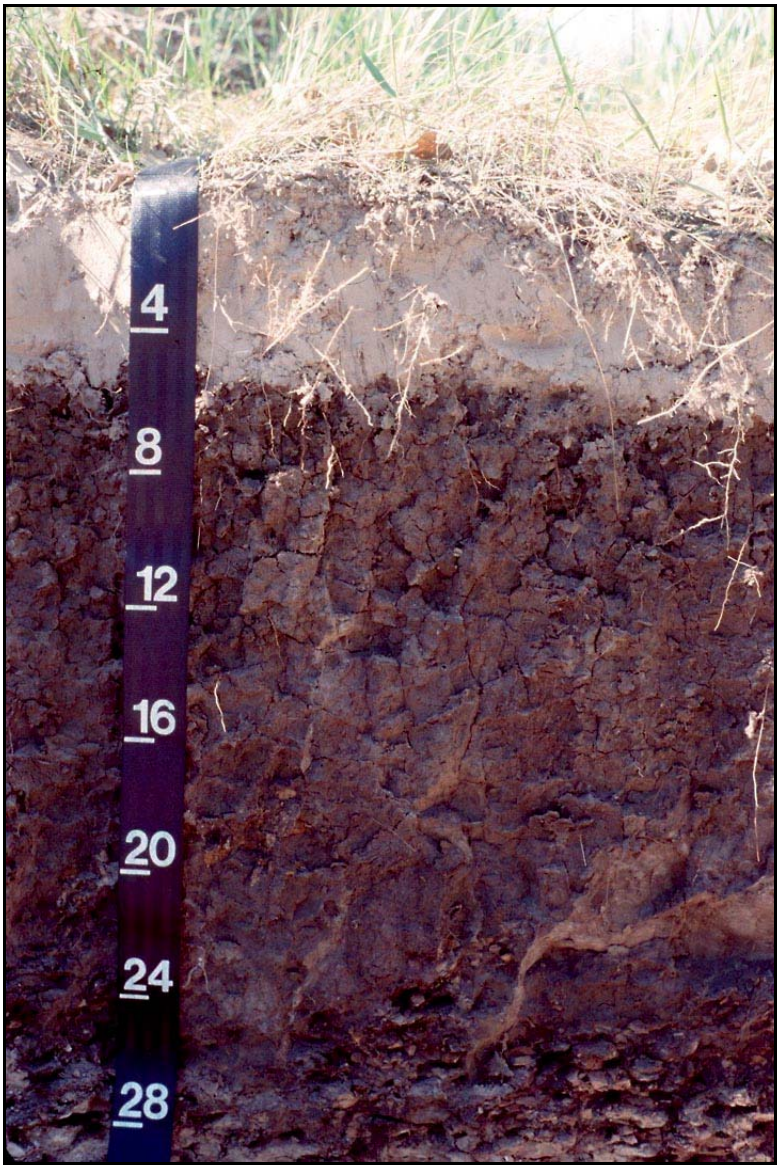


Figure 34.—Profile of Zulch fine sandy loam, 1 to 5 percent slopes. The contact between the light-colored surface layer and the dark-colored subsoil is abrupt.

Formation of the Soils

In this section the factors of soil formation are related to the formation of the soils in Lee County. Also, processes of horizon differentiation and the surficial geology and geomorphology of the county are described.

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 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, and the length of time the forces of soil development have acted on the soil material.

Climate and living organisms are active factors of soil formation. They act on the parent material that has accumulated through the weathering of rocks and slowly change it into a natural body that has genetically related horizons. The effects of climate and living organisms are conditioned by relief. The parent material affects the kind of soil profile that forms and, in extreme cases, determines it almost entirely. Finally, time is needed for changing the parent material into soil. Generally, a long time is needed for the development of distinct horizons.

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effect of any one factor unless conditions are specified for the other factors.

Parent Material

Parent material is the unconsolidated mass from which a soil forms. It determines the chemical and mineral composition of the soil. In Lee County, the parent material consists of unconsolidated sediments of Eocene, Pleistocene, and Holocene epochs. Additional information about parent material is in the section, “Surficial Geology and Geomorphology.”

Climate

The warm and humid climate in Lee County promotes rapid soil development. The climate is uniform throughout the survey area; however its effect is modified locally by runoff. In some areas, the direction of exposure influences the climatic effect. The climate in Lee County is not believed to have made major differences in the soils.

Plant and Animal Life

Plants, insects, earthworms, small mammals, microorganisms, and other living organisms, including human, have contributed to soil development. The addition of organic matter 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 Lee 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 development through its effect on drainage, erosion, and plant cover.

The soils in Lee 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 lower terraces associated with them. The more sloping areas are confined to the upland soils, with the steep areas being the highest points in the county.

The degree of soil profile development often depends on the amount of moisture in the soil. Navasota soils are in nearly level, somewhat poorly drained areas that receive extra water; therefore, they have developed gleyed characteristics and the horizon development is not as well defined. Edge soils are in more sloping areas that are better drained and exhibit brighter colors and distinct horizons throughout. Soils on footslopes, such as Benchley soils, receive additional organic matter and have a thick, dark surface layer. Soils on adjacent side slopes, such as Crockett soils, have a thin surface layer that is light in color because erosion removes most of the soil as quickly as it forms a surface layer.

Time

A great length of time is required for the formation of soils with distinct horizons. The differences in the length of time that the parent material has been in place generally are reflected in the degree of the horizon development. Young soils have little horizon development, and old soils have well expressed development.

Sandow and Uhland soils are young soils and are on nearly level flood plains. Although they have undergone some horizon development, they closely resemble the loamy and sandy parent material from which they have formed. Benchley and Crockett soils are older soils. They have developed distinct horizons that do not resemble their parent materials.

Processes of Horizon Differentiation

Several processes are involved in the formation of horizons in soils. These processes include accumulation of organic matter, leaching of carbonates and other bases, and formation and translocation of silicate clay minerals. In most soils more than one of these processes has been active in horizon development.

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 Lee 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 of the county. Much leaching has occurred in the soils that have thick, sandy surface layers, such as Padina and Silstid 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. In many soils, the subsoil has accumulations of clay films in pores and on ped surfaces. These soils were probably leached of carbonates and bases before the translocation of silicate clay took place. A horizon with accumulation of translocated clay is called an argillic horizon. Edge soils, for example, have an argillic horizon.

Surficial Geology and Geomorphology

Tertiary geologic outcrops trend northeastward across Lee County and landscape features, including prairies and hills, relate to these outcrop patterns. The land surface in northern portions of the county, related to sandstone outcrops of the principal sandstone aquifers, is primarily forested and gently rolling. The dissected topography in southern portions of the county, consisting of low hills and sharp escarpments, reflects outcrop patterns of clay, shale, and minor sandstones associated with marginal aquifers (17).

Quaternary deposits trend generally perpendicular to Tertiary outcrops and, in Lee County, are associated with the Brazos and (to a lesser extent) the Colorado River systems. The primary streams included in the Brazos River drainage area are East Yegua, Middle Yegua, West Yegua, Yegua, Brushy, Elm, Nails, and Cedar Creeks. Pin Oak, Rabbs, and Cummins Creeks, in extreme southern parts of the county, are part of the Colorado River drainage area (17). These streams flow intermittently during a large part of each year, except in local segments where they are fed by springs or excessive runoff related to human activity.

The Tertiary outcrop belt generally parallels the Texas Gulf Coast shoreline, and these sedimentary deposits dip southeastward unless disturbed by faulting. This gentle southeastward dip is greater than the slope of present-day drainage systems, so geologically older units are at the surface in northwestern parts of the county, with the youngest units cropping out in southeastern portions. An intricate fault system trends northeastward across the county, generally parallel to Tertiary outcrops. This structural belt of moderately high angle, en echelon (parallel, yet staggered) normal faults, dipping in opposite directions, results in a downthrown, central graben zone that averages seven or eight miles in width in Lee County (17). This fault network plays an important role in oil and gas exploration, groundwater movement, and plans for mining of lignite coal. Fractures associated with faulting facilitate groundwater flow by providing fracture permeability in addition to the matrix (intergranular) permeability.

Surficial geology in Lee County impacts texture and mineralogy of parent sediments, along with local and regional topography due to the resistance to erosion of different sediments and sedimentary rocks. Topography reflects the geology at the land surface, as erosion-resistant sandstones tend to form ridges and low hills, while more erosive clays and shales generally crop out on lower landscape positions. Sedimentary outcrops in Lee County are primarily of early Tertiary age (Paleocene and Eocene) with minimal exposures of Pliocene and Quaternary (Pleistocene and Holocene) sediments.

Soil parent materials in Lee County include residuum weathered (in place) from exposed bedrock and sediments derived from weathered bedrock, including alluvium, colluvium, and slope alluvium. Alluvial parent materials have been transported some distance from their source by rivers and streams. Colluvium consists of relatively unsorted sediments deposited at the base of a hillslope by mass movement or unconcentrated flow, while slope alluvium consists of nominal sorting or rounding of grains by slope wash processes on similar hillslope positions. Soils on this dissected landscape are typically mapped on hillslope positions (summit, shoulder, backslope, footslope, and toeslope) associated with different parent sediments, so similar hillslope positions will be represented by different soils as surficial geology changes. Soil depth often increases with more downslope positions due to colluvial and slope alluvial sediment additions on footslope, toeslope, and (to a lesser extent) backslope positions.

Midway Group

The Midway Group of Paleocene-Eocene age crops out in a small area in the extreme northwestern part of Lee County. The Wills Point Formation is exposed in this locality and consists of dark gray, sandy and silty clays that have a moderate abundance of microfossils (8).

Wilcox Group

The Wilcox Group of early Eocene age overlies the Midway Group and crops out in northwestern portions of Lee County west of the area of complex faulting. Between the Colorado and Trinity Rivers, the Wilcox Group has been subdivided into the Hooper, Simsboro, and Calvert Bluff Formations (9). The Wilcox Group consists of a widespread deltaic accumulation of sand and interbedded shale with shale beds having lateral continuity over greater distances than lenticular sand beds. The Hooper Formation consists primarily of mudstone, locally glauconitic, with variable amounts of cross-bedded sandstone, minor lignite, and ironstone concretions. The Simsboro Formation ranges from 122 to 233 meters (400 to 765 feet) in thickness and shows a broader lateral continuity (17). This massive sand interval is readily distinguished from the repeating pattern of alternating sandstone, siltstone, and shale typical of most of the Wilcox Group (17). The Calvert Bluff Formation consists of primarily floodbasin deposits of sandy or silty clay and mudstone with variable amounts of cross-bedded, lenticular sandstone. Lignite seams 0.3 to 6 meters (1 to 20 feet) thick are common in these inter-channel, floodbasin deposits, as the Calvert Bluff Formation is the major lignite-bearing formation in the Wilcox Group (9).

Soils associated with deltaic deposits of the Wilcox Group form a steeply rolling and undulating land surface. Soils in the Edge-Crockett-Tabor general soil map unit occur on broad ridges and are associated with siltstone and shale sequences in the Wilcox and Midway Groups. Edge and Crockett soils are on summit, shoulder, and backslope positions with Tabor soils on footslope positions grading into stream terraces. Padina-Robco-Silstid soils formed in sandy residuum weathered from sandstones in the Simsboro Sand Member. Padina and Silstid soils are on summit and shoulder hillslope positions on ridges above Robco soils on footslopes and toeslopes.

Claiborne Group

The Claiborne Group of Eocene age consists of (in order of increasingly younger age) the Carrizo Sand, Reklaw Formation, Queen City Sand, Weches Formation, Sparta Sand, Cook Mountain Formation, and Yegua Formation and represents a repeating series of alternating continental (non-marine) and marine deposition . Cross-bedded sand and sandstone characterize transgressive, continental deposits in the Carrizo Sand, Queen City Sand, Sparta Sand, and Yegua Formation, while glauconitic sandstone and fossiliferous shale characterize regressive marine deposits in the Reklaw, Weches, and Cook Mountain Formations.

The Carrizo Sand unconformably overlies the Wilcox Group and consists of massive, friable, commonly cross-bedded, fine- to medium-grained, well-sorted sandstone. Thickness is estimated to range from 52 to 142 meters (170 to 465 feet), although faulting prevents more accurate determinations (17). Sand grains are iron-stained and the massive sandstone is commonly capped by an erosion-resistant ironstone conglomerate. Queen City sandstones have varying degrees of cementation and are similar to Carrizo Sand lithology and mineralogy, although presence of the ironstone conglomerate is not typical. Thin ironstone ledges occur in the Queen City Sand, primarily in lower parts of this formation. Thickness is estimated to range from 79 to 152 meters (260 to 500 feet) (17). The Sparta Sand is very similar to the Carrizo and Queen City Sands, although siltstone and brown, lignitic shale interbeds are more common in this formation. Friable Sparta sands have several glauconitic sand layers and numerous ironstone layers that are typically one-inch in thickness (8). An ironstone conglomerate may be present, as with the Carrizo Sand. The complete thickness for the Sparta Sand in Lee County ranges from 26 to 52 meters (85 to 170 feet) (17). The Yegua Formation is the youngest continental deposit in the Claiborne Group and crops out in southeastern portions of Lee County.

Yegua sediments consist of iron-stained sand, sandy clay, and lignite beds with silicified wood and palm stumps found across the outcrop length. Lenticular, bentonitic clay beds and sandy bentonitic clays occur in middle and upper portions of the Yegua Formation in Lee County (8). Most recent thickness estimates range from 192 to 229 meters (630 to 750 feet) for a complete section (17).

The Reklaw Formation represents the oldest marine deposits of the Claiborne Group and consists of gray, brown, or red-brown clay and shale in the upper part with indurated, glauconitic sandstone interbedded with shale in the lower part (17). A thin, fossiliferous, yellow-brown limestone is present in a measured stratigraphic section near the Lee-Bastrop county line and thin ironstone beds have been reported (8). While a complete section of the Reklaw Formation is estimated to range from 46 to 82 meters (150 to 270 feet) in thickness, faulting affects surface exposure in Lee County and the exposed thickness is only 15 meters (50 feet) (8,17). The Weches Formation unconformably overlies the Queen City Sand and crops out in north-central and extreme western parts of Lee County. The sedimentary section consists of glauconitic, fossiliferous shale with red-brown, glauconitic, fossiliferous limestone and minor sandstone. A complete section of this formation ranges from 15 to 33 meters (50 to 110 feet) in thickness (17). The Cook Mountain Formation is the youngest marine deposit in the Claiborne Group and crops out across south-central portions of the county. The basal Cook Mountain Formation (Wheelock Member) consists of glauconitic sand and marl with fossiliferous clay (7), similar to the Weches Formation. This section is overlain by dark brown to black, lignitic, slightly calcareous shale or clay with glauconitic lentils and common gypsum crystals (7,17). The upper part of the Cook Mountain Formation consists of the Spiller Sand Member, approximately 15 to 23 meters (50 to 75 feet) of gray to brown, lignitic sand interbedded with brown shale. This thin, fluvial or marginal marine sand unit within a largely regressive marine unit suggests the possibility of local depositional cycles (7). Thickness of individual sand beds ranges from a few inches to 0.6 meters (2 feet). The Spiller Sand Member is readily distinguished from the Carrizo, Queen City, and Sparta Sands by the increased amount of argillaceous (clayey) material in unweathered bedrock (17). The Mt. Tabor Member of the Cook Mountain overlies the Spiller sands and consists of another sequence of (primarily) brown to gray-green shale or clay with minor siltstone interbeds.

The Padina-Robco-Silstid general soil map unit occurs on prominent low hills and ridges on the gently rolling terrain associated with sandy sections of the Claiborne Group, including the Carrizo, Queen City, and Sparta Sands and the Yegua Formation. Soils in the Zack-Boonville-Zulch genral soil map unit occur on broad, low ridges and are associated with shale or interbedded shale and siltstone parent sediments in the Yegua Formation. Moderately deep Zack soils are on summit, shoulder, and upper backslope positions above moderately deep Zulch soils on lower backslope positions and very deep Boonville soils on footslopes and toeslopes.

Soils associated with marine deposits in the Claiborne Group occur on open prairies that are more gently sloping than landscapes associated with transgressive sand deposits. Soils in the Jedd-Gasil general soil map unit occur on ridges and are associated with sandstone and shale sequences in the Reklaw and Cook Mountain Formations. Moderately deep Jedd soils and very deep Gasil soils are both on summit, shoulder, and backslope positions. Soils in the Benchley-Gasil-Lexton general soil map unit are also associated with sandstone and shale sequences. Lexton soils occur on summit, shoulder, and upper backslope positions on ridges with Gasil soil on backslope positions and Benchley soils on lower backslope and footslope positions. Very deep Lexton and Gasil soils formed in residuum weathered from glauconitic shale and sandstone (respectively) in the Weches Formation, while Benchley soils may have an addition of colluvial sediments over residuum. Hillslope positions for the Luling-Benchley-Crockett general soil map unit are similar, with very deep Luling and Crockett soils formed in residuum weathered from shales in the Cook Mountain Formation. Luling and Crockett soils generally occur on summit and shoulder positions on ridges. Soils in the Kurten-Tabor-Spiller general soil map unit occur on narrow ridges and are associated with sandstone and shale sequences in the Mt. Tabor, Spiller Sand, and Landrum Members of the Cook Mountain Formation. Kurten and Spiller soils formed in shale with minor interbedded sandstone on (typically) summit, shoulder, and backslope positions above Tabor soils on footslope positions grading into valley flats.

Jackson Group

The Jackson Group of late Eocene age consists of (in order of increasingly younger age) the Caddell, Wellborn, and Manning Formations and crops out in southeastern portions of Lee County. Jackson Group sediments generally represent a time of lowered sea level and deltaic or marine deposition (11). The Caddell Formation outcrops in Lee County consist of a 40-foot sequence of clayey, prodelta sediments, including brown to gray shale and clay with sand lenses that are locally glauconitic, iron-stained, or have ironstone concretions (8). Exposures of the Caddell Formation in the county are scarce due to the subdued topography.

The overlying Wellborn Formation crops out along a narrow belt that is generally less than one mile in width and consists of (primarily) sandstone with thin interbeds of brown, lignitic clay and gray, lignitic shale (17). Cementation in sandstone beds is highly variable, ranging from indurated to friable. Laterally continuous sandstone beds that are indurated with silica cement form prominent escarpments or low cuestas that extend for some distance (8), while thinner, more weakly cemented sandstone beds form low hills. Petrified (silicified) wood is locally abundant. Thickness of the Wellborn Formation, based on local well control, is estimated at 29 meters (95 feet) in the southern part of Lee County (17).

The Manning Formation conformably overlies the Wellborn Formation and continues the regressive sequence with deposits interpreted as a delta-plain sequence (11). Manning Formation outcrops in Lee County consist of brown to tan clay, shale, lignite, and gray tuffaceous sandstone (11). Thick sandstones within the formation are typically associated with lignite seams that range up to 2.5 m (8 feet) in thickness.

Soils in the Singleton-Winedale-Burlewash general soil map unit occur on broad ridges and are associated with interbedded tuffaceous sandstone, shale and siltstone in the Jackson Group. Winedale and Burlewash soils are on summit, shoulder, and upper backslope positions above Singleton soils on footslope and toeslope positions.

Quaternary High Gravel Deposits

Quaternary high gravel deposits in Lee County generally cover upland areas between the Colorado River and Yegua Creek within the Brazos River drainage area in the southern part of the county. The largest mapped extent of these deposits, in southern Lee and northern Fayette Counties, averages 5 to 6 m (15 to 20 feet) in thickness (11). These upland deposits consist of loose, coarse gravel with moderate amounts of cobbles, and are typically chert with some silicified wood (17) speculated that these upland gravels represent either a widespread, ancestral terrace deposit of the Colorado River or (more likely) a relict siliceous gravel sheet known as Uvalde Gravel. The Uvalde Gravel occurs as a broad, thin deposit or scattered lag accumulation of siliceous gravels, sand, and clay that mantles interstream divides from central Texas southwestward into northern Mexico (3). Soils in the Tabor-Lufkin-Mabank general soil map unit are mapped in association with these upland gravels on paleoterraces.

Local ferruginous pebble and cobble conglomerates also occur within Lee County (17). These upland gravels and angular blocks or boulders of ferruginous sandstone are found sporadically within a belt that is restricted to the central zone of complex faulting (17) postulates that these conglomerates are related to this fault zone and that cementation is due to mineralized waters moving along fault planes (17).

Quaternary Alluvium and Terrace Deposits

Quaternary terrace deposits generally include several levels which likely correspond to sea-level changes and associated geologic units of Pleistocene age along the Texas Gulf Coastal Plain. Texture of these stream terrace deposits can be highly variable and consists of assorted proportions of sand, silt, clay, and gravel. Land surfaces associated with Quaternary terrace deposits are generally of Pleistocene age.

Soils in the Davilla-Wilson general soil map unit formed in loamy alluvium on broad, relict stream terraces. These soils occur in an anastomosing (branching and rejoining) pattern with Davilla soils on broad, convex mounds and Wilson soils on adjacent concave areas. Soils in the Tabor-Lufkin-Mabank general soil map unit formed in loamy and clayey alluvium on stream terraces.

Quaternary alluvium generally consists of flood plain and indistinct low terrace deposits, although sediments associated with additional fluvial landforms (oxbows, point bars, abandoned channels, etc.) are also included. Texture of alluvial deposits can be variable and generally consists of clay, silt, and fine sand (17). Land surfaces associated with Quaternary alluvium are likely Holocene age.

Loamy soils in the Uhland-Sandow general soil map unit occur on narrow flood plains of tributaries and small streams and natural levees along meandering streams. Clayey and loamy soils in the Zilaboy-Sandow-Navasota general soil map unit occur on flood plains, primarily along Yegua Creek within the Brazos River drainage area.

Groundwater Resources

Several aquifers within Lee County are included within the approximately 1,830 meters (6,000 feet) of interbedded friable sandstone, indurated sandstone, silt, siltstone, clay, shale, and thin, local limestone lenses of Tertiary and Quaternary age (17). Principal aquifers are the Simsboro Sand Member within the Wilcox Group, and the Carrizo, Queen City, and Sparta Sands. Additional water-bearing units include other sands in the Wilcox Group, Reklaw Formation, Cook Mountain Formation, Yegua Formation, Jackson Group (including the Wellborn Sandstone), and some surficial deposits (17).

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Glossary

Many of the terms relating to landforms, geology, and geomorphology are defined in more detail in the "National Soil Survey Handbook" (available in local offices of the Natural Resources Conservation Service or on the Internet).

ABC soil. A soil having an A, a B, and a C horizon.

AC soil. A soil having only an A and a C horizon. Commonly, such soil formed in recent alluvium or on steep, rocky slopes.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Unconsolidated material, such as gravel, sand, silt, clay, and various mixtures of these, deposited on land by running water.

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.

Argillic horizon. A subsoil horizon characterized by an accumulation of illuvial clay.

Aspect. The direction toward which a slope faces. Also called slope aspect.

Association, soil. A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Backslope. The position that forms the steepest and generally linear, middle portion of a hill slope. In profile, backslopes are commonly bounded by a convex shoulder above and a concave footslope below.

Backswamp. A flood-plain landform. Extensive, marshy or swampy, depressed areas of flood plains between natural levees and valley sides or terraces.

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.

Base slope (geomorphology). A geomorphic component of hills consisting of the concave to linear (perpendicular to the contour) slope that, regardless of the lateral shape, forms an apron or wedge at the bottom of a hillside dominated by colluvium and slope-wash sediments (for example, slope alluvium).

Bedding plane. A planar or nearly planar bedding surface that visibly separates each successive layer of stratified sediment or rock (of the same or different lithology) from the preceding or following layer; a plane of deposition. It commonly marks a change in the circumstances of deposition and may show a parting, a color difference, a change in particle-size, or various combinations of these. The term is commonly applied to any bedding surface, even one that is conspicuously bent or deformed by folding.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bottom land. An informal term loosely applied to various portions of a flood plain.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Brush management. Use of mechanical, chemical, or biological methods to make conditions favorable for reseeding or to reduce or eliminate competition from woody vegetation and thus allow understory grasses and forbs to recover. Brush management increases forage production and thus reduces the hazard of erosion. It can improve the habitat for some species of wildlife.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Caliche. A general term for a prominent zone of secondary carbonate accumulation in surficial materials in warm, subhumid to arid areas. Caliche is formed by both geologic and pedologic processes. Finely crystalline calcium carbonate forms a nearly continuous surface-coating and void-filling medium in geologic (parent) materials. Cementation ranges from weak in nonindurated forms to very strong in indurated forms. Other minerals (e.g., carbonates, silicate, and sulfate) may occur as accessory cements. Most petrocalcic horizons and some calcic horizons are caliche.

California bearing ratio (CBR). The load-supporting capacity of a soil as compared to that of standard crushed limestone, expressed as a ratio. First standardized in California. A soil having a CBR of 16 supports 16 percent of the load that would be supported by standard crushed limestone, per unit area, with the same degree of distortion.

Canopy. The leafy crown of trees or shrubs. (See Crown.)

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Channery soil material. Soil material that has, by volume, 15 to 35 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches (15 centimeters) along the longest axis. A single piece is called a channer.

Chemical treatment. Control of unwanted vegetation through the use of chemicals.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeters 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. See Redoximorphic features.

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 dense, compact, slowly permeable subsoil layer that contains much more clay than the overlying materials, from which it is separated by a sharply defined boundary. A claypan is commonly hard when dry and plastic and sticky when wet.

Climax plant community. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse textured soil. Sand or loamy sand.

Cobble (or cobblestone). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Cobbly soil material. Material that has 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material has 35 to 60 percent of these rock fragments, and extremely cobbly soil material has more than 60 percent.

COLE (coefficient of linear extensibility). See Linear extensibility.

Colluvium. Unconsolidated, unsorted earth material being transported or deposited on side slopes and/or at the base of slopes by mass movement (e.g., direct gravitational action) and by local, unconcentrated runoff.

Complex slope. Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

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 compounds making up concretions. See Redoximorphic features.

Conglomerate. A coarse grained, clastic sedimentary rock composed of rounded or subangular rock fragments more than 2 millimeters in diameter. It commonly has a matrix of sand and finer textured material. Conglomerate is the consolidated equivalent of gravel.

Conservation cropping system. Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the effects of the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil. Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to compression. Terms describing consistence are defined in the "Soil Survey Manual."

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosion (geomorphology). A process of erosion whereby rocks and soil are removed or worn away by natural chemical processes, especially by the solvent action of running water, but also by other reactions, such as hydrolysis, hydration, carbonation, and oxidation.

Corrosion (soil survey interpretations). Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

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.

Cropping system. Growing crops according to a planned system of rotation and management practices.

Cross-slope farming. Deliberately conducting farming operations on sloping farmland in such a way that tillage is across the general slope.

Cutbanks cave (in tables)**.** The walls of excavations tend to cave in or slough.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Dense layer (in tables)**.** A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depth, soil. Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized—*excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained*, and *very poorly drained*. These classes are defined in the "Soil Survey Manual."

Drainage, surface. Runoff, or surface flow of water, from an area.

Drainageway. A general term for a course or channel along which water moves in draining an area. A term restricted to relatively small, linear depressions that at some time move concentrated water and either do not have a defined channel or have only a small defined channel.

Draw. A small stream valley that generally is shallower and more open than a ravine or gulch and that has a broader bottom. The present stream channel may appear inadequate to have cut the drainageway that it occupies.

Earthy fill. See Mine spoil.

Ecological site. An area where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. An ecological 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 ecological sites in kind and/or proportion of species or in total production.

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.

Endosaturation. A type of saturation of the soil in which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.

Eolian deposit. Sand-, silt-, or clay-sized clastic material transported and deposited primarily by wind, commonly in the form of a dune or a sheet of sand or loess.

Episaturation. A type of saturation indicating a perched water table in a soil in which saturated layers are underlain by one or more unsaturated layers within 2 meters of 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 (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.

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 surface. A land surface shaped by the action of erosion, especially by running water.

Escarpment. A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. Most commonly applied to cliffs produced by differential erosion. Synonym: scarp.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grain is grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity*.

Fine textured soil. Sandy clay, silty clay, or clay.

First bottom. An obsolete, informal term loosely applied to the lowest flood-plain steps that are subject to regular flooding.

Flood plain. The nearly level plain that borders a stream and is subject to flooding unless protected artificially.

Flood-plain landforms. A variety of constructional and erosional features produced by stream channel migration and flooding. Examples include backswamps, flood-plain splays, meanders, meander belts, meander scrolls, oxbow lakes, and natural levees.

Flood-plain splay. A fan-shaped deposit or other outspread deposit formed where an overloaded stream breaks through a levee (natural or artificial) and deposits its material (commonly coarse grained) on the flood plain.

Flood-plain step. An essentially flat, terrace-like alluvial surface within a valley that is frequently covered by floodwater from the present stream; any approximately horizontal surface still actively modified by fluvial scour and/or deposition. May occur individually or as a series of steps.

Fluvial. Of or pertaining to rivers or streams; produced by stream or river action.

Footslope. The concave surface at the base of a hill slope. 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 microlows (microbasins) and microhighs (microknolls) in nearly level areas or of microvalleys and microridges parallel with the slope. Typically, the microrelief of clayey soils that shrink and swell considerably with changes in moisture content.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that has 15 to 35 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water. Water filling all the unblocked pores of the material below the water table.

Gully. A small channel with steep sides caused by erosion and cut in unconsolidated materials by concentrated but intermittent flow of water. 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.

Hard to reclaim (in tables)**.** Reclamation is difficult after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Head slope (geomorphology). 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.

High-residue crops. Such crops as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.

Hill. A generic term for an elevated area of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline. Slopes are generally more than 15 percent. The distinction between a hill and a mountain is arbitrary and may depend on local usage.

Hill slope. A generic term for the steeper part of a hill between its summit and the drainage line, valley flat, or depression floor at the base of a hill.

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:

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff potential. The soil properties that influence this potential are those that affect the minimum rate of water infiltration on a bare soil during periods after prolonged wetting when the soil is not frozen. These properties are depth to a seasonal high water table, the infiltration rate and permeability after prolonged wetting, and depth to a very slowly permeable layer. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Interfluve. A landform composed of the relatively undissected upland or ridge between two adjacent valleys containing streams flowing in the same general direction. An elevated area between two drainageways that sheds water to those drainageways.

Interfluve (geomorphology). A geomorphic component of hills consisting of the uppermost, comparatively level or gently sloping area of a hill; shoulders of backwearing hillslopes can narrow the upland or can merge, resulting in a strongly convex shape.

Intermittent stream. A stream, or reach of a stream, that does not flow year-round but that is commonly dry for 3 or more months out of 12 and whose channel is generally below the local water table. It flows only during wet periods or 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. See Redoximorphic features.

Knoll. A small, low, rounded hill rising above adjacent landforms.

K-sat. Saturated hydraulic conductivity. (See Permeability.)

Lamella. A thin, discontinuous or continuous, generally horizontal layer of fine material (especially clay and iron oxides) that has been illuviated within a coarser, eluviated layer.

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.

Linear extensibility. Refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. Linear extensibility is used to determine the shrink-swell potential of soils. It is an expression of the volume change between the water content of the clod at 1/3- or 1/10-bar tension (33kPa or 10kPa tension) and oven dryness. Volume change is influenced by the amount and type of clay minerals in the soil. The volume change is the percent change for the whole soil. If it is expressed as a fraction, the resulting value is COLE, coefficient of linear extensibility.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Low strength. The soil is not strong enough to support loads.

Low-residue crops. Such crops as corn used for silage, peas, beans, and potatoes. Residue from these crops is not adequate to control erosion until the next crop in the rotation is established. These crops return little organic matter to the soil.

Marl. An earthy, unconsolidated deposit consisting chiefly of calcium carbonate mixed with clay in approximately equal proportions; formed primarily under freshwater lacustrine conditions but also formed in more saline environments.

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. See Redoximorphic features.

Meander belt. The zone within which migration of a meandering channel occurs; the flood-plain area included between two imaginary lines drawn tangential to the outer bends of active channel loops.

Meander scar. A crescent-shaped, concave or linear mark on the face of a bluff or valley wall, produced by the lateral erosion of a meandering stream that impinged upon and undercut the bluff.

Meander scroll. One of a series of long, parallel, close-fitting, crescent-shaped ridges and troughs formed along the inner bank of a stream meander as the channel migrated laterally down-valley and toward the outer bank.

Mechanical treatment. Use of mechanical equipment for seeding, brush management, and other management practices.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mine spoil. An accumulation of displaced earthy material, rock, or other waste material removed during mining or excavation. Also called earthy fill.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. A kind of map unit that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Mollic epipedon. A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Descriptive terms are as follows: abundance—*few, common*, and *many; size—fine, medium*, and *coarse*; and *contrast—faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch)*; medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch)*;* and *coarse,* more than 15 millimeters (about 0.6 inch).

Mudstone. A blocky or massive, fine grained sedimentary rock in which the proportions of clay and silt are approximately equal. Also, a general term for such material as clay, silt, claystone, siltstone, shale, and argillite and that should be used only when the amounts of clay and silt are not known or cannot be precisely identified.

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value of 6.6 to 7.3. (See Reaction, soil.)

Nodules. Cemented bodies lacking visible internal structure. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up nodules. See Redoximorphic features.

Nose slope (geomorphology). A geomorphic component of hills consisting of the projecting end (laterally convex area) of a hillside. The overland waterflow is predominantly divergent. Nose slopes consist dominantly of colluvium and slope-wash sediments (for example, slope alluvium).

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Very low	less than 0.5 percent
Low	0.5 to 1.0 percent
Moderately low	1.0 to 2.0 percent
Moderate	2.0 to 4.0 percent
High	4.0 to 8.0 percent
Very high	more than 8.0 percent

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan*, and *traffic pan*.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three-dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The movement of water through the soil.

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:

Impermeable	less than 0.0015 inch
Very slow	0.0015 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

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

Piping (in tables)**.** Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Pitting (in tables)**.** Pits caused by melting around ice. They form on the soil after plant cover is removed.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

have a high water table and saline conditions.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Pore linings. See Redoximorphic features.

Potential native plant community. See Climax plant community.

Potential rooting depth (effective rooting depth). Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Precipitation Effectiveness Index (PE Index) is the measure of the long-range effectiveness of precipitation in promoting plant growth for a given location. The formula for calculating PE Index is:

$$\text{P-E Index} = 10 \sum_{n-1}^{12} (\text{P-E index})_n \; .$$

The formula is equal to 10 times the sum of the monthly precipitation-evaporation ratios (monthly precipitation amounts divided by monthly evaporation amounts).

Prescribed burning. Deliberately burning an area for specific management purposes, under the appropriate conditions of weather and soil moisture and at the proper time of day.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Proper grazing use. Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This practice increases the vigor and reproduction capacity of the key plants and promotes the accumulation of litter and mulch necessary to conserve soil and water.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed as 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. See Redoximorphic features.

Redoximorphic depletions. See Redoximorphic features.

Redoximorphic features. Redoximorphic features are associated with wetness and result from alternating periods of reduction and oxidation of iron and manganese compounds in the soil. Reduction occurs during saturation with water, and oxidation occurs when the soil is not saturated. Characteristic color patterns are created by these processes. The reduced iron and manganese ions may be removed from a soil if vertical or lateral fluxes of water occur, in which case there is no iron or manganese precipitation in that soil. Wherever the iron and manganese are oxidized and precipitated, they form either soft masses or hard concretions or nodules. Movement of iron and manganese as a result of redoximorphic processes in a soil may result in redoximorphic features that are defined as follows:

1. Redoximorphic concentrations.—These are zones of apparent accumulation of iron-manganese oxides, including:
   a. Nodules and concretions, which are cemented bodies that can be removed from the soil intact. Concretions are distinguished from nodules on the basis of internal organization. A concretion typically has concentric layers that are visible to the naked eye. Nodules do not have visible organized internal structure; and
   b. Masses, which are noncemented concentrations of substances within the soil matrix; and
   c. Pore linings, i.e., zones of accumulation along pores that may be either coatings on pore surfaces or impregnations from the matrix adjacent to the pores.
2. Redoximorphic depletions.—These are zones of low chroma (chromas less than those in the matrix) where either iron-manganese oxides alone or both iron-manganese oxides and clay have been stripped out, including:
   a. Iron depletions, i.e., zones that contain low amounts of iron and manganese oxides but have a clay content similar to that of the adjacent matrix; and
   b. Clay depletions, i.e., zones that contain low amounts of iron, manganese, and clay (often referred to as silt coatings or skeletans).
3. Reduced matrix.—This is a soil matrix that has low chroma *in situ* but undergoes a change in hue or chroma within 30 minutes after the soil material has been exposed to air.

Reduced matrix. See Redoximorphic features.

Regolith. All unconsolidated earth materials above the solid bedrock. It includes material weathered in place from all kinds of bedrock and alluvial, glacial, eolian, lacustrine, and pyroclastic deposits.

Relief. The relative difference in elevation between the upland summits and the lowlands or valleys of a given region.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as bedrock disintegrated in place.

Rill. A very small, steep-sided channel resulting from erosion and cut in unconsolidated materials by concentrated but intermittent flow of water. A rill generally is not an obstacle to wheeled vehicles and is shallow enough to be smoothed over by ordinary tillage.

Riser. The vertical or steep side slope (e.g., escarpment) of terraces, flood-plain steps, or other stepped landforms; commonly a recurring part of a series of natural, steplike landforms, such as successive stream terraces.

Road cut. A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

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.

Saturated hydraulic conductivity (K-sat). See Permeability.

Saturation. Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

Sedimentary rock. A consolidated deposit of clastic particles, chemical precipitates, or organic remains accumulated at or near the surface of the earth under normal low temperature and pressure conditions. Sedimentary rocks include consolidated equivalents of alluvium, colluvium, drift, and eolian, lacustrine, and marine deposits. Examples are sandstone, siltstone, mudstone, claystone, shale, conglomerate, limestone, dolomite, and coal.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer. All the soils of a series have horizons that are similar in Composition, thickness, and arrangement.

Shale. Sedimentary rock that formed by the hardening of a deposit of clay, silty clay, or silty clay loam and that has a tendency to split into thin layers.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shoulder. The convex, erosional surface near the top of a hill slope. A shoulder is a transition from summit to backslope.

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.

Shrub-coppice dune. A small, streamlined dune that forms around brush and clump vegetation.

Side slope (geomorphology). A geomorphic component of hills consisting of a laterally planar area of a hillside. The overland waterflow is predominantly parallel. Side slopes are dominantly colluvium and slope-wash sediments.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. An indurated silt having the texture and Composition of shale but lacking its fine lamination or fissility; a massive mudstone in which silt predominates over clay.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

Slickensides (pedogenic). Grooved, striated, and/or glossy (shiny) slip faces on structural peds, such as wedges; produced by shrink-swell processes, most commonly in soils that have a high content of expansive clays.

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	3 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 alluvium. Sediment gradually transported down the slopes of mountains or hills primarily by nonchannel alluvial processes (i.e., slope-wash processes) and characterized by particle sorting. Lateral particle sorting is evident on long slopes. In a profile sequence, sediments may be distinguished by differences in size and/or specific gravity of rock fragments and may be separated by stone lines. Burnished peds and sorting of rounded or subrounded pebbles or cobbles distinguish these materials from unsorted colluvial deposits.

Slow refill (in tables)**.** The slow filling of ponds, resulting from restricted permeability in the soil.

Sodicity. The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium adsorption ratio (SAR) of a saturation extract, or the ratio of Na+ to Ca ++ + Mg++. The degrees of sodicity and their respective ratios are:

Slight	less than 13:1
Moderate	13 to 30:1
Strong	more than 30:1

Sodium adsorption ratio (SAR). A measure of the amount of sodium (Na) relative to calcium (Ca) and magnesium (Mg) in the water extract from saturated soil paste. It is the ratio of the Na concentration divided by the square root of one-half of the Ca + Mg concentration.

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.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stream terrace. One of a series of platforms in a stream valley, flanking and more or less parallel to the stream channel, originally formed near the level of the stream; represents the remnants of an abandoned flood plain, stream bed, or valley floor produced during a former state of fluvial erosion or deposition.

Stripcropping. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to wind erosion and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless soils are either single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind erosion and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

Substratum. See Underlying material.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Summer fallow. The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

Summit. The topographically highest position of a hill slope. 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."

Surface soil. The A, E, AB, and EB horizons, considered collectively. It includes all subdivisions of these horizons.

Terrace (conservation). An embankment, or ridge, constructed across sloping soils are on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field generally is built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geomorphology). A steplike surface, bordering a valley floor or shoreline, that represents the former position of a flood plain, lake, or seashore. The term is usually applied both to the relatively flat summit surface (tread) that was cut or built by stream or wave action and to the steeper descending slope (scarp or riser) that has graded to a lower base level of erosion.

Terracettes. Small, irregular steplike forms on steep hillslopes, especially in pasture, formed by creep or erosion of surficial materials that may be induced or enhanced by trampling of livestock, such as sheep or cattle.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables)**.** Otherwise suitable soil material that is too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toeslope. The gently inclined surface at the base of a hill slope. Toeslopes in profile are commonly gentle and linear and are constructional surfaces forming the lower part of a hill slope 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.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Tread. The flat to gently sloping, topmost, laterally extensive slope of terraces, flood-plain steps, or other stepped landforms; commonly a recurring part of a series of natural steplike landforms, such as successive stream terraces.

Upland. An informal, general term for the higher ground of a region, in contrast with a low-lying adjacent area, such as a valley or plain, or for land at a higher elevation than the flood plain or low stream terrace; land above the footslope zone of the hill slope continuum.

Underlying material. The part of the soil below the solum.

Valley fill. The unconsolidated sediment deposited by any agent (water, wind, ice, or mass wasting) so as to fill or partly fill a valley.

Weathering. All physical disintegration, chemical decomposition, and biologically induced changes in rocks or other deposits at or near the earth's surface by atmospheric or biologic agents or by circulating surface waters but involving essentially no transport of the altered 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.

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